Kipeto Wind Farm

and

220 kV Transmission Line

Executive Summary

September 2013

Kipeto Energy Ltd.

Contents

1.0 Introduction

Kipeto Energy Ltd proposes to establish a commercial wind energy facility by constructing 63 wind turbine generators with a combined maximum generating capacity of 100 MW. The proposed development is to be sited within an area of about 70km^2. The Kipeto area is located about 70 km south-west of Nairobi in Kajiado County. The area is dominated by the indigenous Maasai people and lies approximately 18km north-west of Kajiado town in the Rift Valley Province. The main activities of the project include a turbine corridor of 63 wind turbines, internal access roads to all turbines, and a 17km transmission line to the main Nairobi Namanga road on a 30 metre wayleave.

The proposed project will be undertaken in the Esilanke area, Oloiyangani (Kipeto) sub-location, south Keekonyokei location in Kiserian, Kajiado division. The proposed wind farm will be developed on land leased from local landowners.

Kipeto Energy Limited is a special purpose vehicle incorporated in Kenya for developing the proposed wind energy facility. The company comprises two partners namely, General Electric Company of the USA, and Craftskills Wind Energy International Limited, a Kenyan renewable energy company. Kipeto Energy Limited will contribute 5% of the proceeds arising from power generation to the local Masai community through a trust fund. Details of the trust fund are outlined later in this document.

Background to the Project

In 2009, the Proponent applied for an Expression of Interest in prospecting for wind energy in the proposed project area and was subsequently granted the “Non-renewable Rights of First Refusal” by the Ministry of Energy.

In March 2011, the Proponent appointed Galetech Energy Developments Ltd as the Project Manager to oversee the EIA process, design, construction, supervision, project management and commissioning of the project. Galetech Energy Developments is an Irish based internationally focused multi-disciplinary renewable energy consultancy, which specializes in the delivery of feasibility analysis, project design, project management, GIS mapping, permitting & environmental impact assessment reports associated with renewable energy projects.

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In June 2011, the Proponent appointed Kurrent Technologies Ltd. to complete the Environmental and Social Impact Assessment (ESIA) and Environment Management Plan (EMP) for necessary environmental authorizations in accordance with the Environment Management and Coordination Act, 1999 (EMCA) and Legal Notice (LN) 101: Environment (Impact Assessment and Audit) Regulations, 2003. It is a legal requirement in Kenya that a local Lead Expert or Firm of Experts registered by the National Environment Management Authority undertakes EIA Studies. Kurrent Technologies Ltd. is a National Environment Management Authority (NEMA) registered Firm of Experts.

The Kipeto project area basic statistical footprint estimates population at about 3,750 in 780 Households, of which about 1,260 are registered voters. There are four primary schools, one secondary school and one hospital within the footprint.

Kajiado County has an area of approximately 19600km2 (Central Bureau of Statistics, 1981). It is roughly triangular and is bordered by the Nairobi-Mombasa railway to the north-east, the border with Tanzania to the south, and the western wall of the Rift Valley to the west. The eastern boundary is formed by the Chyulu Range and western limit of Tsavo National Park. The County is divided into four eco-zones namely, the Rift Valley, the upland Athi Kapiti Plains, the Central Hills and the Amboseli Plains.

The proposed project falls within the Athi-Kapiti plains eco-zone. The upland Athi-Kapiti Plains are mainly open, rolling land. The Plains drain towards the Athi River basin in the east. Geologically, they are volcanically derived but there is a band of tertiary sediments running south-west to north-east across the centre of the plains. The soils are mostly deep black Vertisols.

1.1 Kipeto Wind Farm

The proposed wind farm will be developed on land leased from local land owners; the wind turbines will be sited over a project area measuring approximately 70km^2. The original layout submitted to NEMA consisted of 67 no. turbines. The application was for 100MW Wind Farm. It is considered following extensive wind resource analysis, that the GE 1.6 is the most suitable turbine for this site. Following externsive site investigations the 63 no turbines were chosen on the basis of;-

- Environmemtal constraints such as:
  - 500m set back distance from households;
  - Noise impact less than 43dB(A) or in the case of landowners less than 45dB(A);
  - Outside a radius of 500m of any Osyris Lanceolata (East African Sandalwood) establishment;
  - Away from the riverine areas that support sensitive habitats;
  - Construction compound at least 100m from water bodies;
- Separation distances of 7 x 3 rotor diameter spacing was employed in order to maximise the wind resource

The proposed development is for a wind farm consisting of 63 no. 1.6MW turbines and all associated development. The dimensions of the proposed turbines are:

- Hub height – 80m
- Blade Length – 50 m
- Rotor Diameter – 100m
- Overall height not exceeding - 130m

A receptor survey was conducted in order to quantify the number of properties within 1km (10 rotor diameters) of the proposed turbines. In total, 62 receptors were found. Noise and shadow flicker impact assessments were conducted to assess any potential impact on these receptors.

1.2 Transmission Line Layout

The 220 kV transmission line will connect the Kipeto wind energy facility to the national grid at the Isinya substation near the town of Kajiado.

The transmission line will pass through Maasai pastoral land which is mainly used for grazing. Vegetation cover is savannah grassland with scattered trees (of variable canopy density). The topography consists of the western highland above the Rift Valley (further west), and the low, open hills of the Athi-Kapiti plains.

Maasai homesteads are scattered throughout the region towards the western end of the transmission line, while the eastern end is more urbanised and is located between the relatively

large towns of Isinya and Kajiado. The transmission line meets up with the 400 kV Mombasa-Nairobi transmission line at the still-to-be-constructed Isinya substation.

The A104 is a major transport route connecting Nairobi with Tanzania. It is also heavily used by tourists visiting the Amboseli game reserve. The proposed transmission line will cross this road between Isinya and Kajiado.

There are no officially recognised protected areas within 10 km of the transmission line route. It is necessary to build a separate line from the wind farm to Isinya the substation due to the requirements of Kenya electricity regulations.

2.0 Documentation

The documentation connected with these projects is comprised as follows:

Volume	*Description*
II	**Executive Summary**
III	**Environmental and Social Impact Assessment/ Wind Farm Site**
a.	Original SEIA
i.	Appendices
b.	Supplement to the SEIA
i.	Appendices
IV	**Stakeholder Engagement**
ii.	Stakeholder Engagement Plan
iii.	Indigenous Peoples Plan
V	**Transmission SEIA**
a	Appendices
b	Stakeholder Engagement
VI	**Environmental and Social Management Plan**

This executive summary will be available written in Masai language at the following locations;-

- Esilanke Primary School,
- Esilanke Market

Also note that the entire ESIA for the wind farm and transmission line in English is available at the Kajiado County offices

3.0 Environmental and Social Impact Assessment/ Wind Farm Site Original SEIA

The scope of the ESIA originally submitted for the Wind Farm Project to the National Environmental Management Agency in March 2012 project includes design, construction, operation and decommissioning activities of the proposed wind farm. The ESIA Study has evaluated the potential environmental and social impacts associated with all three phases of the project.

The primary components of the project include a wind energy facility including 67 no. wind turbines, one on-site sub-station, underground electrical cabling between turbines and the sub-station, internal access roads and an office/maintenance building on the site. Please note the number of turbines has now been reduced from 67 to 63.

The associated facilities include transmission lines which will emanate from the on-site sub-station and terminate at the yet to be constructed Isinya Kenya Power sub-station. The associated facilities are excluded from the original ESIA Study as discussions are currently on-going between the Proponent and Kenya Power on the transmission lines design, routing and connectivity. The environmental and social impacts related to the associated facilities are subject of a separate ESIA Study which is available in Volume IV.

In compiling this ESIA Study, a number of specialist studies were undertaken by the Firm of Experts. These studies are listed below for ease of reference.

Description of Specialist Study

A. Archaeological and Cultural Heritage Report
B. Ecological Impact Assessment Report
C. Geology and Soils Report
D. Hydrology Report
E. Hydrogeology Report
F. Noise Assessment Report
G. Ornithological Study Report
H. Social Impact Assessment Report
I. Transport Assessment Report

J. Landscape and Visual Impact Assessment Report
K. Shadow Flicker Assessment Report

The conclusions and recommendations of this ESIA study are the result of the assessment of identified impacts by the Firm of Experts and their specialists including the process of public stakeholder consultation. The public stakeholder consultation process has been extensive and every effort was made to include representatives of all stakeholders in the study area.

The most significant environmental impacts associated with the proposed project include:

- Visual impacts on the natural scenic resources of the region;
- Local site-specific impacts as a result of the construction and operational phases of the project;
- Impacts on the social environment.

The findings of the specialist studies undertaken within the ESIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project concluded that:

- The landowners directly affected by the project who have signed leases with Kipeto Energy Limited are not opposed to the project. In order to enhance the local employment and business opportunities, the mitigation measures stated in the report should be implemented;
- The environmental impacts associated with the proposed wind energy facility will be minimized provided that the recommended mitigation, monitoring and management measures are implemented and given due consideration during the process of finalizing the wind energy facility layout;
- The proposed project represents an investment in clean, renewable energy which given the challenges created by climate change, would result in positive social benefits for society as a whole.

The significance of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. Subsequently it is recommended that:

- All mitigation measures stated in this ESIA Study including those indicated in the specialist studies be implemented;

- The Environment Management Plan (EMP) to form part of the agreement with the contractors appointed to build and maintain the proposed wind energy facility, and will be used to ensure compliance with environmental specifications and management measures;
- The wind energy facility management will implement a monitoring program in order to understand the nature of impacts on avifauna due to the wind energy facility at the site;
- As far as is practical, wind turbines and associated lay down areas and access roads which could potentially impact on sensitive receptors, will be designed to avoid areas of high sensitivities. Where this is not possible, alternative mitigation measures detailed in this report are to be implemented;
- Disturbed areas will be rehabilitated as quickly as possible and an on-going monitoring program should be considered to detect and quantify any alien species;
- During the construction phase, unnecessary disturbance to habitats will be strictly controlled and the footprint of the impact should be kept to a minimum;
- A comprehensive storm water management plan will be compiled for the sub-station footprints prior to construction;
- Applications for all relevant and required permits required shall be obtained by Kipeto Energy Limited must be submitted to the relevant lead agencies.

3.1 Post ESIA Additional Bird and Bat Studies

Additional bird and bats studies were carried out from May to December 2012 to enhance the ESIA studies and to provide further baseline data to be used in determining the layout.

3.1.1 Birds

Additional bird surveys were carried out in 2012 following the acquisition of Kenyan environmental authorization for a proposed 100MW wind power generation project by Kipeto Energy Limited (KEL). This survey was carried out in the months of February to May and September to December respectively when most bird activities occur in the Kipeto area. The findings of all the 2012 bird studies are incorporated into a single report which can be found in **Kipeto Wind Farm SEIA and Appendices Post ESIA Studies**.

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The objective of undertaking this avifauna survey was to delineate the avifauna behavior within the proposed wind farm area and refine any mitigation measures proposed in the Environment and Social Impact Assessment (ESIA) Study. The bird survey was carried out by Kurrent Technologies Ltd. working in association with ornithologists from the National Museums of Kenya (NMK).

The proposed project site lies within the Rift Valley in Kenya and is characterized by scattered Acacia woodland, scrub, small wetlands and streams. Rainfall in the Kipeto area generally occurs between the months of March to May (referred to as the long rains) and between October and December (referred to as the short rains).

The ornithological surveys carried out were used to identify birds that use the area for foraging, passage and breeding within the wind farm development footprint area and attempted to establish whether the wind farm would be within the flight-line of any species considered vulnerable to collision and subsequent mortality risks.

Flight line and transects surveys of birds was undertaken at the proposed Kipeto wind farm project site in order to assess potential collision risks on birds. Surveys were conducted from February to November 2012. All species observed were recorded together with other variables describing their use of habitat e.g. movements, numbers of individuals, flight behavior etc. Several species were recorded in varying numbers at the site during the surveys.

The results of the transect surveys for breeding birds indicates that only a few species were likely to breed within the project footprint area. These were all relatively small species and consisted mostly of Passerines which are considered at low risk of collision with turbines.

Several species of raptors were recorded but in very low numbers. Raptor species were considered to be at potential collision risks with turbines. Among the raptors Augur Buzzards and Tawny eagles occurred throughout the field surveys, however their numbers were low.

The 2011/2012 avifaunal assessment in Kipeto provided information on the following:

- Bird species present in the general area of the proposed wind farm;
- The assessment so far includes a description of species in terms of their status such as migrants or resident and conservation status;

- The species have also been categorized under various groups and assessed according to their vulnerability to wind farm projects with raptors being most vulnerable and key targets for monitoring. Other medium size species have also been identified;
- Signs of breeding for few bird species such as Kori Bustard have also been observed;
- Seasonality, movement and habitat use of key raptors have been established.

The assessments so far indicate that wind farms impact on ornithological interests in a number of ways including loss of habitat due to the construction of turbine bases and tracks, displacement of birds as a result of disturbance, potential mortality through collision.

The 2011/2012 bird surveys provided important information to guide the implementation of the Kipeto wind energy project. Despite the high records of species recorded in Kipeto, there were no species of conservation concern listed under the various categories by the IUCN observed during flight line and breeding surveys.

Mitigation measures for specific impacts have been identified including data which would provide for the assessment of collision risk and mortality at the proposed sites for location of turbines.

Recorded species which are considered to be potentially at risk from collisions include relatively large species that included raptors such as Eagles, Vultures, Buzzards, Goshawks in small numbers and Lesser Kestrels that were only observed in large numbers during the April 2011but in 2012 they were recorded in low numbers.

Augur buzzard was the most abundant of the raptors and was observed regularly moving over all parts of the site. The raptors tended to be more abundant during the breeding season coinciding with the onset of rains with abundance of prey items. Several passerines were recorded with movements recorded rarely at potential collision height. The current survey has identified raptor species that are at potential collision risk although this must be considered low given their rarity at the site.

Observations of birds from vantage points detect only movements within daylight hours and when visibility is reasonable. It is possible that night movements of birds and some rarer breeding species were not detected in the surveys. Despite Kipeto being a point of migration

within the greater Rift Valley, the densities of migrating birds in the study area are low. Additionally, only a small fraction of the site is exposed to turbines. Birds may behave differently once turbines are erected; subsequently, post construction monitoring will need to be undertaken to provide additional information on avian behavior. New wind installations must be followed by detailed behavioral observation of soaring birds as well as further mapping of migration routes to establish any changes in bird behavior and movements during the post construction studies.

3.1.2 Bats

The 2012 bat baseline survey and an analysis of activities in the area where the proposed 100MW wind farm is to be developed by Kipeto Energy Limited (KEL) in Kajiado County, Rift Valley, Kenya was carried out with the objective of assess the diversity of bats, their use of the area and potential impact on those species from wind energy development in Kipeto using IFC Performance Standards1.

The assignment was undertaken by Kurrent Technologies Ltd. (KTL) on behalf of KEL which enjoined the expertise from bat specialist from National Museums of Kenya. The findings of all the 2012 studies are incorporated into a single report which can be found in **Volume III Kipeto Wind Farm SEIA and Appendices Post ESIA Studies**.

The survey design, and methods of data collection and analysis employed, followed best practice in both scientific bat surveys and assessing impacts of wind energy developments on bats in countries such as UK, Canada and Australia. Importantly baseline survey and monthly activity monitoring took into consideration the IFC Performance Standard 6 titled **Biodiversity Conservation and Sustainable Management of Living Natural Resources**.

Methods adopted for the field surveys included bat captures and release, walking transects for recordings of bat ultrasound, static automated ultra sound recording and physical search of bat roosts over the proposed wind farm site in Kipeto. Further, standard equipment devices were employed to gather data during the surveys. In particular, mist-nets were used to capture bats while Anabat SD2 ultra sound and Bat box bat detectors were used in the automated static recording and walking transects respectively.

Taxonomic identification was informed by the acoustic reference library on Kenyan bats, scientific reference bat collections at National Museums of Kenya (NMK), recent publications such as Monadjen et al (2010), Thorn and Kerbis (2009) and Pertterson and Webala 2012. Taxonomic names adopted for the recorded species followed standard binomial nomenclature and Wilson and Reeder (2005), which is a world authority in mammal taxonomic and geographic reference.

Fifteen species of bats from 8 families were recorded in the general area between March and December 2012. The records include one family of Fruit bat, *Epomorphorus wahlbergi*, and seven other families represented by several insect eating bats.

Higher densities of bat species and activities were recorded near wooded areas and valleys (e.g. around T26, T42, T62-64), than in open grass fields (e.g. around T1-T20). In open areas, bats were recorded near man-made water pans while in wooded areas, enhanced bat activity was recorded between trees, bushes, over streams, along dry valleys and over vegetation.

Bats were observed to be more active early in the night between 1900Hrs and 2100Hrs, than later at night and dawn in all the studied turbine locations in Kipeto.

Seven caves and two tree bat roosts were identified of which one cave situated 500m NE of turbine location T26 had at least six pregnant Hildebrandt's Horseshoe bats, *Rhinolophus hildebrandtii*. The rest of the caves appeared to used by bats only occasionally or at night.

The one cave containing pregnant Hildebrandt's horseshoe bat is considered as CRITICAL HBITAT in accordance with IFC Performance Standards 6 line 16 (IFC Performance standard 2012).

In view of the fact that all the 15 bat species recorded in Kipeto are not listed as of conservation concern in the IUCN Red list, potential risk to the species are considered low. This is because the 15 species are commoner species found elsewhere in Kenya and is observed to be on low activity in the Kipeto wind power project footprint area. The development of the proposed wind power project should however take mitigation measures especially avoiding wooded and bush hedgerows by at least 50 meters.

4.0: Supplement to Kipeto Wind Farm ESIA

A report to supplement the original ESIA submitted to NEMA in March 2012 due to changes to the layout, further studies carried out and requirements of international standards such as IFC and OPIC due diligence requirements has been prepared and can be found in Volume III b. A brief summary of the findings of this report is presented below.

4.1 Ecology

The Kipeto-Isinya landscape is diverse and characterized by different habitats complementing support for the wild herbivores and local communities. The diversity of plant species is high in the south eastern area of the proposed transmission line. Generally, there are mixed habitats and species; the upper areas have more grassland, which are easily affected by harsh climatic conditions such as drought.

The main impacts that were identified and resolved for purpose of assessment were the potential alteration of terrestrial plant through the destruction of plants and the introduction of alien invasive plant species; temporary obstruction of movement of wild-herbivores; potential poaching for bush meat; potential exposure to wild herbivores and; potential alteration of aquatic habitats. A risk assessment matrix developed by Kurrent Technologies Ltd. was used to determine potential ecological risks that the Kipeto wind energy project would pose to the environment. The risk matrix has a score of up to 100. According to the risk assessment matrix, when an impact score is more than 30 (-ve) then recommendation is made. After the assessment was undertaken, impacts that were given special attention due to exceeding the threshold were alteration of terrestrial plants (-36), introduction of alien invasive plant species (-48), alteration of aquatic habitat (-32), temporary obstruction of wild herbivores (-32).

The impacts recommended for mitigation include the avoidance of the destruction of habitats and a change in the behavior of personnel. A detailed environmental management plan is proposed at the end to guide on issues to be addressed and assignment of responsibility on monitoring development. A review of the ecological impact assessment, of the proposed Electric Power Transmission Line project activities was carried out in accordance with the IFC EHS guideline for Electric and Power Transmission and Distribution. A field study was conducted to determine areas that would be affected adversely by the project activities. The potential impacts on

ecological system in the Kipeto-Isinya area were reviewed in accordance with IFC Performance Standard and EHS guidelines, while, the Kurrent Technologies Ltd EIA study risk matrix was used to analyze impacts. Cumulative impacts from reasonably foreseeable similar projects and other activities were assessed on both habitats and movements of animals.

Following on from the original Ecological Impact Assessment some specific findings require further investigation in particular references to Acalypha and Cyperus species. A review of the ecology impact assessment as part of the due diligence process questioned whether Acalypha species is present in Africa. Some Acalypha species are also found in Kenya as indigenous species as well besides other parts of Africa. The species in this genus are however more common in the South America than Africa. The species that are in the IUCN red list of threatened species are mainly ornamental and are endemic mostly in the South America and one in Democratic Republic of Congo (Africa). There are some ornamental species in Kenya but these are exotic and only found in homes. The species encountered is indigenous and widely distributed in the country. A full species identification would require complete phenological observation based on all season observation, that is, to see its flowers and seeds other than just leaves. Absence of these can make identification reach at genus level difficult.

Similarly the cyperus species is distributed throughout all continents in both tropical and temperate regions and is often found in East Africa.

The Grey-Crown Crane bird was observed on one of the water resource pan off the ROW (60 m wide) during the ecology survey but was not observed during any of the ornithology surveys.

The presence of a globally endangered species does not necessarily trigger a designation of Critical Habitat. Despite the fact that this species were observed the numbers was very low in fact the species were only observed once during the 2 year survey period. The Grey-crowned crane doesn't seem to be a resident in the area and it is considered that the ecologist sighting is an opportunistic observation, Rupells Vulture was only observed at the beginning of the survey in May 2011 The only listed species that occurred often was the African White-Backed Vulture in passage and it was only observed actively using the site when there was a dead zebra. Raptors are known to range widely as they have extensive home ranges. Following on from this and the low numbers noted, the predicted impacts on the species do not raise concerns. None of the

raptor species is resident apart from the Augur Buzzard which is listed as List Concern. The Post construction monitoring plan will consider these species as targets for monitoring.

4.1.1 Access Roads

The designed Kipeto Wind Farm turbine access roads are networked on the turbine areas (T1 to T63. These roads will facilitate movement of equipments during construction and monitoring phase of the project. The total distance of the access road is estimated at 29.8 km. Almost two-thirds of the roads are located in the southern area of Kipeto whilst the remainder are located in the north. A total area of 24 ha will be cleared to accommodate the construction of roads.

The potential impacts of the proposed road will be greatest during the construction phase as the existing vegetation is cleared. The vast majority of the vegetation to be cleared is located in the southern portion of the project area. This area contains the bulk of species and the woody biomass in the area consists mainly of bushes and woodland. The northern side consists only of grasslands and population of *Acacia drepanolobium*.

During wet season animals, especially the herbivores, are distributed in the southern areas where bushes and woodland occur. Other animals include baboons which were observed on the southern riverines.

Construction activities are envisaged to impact varyingly on different aspects of biodiversity; these include impacts on terrestrial plants, sensitive habitats (riverines and woodlands), mammals, and herpetofauna.

The operation of construction activities should be restricted to day time from 8am to 5pm. This provides time for foraging for nocturnal animals. This group is normally sensitive to presence of human activities and flood lights at night.

During dry season the upland is void of grasses but the lowland still have grass, herbs and shrub reserves. Most of herbivores migrate to this area thus construction activities during dry season can affect utilization of this area. Construction should therefore be scheduled after the onset of rainfall. Generally, vegetation in the area respond very fast to rainfall hence herbivores will disperse to avoid any adverse impacts

Aquatic habitat alteration Contractor should work within the construction space of the ROW.

If additional temporary storage areas are required then, such areas should not have tree species. The construction contractor should consult relevant authority e.g. KWS and KFS

4.1.2 Bridge

As part of the project design it is planned to construct a small bridge to facilitate access between T55 and T57. The design of the bridge will be decided at EPC stage but is likely to be a plinth measuring approximately 5m long and 5m wide. The bridge will be treated as part of the access network in terms of impact assessment.

The area where the bridge is located consists of woody biomass in the area existing as bushes and woodland. Standard construction procedures and mitigation measures as described in the ecology impact assessment will be implemented to protect the habitat and water resources impacted.

4.2 Bat Studies

Following on from the Kipeto Wind Farm post ESIA studies bats have been assessed in conjunction with the Transmission Line ESIA for cumulative impact. Please refer to **the Transmission Line ESIA Appendix B** for the full report.

The assessments found Impact of habitat loss, alteration and disturbance could be ameliorated by maximizing use of existing roads and trucks for vehicles. A waste management plan is also recommended to proactively guide on-site and off-site waste disposal.

The bats documented are not of critical conservation concern, nationally or regionally. Non are either IUCN listed as threatened or known to be endemic, hence the overall remark that Kipeto-Isinya area is a moderate bat conservation.

Due to paucity in our knowledge on how local bat species including suspected migratory ones, could be affected by wind turbines and power lines, a monitoring plan is strongly recommended during operations. The monitoring plan should be integrated within the construction and operational plans.

4.3 Birds

The ornithological study aims to define the baseline environment and potential ornithological impacts associated with the project in order to develop mitigation measures that aim to minimize the negative impacts of the project while optimizing the positive impacts. Cumulative effects on the wind farm, transmission line and associated infrastructure are also assessed both at a local and national scale.

This study has been conducted to satisfy the Kenyan Environmental Management and Co-ordination Act 1999, which is the legislation that governs EIA studies in Kenya. The study further aims to satisfy the requirements of applicable avifauna related treaties and conventions and the procedures of the World Bank Group.

The ornithological impact assessment of the transmission line comprised discussions and consultations with the proponent and stakeholders; initial site reconnaissance; desk study and literature review; preparation of data collection instruments; field visits for consultations and observations; data analysis and report writing.

Bird surveys were carried out along the proposed 17km transmission line. Additional studies were also conducted on the wind farm site to relate how the different actions will impact on bird species cumulatively. The key activities undertaken during the ornithological assessment of the proposed 220kV transmission line are:

- Identifying sensitive bird habitats along the transmission line corridor;
- Identifying key bird species that would be affected by the transmission line while establishing their distribution;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures to be implemented during the project cycle;
- Assessing the anticipated impacts of the project on birds, with particular emphasis on the various phases of the project (i.e. construction, operation and maintenance)
- Recommend practical measures for mitigation of adverse impacts and enhancement of positive ones;
- Identify actions and species that would be impacted upon cumulatively by other reasonably foreseeable wind power projects; and

A semi-quantitative impact assessment methodology was undertaken to determine the significance of potential avifaunal impacts resulting from the transmission line project. Bird

collision was established as the most significant impact with the overhead conductors without mitigation. Electrocution was also identified as potential impact with high significance but with relevant mitigation on the design of the support structures, the probability would be low. No fatal flaws were identified which could prevent the project from proceeding.

There has been a substantial increased interest in wind farm developments globally. Most of the areas proposed for wind energy are also important areas for birds especially raptors and water birds. Whilst renewable energy development is crucial to the region's growth and to combating climate change, the impacts for soaring birds—including collision and electrocution with power lines and wind turbines—is considerable. The scale of energy development is huge, with over five million kilometers of transmission lines planned globally between 2010 and 2015. The Rift Valley/Red Sea region provides some of the best wind resources in the world. It is important to follow precautionary approaches that ensure potential cumulative impacts are considered and avoided where possible in accordance with existing environmental protection in EMCA and the 2012 International Finance Corporation's Performance Standards on Environmental and Social Sustainability. It should however be noted that not all the proposed wind farms presently under consideration are operational. However this assessment will consider that all potential wind farms will become operational in a reasonably foreseeable time frame.

The cumulative impact assessment in this report focused on known proposed wind farms in Kenya. The proposed projects would have the potential to impact on avifauna in a cumulative manner. Each project is expected to have additional potential impacts depending on the size, location and the interactions with different bird species.

The cumulative impacts assessment also focused on key vulnerable bird groups that include migrating raptors and breeding birds. The key cumulative effects identified were direct mortality through collision from wind turbines, transmission lines and barrier effect resulting from wind farms. Results from cumulative effects assessment indicate minimal residual impacts on birds with effective implementation of mitigation measures. A comprehensive post monitoring plan will reduce any anticipated impacts.

4.4 Hydrology

The volumes of water needed to be used have been calculated as:

- Concrete: 5000 m3

- Roads and hardstandings: 21.300 m3

- Maintenance roads and hardstandings: 60 m3 per day in the working area

Several options for procuring water exist. The procurement of water including any permits required will be managed by the EPC contractor. It is envisaged that water requirements shall be satisfied as follows:

- Construct a borehole on site and abstract water. A permit from the ministry of water is required for this. It is unlikely that enough water will be abstracted using this method alone but it could be used in combination with other supply means. It is considered likely that at least one borehole will be constructed on site to meet the water needs of the project. Care will need to be taken to not impact on other boreholes in the area. The borehole will be turned over to the community once construction is completed;
- Purchase water and transport to site from within Kenya. This is standard procedure for major construction projects in Kenya;
- Potable water for catering and welfare facilities will also be supplied by the EPC contractor from an accredited source.

4.5 Shadow Flicker

The Shadow Flicker impact Assessment for the Kipeto Wind Farm Layout has been updated following the revision of the layout using *WindPRO version 2.8.579.* Please refer to the **Volume 3 Kipeto Wind Farm Supplementary ESIA Report** for a detailed analysis**.**

The analysis found that no households within 10 rotor diameters of a proposed turbine will exceed the guidance of 30 hours maximum per annum. 14 no. households will exceed the guidance of 30 minutes per day. The affected household owners have been informed and signed a letter consenting to the proposed development.

4.6 Noise

There are 62 households located within 1km of a proposed turbine (10 rotor diameters). To predict the noise generated at these properties, noise modeling was conducted using WindPRO

software, version 2.8.579. Please refer to Appendix 12.1 for detailed results of the prediction model.

The noise prediction model was run using a wind speed of 12 m/s at 10 m height. All criteria are based on L_{A90} levels rather than $L_{Aeq:}$ L_{A90} is the 90th percentile noise level which is exceeded for 90% of the time. As wind turbines will be operating continuously throughout its particular operating range the L_{A90} level is much more useful in identifying noise which may be attributed directly to the wind farm rather than L_{Aeq} which will be affected by short term influences such as a passing car or plane or short-term noise from external influences including wildlife or man-made sources.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the frequency characteristics of human hearing. All sound pressure levels are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

The Noise prediction model implements the International Standard ISO 9613-2, Acoustics – Attenuation of Sound during Propagation Outdoors[2]. The propagation model described in Part 2 of this standard provides for the prediction of sound pressure levels based on conditions favourable to noise propagation.

Noise levels for 62 households in the vicinity of the site were predicted for this wind speed. The results are re-produced in Appendix 12.1 below. It should be noted that these predictions represent downwind propagation in all directions, which clearly cannot happen at all locations simultaneously.

The lower fixed noise level limit is 43dB L_{A90} for non-involved houses and the lower fixed noise level limit for involved houses is 45dB L_{A90}.

The predicted noise levels lie within the adopted criteria in all cases. The noise impact of the wind farm is considered acceptable.

4.6.1 IFC Guidance on Noise

This section presents the results of the noise assessment based on the criteria set out in the International Finance Corporation document *General EHS Guideline.*

This assessment is based on the International Finance Corporation document *General EHS Guidelines.* These are general guidelines and do not contain any wind farm specific information. In this instance reference is made to Table 1.7.1 in these guidelines, in which maximum noise level of 55 dB $L_{Aeq,1hr}$ for daytime and 45 dB $L_{Aeq,1hr}$ for night-time are given. As the wind farm would operate at any time of day or night, the daytime limit is not relevant and the night-time limit is considered to apply throughout daytime and night-time periods.

The noise levels were predicted using the WindPRO software package version 2.8.579. This package predicts noise levels based at noise-sensitive locations using the method described in ISO 9613: *Acoustics – Attenuation of sound during propagation outdoors*. The model also contained terrain data to reflect correctly the differences in land height of each turbine and noise-sensitive location.

The predicted noise levels are the total noise level at each noise-sensitive location due to the wind farm. Wind farm noise is generally assessed in terms of $L_{A90,10\ min}$, where given the nature of the noise, is generally accepted that the L_{A90} of measured wind farm noise is 2dB lower than the L_{Aeq} value. However the WindPRO software was configured in this instance to predict the noise levels at each dwelling in terms of L_{Aeq}.

Noise levels due to the proposed wind farm have been predicted and shown to be within the adopted criteria.

4.7 Visual Impact Assessment

The power line will connect a wind energy facility with the Kenya national grid at the Isinya Substation. As such the cumulative visual impact of the wind energy facility and the power line should be considered. In the regional context the visual impact of the wind turbines is likely to overshadow that of other structures associated with the facility. They will be visible over much greater distances than power lines and pylons.

Other existing structures such as the highly visible communication towers visible on the hills on the edge of the Rift Valley (**Error! Reference source not found.**) have already introduced structures visually similar to power line pylons into the viewshed and the existing landscape is not that of a pristine wilderness area with a sense of remoteness.

The cumulative visual impact of a power line in this region is therefore expected to be low.

5.0 Social Issues

As the project is located in Maasai land engagement with the local community was essential to meet the requirements of Kenyan law and IFC standards. It is considered that consultation with regard to all aspects of the project is an ongoing process and will continue for the lifetime of the project.

The wind farm project includes several impacts and the proposed mitigation measures have been subject to in-depth informed consultations and participation over a period of five years delineated at the feasibility study phase.

The in-depth stakeholder consultation is an effort to meet the standards provided by IFC performance standards, the new constitution, including legislation like the county government Act on devolution among others. Various regional and international standards of stakeholder engagement including the African Charter, especially sections relevant to Indigenous people rights and the ILO convention 169, have guided the development and implementation of this stakeholder engagement plan.

5.1 Stakeholder Engagement Plan.

The guiding principles of the International Association of Public Participation have enabled a comprehensive stakeholder's engagement approach and plan which has not only sought to achieve Free, Prior, Informed Consent of the indigenous Maasai community. It has also developed an indigenous people's development plan that seeks to ensure sustainable development of the community in their cultural and indigenous lifestyle is protected from the impacts of the project which may negatively harm the Maasai brand as is internationally recognized.

The engagement approach displays the detailed consultations in an effort to achieve the indigenous people's FPIC which also develops a management infrastructure that ensures continuous consultation and participation within the whole project cycle from design, feasibility study phase, to construction, operations and decommissioning.

Detailed engagement during the environmental assessment stage with all the processes agreed to and the informed consultations generated thereafter have been summarized and documented to work with and supplement the social impact assessment report. The commitments derived from the consultation process have then guided the post EIA engagements and provided the guidance for the community and project to engage at the construction and operation phase.

A Stakeholder Engagement Plan (SEP) for the wind farm post granting of the NEMA licence has been developed in conjunction with the transmission line project to ensure that stakeholder engagement was undertaken in a systematic and inclusive manner and provided important input to the EIA process. The objective of engagement is to ensure that sources of existing information and expertise are identified, legislative requirements are met and that stakeholder concerns and expectations are addressed.

A series of consultation meetings involving people from the project area and Kajiado County administration were undertaken for the EIA between January and July 2013.

Key issues raised during stakeholder consultations

Public/stakeholder meetings form an integral part of the ESIA process; subsequently various types of meetings were held with respect to the proposed project. These included stakeholder meetings with land owners, non-land owners and other community members, focus group meetings with the youth and women and one-on-one meetings.

Some of the issues raised by the public include:

- Economic issues (employment, economic benefits, etc.);
- Ecological issues (impacts on terrestrial ecology);
- Health, safety and security arising from the operation of the new transmission line; and
- Social issues (conflicts over job opportunities, disruption of infrastructure and services, etc.).

These issues informed the specialist studies and the detailed environmental assessment. Please refer to Volume IV for full details of the SEP.

A management plan with timelines, tasks, activities, deliverables and responsibility was defined for preconstruction, construction, operations with informed participation defined by two way periodically communication and feedback management.

5.2 Indigenous People's Plan for a Proposed 100MW Wind Energy Project, Kajiado District, Kenya

The contemporary requirement for Indigenous people's Free Prior and Informed Consent (FPIC) before a project is developed is observed in this project derived from rights of indigenous People's which is recognized under international, regional and local human rights treaties and declarations.

The process included identification of the project impacts on the indigenous Maasai community, collective cultural resources, natural resources and distinct language rights, events and activities which may be affected and informed consultation on the mitigation measures proposed through the ESIA process.

Participation that was led by and involved Maasai indigenous people's representative bodies and organizations (the Council of Elders in the case for Maasai of Kipeto project area) as well as members of the affected communities. Most general meetings did not specify between land owners who have signed land leases and those landowners who have not. It provided sufficient time for the indigenous Maasai's internal decision-making processes to work through and debate information.

Information about impacts was disclosed at all times to interested parties in local language and in a step by step understanding of the process. Land owners were given access to legal advice before agreeing to sign a land lease to the project, to agree to a location of a turbine, road, or any project facility through their land, the right to negotiate location, right to relocate with compensation, right to negotiate compensation that enables voluntary relocation and right to change mind.

The identification of needs and interests and planning for the protection of indigenous Maasai people's interests going forward, as the directly affected community was done together with the community members. Leaders of various levels were engaged on protection of their interests as a distinct community.

Development programs and impact mitigation decision making by the indigenous maasai's for the Kipeto project is an ongoing and iterative process. They are at the process of debating the different projects that would of interest to improve their livelihoods. The community leaders have identified the following key areas of interest some of which have been integrated into the objectives of the community trust:

- Create employment and sub-contracting opportunities;
- Health care;
- Education facilities and opportunities;
- Vocational, business, and cultural training;
- Community infrastructure including roads, electricity in their homes, and roads;
- Environmental protections;
- Promotion of Maasai cultural and indigenous interests.

The Community Trust introduces two other contexts that have generated interest in the community: a) Sustainable Development; b) Community Management and Capacity

Measures to Enhance Opportunities

- Compensation is provided to landowners with plots through which the Transmission line.
- Subject to signed leases land owners who have turbine allocated will have a lease amount paid annually for the land in which the turbine stands and the access roads pass;
- The project will see the improvement of local road network both around and within the project area. This will significantly improve accessibility of the area (a major challenge during the rainy season);
- There are employment opportunities for skilled and unskilled labour for community members willing to and who access employment opportunities available;
- The local indigenous Maasai youths will be provided with opportunities for supply of materials and small construction subcontracts as a way to enhance their economic participation;
- Training of new skills to locals who will participate in various project activities to transfer and improve skills to the indigenous Maasai community;

- The communication and information provided throughout the consultation process is done in accessible formats mostly local Maasai language using translators and the national language.

The community and the proponent agreed and are in the process of developing and implementing a grievance mechanism for the purpose of managing any of the issues that may arise as a result of the project. Different risks related to various phases of the project were identified and the suitability of the grievance mechanism defined within the legal and indigenous frameworks available within the community and the wider administrative structures.

5.3 Trust

The trust is a legal arrangement (to be created via a document called a Deed of Trust) in which the board of trustees will control income received from the ownership of 5% of the diluted equity in Kipeto Energy limited) for the benefit of other people ("beneficiaries"). In this case the board of trustees will be appointed by all the shareholders and representatives of the wider group of people who are to benefit and the beneficiaries will be the group of people who live in the surrounding areas. These benefits will be investment in the area in which they live through increased amenities such as infrastructure, schools, clinics and other such facilities as may be decided by the Trustees exercising their fiduciary powers granted to them under the Deed and by law.

The following is a summary of the legal framework of the trust intended to be settled for the benefit of the wider residents of the area surrounding the proposed Wind Farm (“Kipeto”).

1. The Objectives of the Trust

These objectives need to be defined through engagement of the wider community to ensure the objective meet the wider community for its benefit. The intention is the ensure that the form of support to the community (as will be defined) will be the investment (from share in the Project Company) into projects that will ensure better amenities for the benefit of all. Those broad areas of support, subject to full consultation and engagement, will be:-

1.1. Development of infrastructure;
1.2. Promote and sustain formal education (including schools and other facilities);
1.3. Promote and sustain adult education and awareness into economic matters, including financial and legal services to understand the implications of the increased resources in the community;
1.4. Promote health services (including clinics and other facilities) focusing on community based healthcare, primary health care, education and prevention on sexually transmitted diseases including HIV/Aids, education and awareness to avoid substance abuse and general management of good hygiene and good health;
1.5. Natural resource management including provision and preservation of water;

1.6. Preservation of the Masaai culture and language for the specific betterment of the Masaai community;
1.7. Ensure that there is equality in representation of all focus groups to include women/widow, orphaned children and youth groups to ensure their interests are protected;
1.8. Generally ensure equitable distribution, management and use of wealth to ensure no one section of the community are disadvantaged in deployment of resources that are available to the Trust
1.9. A central team or teams to be appointed from the various groups of the Community to ensure their interests are added to the formal establishment of the Trust (below)

2. Establishment of the Trust – Legal Framework of the Trust

2.1. The Trust has to be registered under the laws of Kenya once a Trust Deed setting out the following has been agreed
2.2. The Name of the Trust
2.3. The objectives of the Trust
2.4. Number of Trustees to be appointed and the terms of their appointment. The legal duties of Trustees will remain subject to local legal provisions
2.5. Timing of the registration to be made very clear (12- 24 months) which will meet the timing of when funds will be available to the Trust. This timing is to be considered as part of the consultation and communication of the establishment principles;
2.6. Governance of the Trust in terms of meetings to ensure continual engagement and communication to the Community on the operations and meeting the objectives of the Trust;
2.7. Draft of the Trust Deed to be agreed with representatives of the Trust, with a lawyer who has been appointed to assist the community represent their combined interests, Lucas Naikuni of Naikuni, Ngaah and Miencha Company Advocates, Nairobi Kenya.

3. Functions of the Community Trust

3.1. The community has a general agreement that the trust should have the following functional focus including:
3.2. to ensure that the management of the Trust through the Trustees in line with the Trust Deed are made in accordance with the agreed objectives;
3.3. There should be regular meetings involving community members and specific areas of priority to be given to the special interest groups
3.4. Financial governance and transparency will be critical to ensure full visibility of the use of resources available to the Trust to ensure proper alignment with the objectives of the Trust

4. Special Interest Groups

There will be special recognition of the special interests of the Masaai Community and the Youth, Women/Widows and orphaned children that will be managed within the objectives of the Trust;

5. Financial Management of the Trust

There will be transparency as to the all financial matters that will be set out in the operation of the Trust. The Trust as per local law will be subject to stringent governance processes akin to a company where accounts will be subject to audit and the Board of Trustees will be required to act within standard fiduciary duties.

6.0 Transmission Line Impact Assessment

Kipeto Energy Limited (KEL) proposes to construct a 17km long 220 kV transmission line to transmit power from their 100MW wind farm to the proposed Kenya Power Isinya switching sub-station as shown in Figure 2-1. The proposed transmission line will be constructed with a

60m wide wayleave to be acquired from local land owners affected by the route. The actual line width will be 5-10m wide. The transmission line will transmit electrical power from a wind farm sub-station to a proposed switching station owned by the Kenya Power.

It is envisaged that once the transmission line has been commissioned, KEL will hand over the operations and maintenance of the transmission line to the Kenya Power who has signed a Power Purchase Agreement (PPA) with KEL.

Kurrent Technologies Ltd. (KTL) has been appointed by KEL to complete the Environment and Social Impact Assessment (ESIA) Study report for the necessary environmental authorization required in terms of Legal Notice 101 titled Environment (Impact Assessment and Audit) Regulations, 2003 (EIA/EA Regulations) promulgated under the Environment Management and Coordination Act, 1999 (EMCA). KTL is a National Environment Management Authority (NEMA) registered Firm of Experts and is producing this report in accordance with Regulations 18 – 23 of the EIA/EA Regulations.

This ESIA Study has further been undertaken in accordance with the International Finance Corporation (IFC) Performance Standards (PS) 1-8. The proposed transmission line is defined as an “associated facility” to the 100MW wind farm to be developed by KEL.

The objective of the proposed project is to evacuate power generated by a 100MW wind power project owned by KEL and for which environmental authorization was granted by NEMA in 2012. The high level of economic growth experienced in recent years and projections of continued growth point towards capacity of the power generation, transmission and distribution system being outstripped by demand in the short term.

This section presents an overview of the project and highlights the key impacts identified through the Environmental and Social Impact Assessment (ESIA) process and the mitigation and management measures that have been proposed by KEL to reduce negative impacts and enhance positive impacts.

The ESIA Study describes the detailed environmental assessment of the proposed project including an Environment Management Plan (EMP). The NEMA is the lead agency in Kenya

responsible for environmental authorization of the project. The NEMA file reference number for the project is NEMA/PR/5/2/10952.

The project will comprise construction of an overhead 17km long transmission line for evacuating power generated by a 100MW capacity wind farm. The transmission line will start from a sub-station to be constructed at the wind farm area near the Esilanke Primary School and terminate at the proposed Kenya Power Isinya switching sub-station.

A wayleave agreement is in the process of being negotiated with respective land owners whose land is affected by the proposed transmission line. This wayleave will be used for the construction and operation of the project.

The transmission line will be designed to established national and international codes during the detailed design phase. Most of the codes will be derived from the Kenya Electricity Transmission Company Ltd. (KETRACO), International Electrotechnical Commission (IEC), etc. A list of some of the local and international standards that will be used for the design and construction of the proposed transmission line are provided in Section 3.6 of the ESIA Study.

Transmission towers are the most visible component of the bulk power transmission system. Their function is to keep the high-voltage conductors separated from their surroundings and from each other. Higher voltage lines require greater separation. The unintended transfer of power between a conductor and its surroundings, known as a fault to ground, will occur if an energized line comes into direct contact with the surroundings or comes close enough that an arc can jump the remaining separation. A fault can also occur between conductors. Such a fault is known as a phase-to-phase fault. The first design consideration for transmission towers is to separate the conductors from each other, from the tower, and from other structures in the environment in order to prevent faults. This requirement and the electrical potential (voltage) define the basic physical dimensions of a tower, including its height, conductor spacing, and length of insulator required to mount the conductor. Given these basic dimensions, the next design requirement is to provide the structural strength necessary to maintain these distances under loading from the weight of the conductors, wind loads, seismic loads and possible impacts. Of course, the structure must meet these requirements in the most economical possible manner. This has led to the extensive use of variants on a space frame or truss design, which can provide high strength with minimal material requirements. The result is the ubiquitous lattice work towers seen in

several parts of the country. The last design requirement is to provide a foundation adequate to support the needed tower under the design loads.

For the proposed transmission line, a tower spotting exercise was carried out based on several factors in order to determine the span length (distance between two towers). While it is not fixed, the towers will be spaced between 250m and 400m apart.

For the proposed transmission line, two new sub-stations will be required; one will be constructed near the proposed 100MW wind farm which will collect and evacuate the power generated to the transmission line and the second one will be at the termination point in Isinya where Kenya Power is proposing to construct a switching station at Isinya. While the dimensions of the Kenya Power sub-station are unknown, the KEL sub-station will be about 140m x 130m or 1.82 hectares in size.

A wayleave or right-of-way (ROW) is a largely passive but critical component of a transmission line. It provides a safety margin between the high-voltage lines and surrounding structures and vegetation. The ROW also provides a path for ground-based inspections and access to transmission towers and other line components, if repairs are needed. Failure to maintain an adequate ROW can result in dangerous situations, including ground faults.

A ROW generally consists of native vegetation or plants selected for favorable growth patterns (slow growth and low mature heights). However, in some cases, access roads constitute a portion of the ROW and provide more convenient access for repair and inspection vehicles.

For the proposed transmission line, a wayleave of 60m in total will be required. The wayleave will go through several land owners properties and subsequently KEL is in the process of negotiating agreements with land owners for creation of the 60m wide ROW or wayleave.

As far as possible, existing access routes will be used for construction and maintenance of the proposed transmission line. The access roads/routes will be upgraded in order to meet the loads expected for transmission line construction and maintenance. Roads are also classified as temporary or permanent. A temporary road will be decommissioned after construction is complete, and the ROW will be restored.

The roadway includes the traffic-bearing travelled way, the shoulders, and areas adjacent to the road that have been excavated or filled to provide drainage and support. Beyond the roadway are the clearing width and the outer boundary of the ROW. These features are important for estimating the environmental impact.

Access road widths are commonly from 3.5m to 4.5m. The proposed transmission line access roads/routes will be built or expanded such that they are between 4m and 5m in width. No additional area is needed beyond the ditches.

There will be several construction phase activities associated with the proposed transmission line project with some of the key ones being:

- Staging area development;
- Establish access to the transmission line route;
- Tower construction;
- Sub-station construction;
- Conductor stringing; and
- ROW restoration.

Equipment and materials are stockpiled before and during construction in staging areas, which are normally adjacent to the ROW where they would not interfere with the movement of materials, erection of towers, and line pulling.

The staging areas are used for storage of materials and fuel used during construction, including diesel fuel, gasoline, lubricating oil, and paints. Depending on the location and stage of construction, they may be used for storage of herbicides that are used to maintain clearance along the ROW. Blasting agents may be stored at staging areas, subject to applicable regulations and standards.

For construction of long distance transmission lines, staging areas would typically be located every 13km to 16km. The size would vary, but approximately 1 Ha would accommodate materials and vehicle and equipment parking. Tower assembly areas are accounted for separately.

The proposed transmission line project is relatively short (17km) and subsequently may not require multiple staging areas. The proposed compounds (2 in number) for the 100MW wind farm components may be sufficient to accommodate the transmission line components.

The extent of new access road construction that would be required to service construction and maintenance of a transmission line is very site-specific. Existing roads may serve some of the ROW, and some sections may be accessed only by air.

Note that fill material and road base are likely to be derived from local sources at sites known as borrow pits. Excavation of borrow pits removes material and possibly habitat from nearby land. These impacts can be minimized by restoration of the surface of the pits.

For the proposed transmission line project, the borrow pit has already been identified by the project manager which is situated adjacent to the proposed location of the wind farm sub-station. KEL is in the process of negotiating with the land owner for the use of the borrow pit.

Specific sites for structures such as towers and substations must be cleared as well as the ROW, staging areas, and areas for tower assembly. Clearing of the ROW can employ a variety of techniques, including the use of heavy equipment, such as dozers and scrapers, or selective hand-clearing. The choice depends upon topography, current growth, land use, and plant species on ROW-adjacent property and the presence of sensitive environments. In sensitive areas, hand-clearing may be used to minimize environmental disturbance. However, even with careful practices, habitat may be changed by ROW clearing, especially if it results in substantial changes to the original vegetation cover. Changes may extend to the area adjacent to the ROW, which is subsequently exposed to increased sunlight or other changes. Changes in drainage patterns may be an important consideration, especially if the ROW is adjacent to a body of water.

Where a crossing is required, there is further risk of impact to the body of water and its aquatic species, since these are dependent on the bordering wetlands that must also be crossed. Erosion at the points of crossing introduce soil particles, increasing sedimentation and the associated clouding of water. The maintenance of a buffer zone between the ROW and the body of water is one strategy used to minimize impacts. Hand-clearing and the removal of slash (cuttings) from the water and the immediately adjacent shore are strategies to reduce construction impacts.

Tower construction will begin by excavating foundations for each of the four legs of the steel lattice tower. In areas of hard rock, use of pneumatic hammers or blasting may be required. Once each foundation hole has been drilled to the required size and depth, an anchor bolt cage with reinforcement is lowered into the hole and concreted. A crane will be used to lift and place the tower base on the anchor bolt cage. In some cases, helicopter cranes may be used to connect tower sections during the assembly.

Substation construction is expected to take 6 to 9 months and will cover approximately 10 acres for the fenced station plus 3 acres for construction support.

The process of attaching conductor wires to the insulators suspended from the towers is called conductor stringing. It generally involves pulling the conductor off of a truck-mounted spool. This process typically will not result in additional land disturbance beyond that required for tower construction. An exception may occur at diversion towers where severe line direction changes occur.

It is general practice to restore the ROW after construction, although the replacement of tall vegetation is not a part of restoration directly within the ROW boundaries. Tall vegetation can create ground-fault hazards, including the risk of fire. Plants consistent with native species are selected, although with consideration of their growth rates and mature plant heights. In some areas, the ROW must remain passable by land vehicles for line inspections.

During normal operation, transmission lines require very little intervention. The only exception is periodic inspections and vegetation management. Inspections are frequently done using tracked or other ground vehicles. In some cases, air inspections may also be carried out where ground vehicles find difficulties accessing the ROW. Ground vehicles are useful where a closer inspection of a potential hazard is required.

Although normal operation requires minimal intrusion into the ROW, line or tower failures can result in the reintroduction of heavy equipment, work crews, excavation, and materials transport.

It is envisaged that the pipeline will be operational for more than 30 years, and it is likely that this period will be extended. A decommissioning plan will be provided to NEMA three months prior to the decommissioning of the transmission line. The decommissioning plan will take into

account the environmental legislation at the time of decommissioning, new technologies for rehabilitation and any residual impacts.

Kenya has a specific blueprint for power generation, transmission and distribution referred to as the Least Cost Power Development Plan (LCPDP) 2010 – 2030. This LCPDP identifies the need for various projects in the power sub-sector that need to be developed and implemented during the plan period.

The transmission and distribution system comprises of 1331 Km of 220 KV, 2112 km 132 kV, 649 km 66 kV, 29 km 40 kV, 13,031 km 33kv and 24,334 km of 11 kV. 220 kV forms the system transmission backbone, the main lines being the parallel Kamburu – Dandora 1&2 and Kiambere – Embakasi lines interconnecting Mt. Kenya and Nairobi regions and evacuating hydro generation.

Kiambere-Rabai 220 KV line interconnects Mt Kenya and coast regions. Apart from the low rated 132 kV Rabai-Juja line, Kiambere-Rabai line forms the only other link between Nairobi and Coast regions. This is a very long transmission path to Nairobi and power transfer capability between Mombasa and Nairobi is therefore limited by system stability and overloading of Rabai-Juja line. This interconnection also lacks n-1 reliability with the risk of coast system collapse when Rabai-Kiambere line trips on load.

Olkaria – Dandora 220 kV double circuit lines designed to evacuate geothermal generation at Olkaria form the link between Central Rift and Nairobi regions. The link between Nairobi and West Kenya region is completed by the 132 kV Juja-Lessos-Tororo double circuit line.

The line is old and lowly rated, and lacks sufficient capacity to transmit power from West Kenya to Nairobi especially during contingencies when significant import for generation support is required from Uganda.

Subsequent to the above, Kenya needs to develop a significant amount of transmission line infrastructure to evacuate power generated by various types of power generations sources.

Additionally it is recognized that the 100MW KEL wind power project needs to evacuate power using transmission lines and there are currently no existing transmission lines that can be used to

evacuate power from this power plant. Subsequently, the proposed transmission line project is an associated project to the 100MW wind power project being promoted by KEL.

The development of the 100MW wind power project and transmission of electricity to the national grid through the proposed Kenya Power Isinya switching sub-station will assist in bridging the demand side management of power in the country.

The study has also been guided by the requirements of the EIA Regulations set out in terms of the Environment Management and Coordination Act, 1999 (EMCA).

The range of specialist studies undertaken during the EIA phase were informed by the issues identified in the final Environment Project Report (EPR) Study. The specialist studies and experts used are listed in Table 2-1. Results from these studies have been incorporated into the EIA Study, particularly into the description of the affected environment and impact assessment.

List of Specialist Studies undertaken as part of the EIA Study Specialist Study	**Specialist**
Avifauna Study	Ms. Phillista Malaki
Bat Study	Mr. Bernard Agwanda
Ecology	Mr. Dickens Odeny
Social impact assessment	Mr. Winstone Omondi
Stakeholder Engagement Plan	Mr. Winstone Omondi
Visual Impact Assessment	Mr. Henry Holland

6.1 Visual Impact Assessment

Components of the operational transmission line that will potentially cause visual impact are towers/pylons, cables, access roads and wayleave/right of way zones. The towers are most likely to cause a visual impact due to their height and number.

In terms of viewshed size the potential visibility of the transmission line is high. The viewshed is a theoretical tool and does not take into account the screening effect of vegetation, buildings and atmospheric conditions.

Visual receptors in the Rift Valley are unlikely to have any views of the transmission line.

Visual receptors that may be affected include:

- Viewers and viewpoints in protected areas;
- Residents of Maasai communal land surrounding the development;
- Residents of surrounding villages/towns, and;
- Motorists (including tourists).

The significance of the visual impact of construction activity is **medium** due to its large spatial extent (40 km) and high intensity. Mitigation measures, as discussed in the report, are unlikely to lower the significance but will contain the impact intensity.

There are a relatively small number of highly sensitive visual receptors living within 1 km of the proposed transmission line. The existing views of these residents will be highly affected by the tall towers (as a negative visual impact). Even though there are similar structures in the distance (communication towers) the proximity of the transmission line and structures will have a significant impact on their views. It is also unlikely that an alternative route will be found where homesteads within 1 km of the route can be avoided.

6.2 Ecology

A review of the ecological impact assessment, of the proposed Electric Power Transmission Line project activities was carried out in accordance to the IFC EHS guideline for Electric and Power Transmission and Distribution. A field study was conducted to determine areas that would be affected adversely by the project activities. The potential impacts on ecological systems in Kipeto-Isinya area were reviewed in accordance to IFC documents: Performance Standard and EHS guidelines. While, the Kurrent Technology Ltd EIA study risk matrix was used to analyze impacts. Cumulative impacts from existing similar projects and other activities were assessed on both habitats and movements of animals.

The Kipeto-Isinya landscape is diverse and characterized by different habitats complementing support for the wild herbivores and local communities. The diversity of plant species is high in the south eastern area of the proposed transmission line. There are mixed habitats and species. The upper areas have more grassland, which are easily affected by by harsh climatic conditions such as drought.

The main impacts that were identified and resolved for purpose of assessment were the potential alteration of terrestrial plant habitat through the destruction of plants and the introduction of alien invasive plant species; temporary obstruction of movement of wild-herbivores; potential poaching for bushmeat; potential exposure to wild herbivores and; potential alteration of aquatic habitats. The Kurrent 2012 risk assessment matrix was used to determine potential risks that the project would pose in the environment. The risk matrix has a score of up to 100. According to the risk assessment matrix, when an impact score is more than 30 (-ve) then recommendation is made. After the assessment was undertaken, impacts that were given special attention due to exceeding the threshold were alteration of terrestrial plants (-36), introduction of alien invasive plant species (-48), alteration of aquatic habitat (-32), temporary obstruction of wild herbivores (-32).

The impacts recommended for mitigation include the avoidance of the destruction of habitats and a change in the behavior of personnel. A detailed environmental management plan is proposed at the end of this report to guide on issues to be addressed and assignment of responsibility on monitoring development.

The transmission line will be 17km long with a wayleave width of 60m. The actual with of the line will be 5-10m. Based on the wayleave an area of 1,020 km^2 of habitat will be impacted.

6.3 Ornithology Summary

This report presents findings of the ornithological study aimed at evaluating the potential ornithological impacts of the proposed 220kV transmission line associated with the proposed Kipeto Energy Limited wind power project and to develop mitigation measures that aim to minimize the negative impacts of the project while optimizing the positive impacts. Cumulative effects on wind farm and associated infrastructure are also assessed both at local and national scale.

Bird surveys were carried out along the proposed 17km transmission Line. Additional studies were also conducted on the wind farm site to relate how the different actions will act on bird species cumulatively. The key activities undertaken during the ornithological assessment of the proposed 220kV transmission line are:

- Identifying sensitive bird habitats along the transmission line corridor;
- Identifying key bird species that would be affected by the transmission line while establishing their distribution;
- Assessing the anticipated impacts of the project on birds, with particular emphasis on the various phases of the project (i.e. construction, operation and maintenance phase); and recommend measures for mitigation;
- Identify actions and species that would be impacted upon cumulatively by other reasonably foreseeable wind power projects.
- Generate baseline data that will be used to monitor and evaluate the mitigation measures to be implemented during the project cycle;

Qualitative impact assessment methodology was undertaken to determine the significance of potential impacts. Bird collision was established as the most significant impact with the overhead conductors without mitigation. Electrocution was also identified as potential impact with high significance but with relevant mitigation on the design of the support structures the probability would be low. No fatal flaws were identified which could prevent the project from proceeding.

Due to the recent substantial increase in interest in wind farm developments in Kenya, it is important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts are considered and avoided where possible. It should however be noted that not all the wind farms presently under consideration by various wind farm developers will become operational. However this assessment will consider that all potential wind farms will become operational

The cumulative impact assessment in this report focused on known proposed wind farms in Kenya, along the rift valley and into Europe. The proposed projects would have the potential to impact on avifauna in a cumulative manner. Each project is expected to have additional potential impact depending on the size and location and the interactions with different bird species.

The cumulative impacts assessment also focused on key vulnerable bird groups that include migrating raptors and breeding birds. The key cumulative effects identified were direct mortality through collision from wind turbines and barrier effect resulting from wind farms. Results from cumulative effects assessment indicate no major impact on birds with effective implementation

of mitigations recommended. A comprehensive post monitoring plan will reduce any anticipated impacts.

6.4 Bat Studies

Bats have been shown in the past, to be affected by wind turbines and associated activities. More Recent studies in US and Europe have shown specific causes and effects involved. Less is known locally, hence this baseline study. As a result guidelines for protecting bats from wind power and transmission line projects have been developed. Finance lending agencies under World Bank Group, under International Finance Corporation (IFC) has policy and guidelines (Performance Standards) that compels members and stakeholders to uphold Environmental and Social Sustainability.

IFC performance standards 1 and 6, and National law; Environment Management and Coordination Act (EMCA) were used as policy and legal guidelines for study of bats in Kipeto-Isinya Power Transmission line. United Kingdom's and South African Guidelines for Bat study in Wind Power project have also been used to inform the bat survey.

Bats were studied using standard methods as detailed in the Kipeto Wind Farm ESIA Bat Study (Kurrent Technologies 2013). Mistnets were used to capture for inventory surveys. Automatic bat detectors including Anabat SD2 bat ultrasonic sound recorder was used to investigate diversity and monitor bat activities in selected static positions along proposed transmission line. Hand-held Bat box detector was used to monitor bat activities along selected habitats on the Transmission line. Reference specimen collections and bat call library at National Museums of Kenya were used to identify bats and construct inventory. 6-month bat study data at Kipeto Wind farm was also used in preparing this report.

Fifteen species of bats from 8 families were recorded in the general area of Kipeto between March and December 2012. This includes bats with low wing load and flies low below transmission cables, medium height fliers and high load, high and fast flying species that are vulnerable to cables.

Several processes and activities associated with establishing and operating Transmission line from Kipeto to Isinya, were identified to have potential risk to bats in that area. Habitat loss

disturbance and alteration, during construction and maintenance of right of way were identified as potential threat to bats foraging, breeding and roosting habitats. Hazardous chemicals including spilled coolants, engine oil, herbicides for vegetation clearance wer also identified as potential environmental pollutants and source of poisons to species feeding and watering in the area.

Collision with overhead electric cables and electrocution by energized overhead cables were further noted as potential risks in the Operational Phase.

Risks of these processes were screened using Kurrent Technologies Risk Assessment Matrix. Consequently, mitigation measures on the impacts are recommended following IFC Performance standard 1 and 6, as guidelines.

Impact of habitat loss, alteration and disturbance could be ameliorated by maximizing use of existing roads and trucks for vehicles. Waste management plan is also recommended to proactively guide on-site and off-site waste disposal.

Since results show that resident bats have smaller wings span (<40cm), transmission over head cables should be 60cm or more apart to eliminate any chance of electrocuting bats.

Bats documented are not of critical conservation concern, nationally or regionally. Non is either IUCN listed as threatened or known to be endemic, hence the overall remark that Kipeto-Isinya area is a moderate bat conservation.

7.0 Environmental and Social Management Plan.

An Environmental and Social Management Plan (SEMP) for the wind farm project and a separate SEMP for the transmission line are provided in two separate documents. Both of the SEMPs seek to manage and keep to a minimum the negative impacts of the proposed wind farm and the 220kV transmission line project and at the same time, enhance the positive and beneficial impacts.

The Project Manager is responsible for ensuring that the EPC contractor complies with the mitigation measures and EMP requirements during the **design**, **pre-construction** and **construction** phases of the project.

An Operations and Maintenance (O&M) company will be responsible for implementation of the EMP during the **operational** and **decommissioning** phases of the project. Decommissioning will however entail the appointment of a new professional team and responsibilities will be similar to those during the design, pre-construction and construction phases. It is unlikely that the transmission line will be decommissioned for several years.

8.0 Cumulative Impacts

Due to the nature of the project the transmission line ESIA has endeavored to address firstly the impacts of the proposed line and secondly the cumulative impacts of the proposed line with the already permitted 100MW Kipeto Wind Farm.

There will be cumulative impacts arising in particular to

- Ornithology
- Bats
- Visuals
- Social

from other wind farms planned in the area and along the Rift Valley and also from multiple transmission lines in Isinya to the west of A109 road from Kajiado to Nairobi.

8.1 Other Wind Farms

Due to the recent substantial increase in interest in wind farm developments in Kenya, it is important to follow a precautionary approach to ensure that the potential for cumulative impacts are considered and avoided where possible. It should however be noted that not all the wind farms presently under consideration by various wind farm developers will become operational. However this assessment will consider that all potential wind farms will become operational

Ornithology

The cumulative impact assessment in this report focused on known proposed wind farms in Kenya, along the rift valley and into Europe. The proposed projects would have the potential to

impact on avifauna in a cumulative manner. Each project is expected to have additional potential impact depending on the size and location and the interactions with different bird species.

The cumulative impacts assessment also focused on key vulnerable bird groups that include migrating raptors and breeding birds. The key cumulative effects identified were direct mortality through collision from wind turbines and barrier effect resulting from wind farms. Results from cumulative effects assessment indicate no major impact on birds with effective implementation of mitigations recommended. A comprehensive post monitoring plan will reduce any anticipated impacts.

Bats

As stated previously bats documented in the Kipeto area are not of critical conservation concern, nationally or regionally.Due to paucity in our knowledge on how local bat species including suspected migratory ones, could be affected by wind turbines and power lines, a monitoring plan is strongly recommended during operations. The monitoring plan should be integrated within the construction and operational plans.

Visual

The overall significance of impact for the proposed Kipeto Wind Farm is onsidered to be Moderate in line with the highest summary impact for VRP's. A moderate significance of impact is defined as: '*An impact that changes the character of the environment in a manner that is consistent with existing and emerging trends.*'

The power line will pass through a landscape of low, open hills covered in grassland and thorn trees. There are no officially recognised protected areas that will be affected with most of the land used by Maasai for grazing for their cattle. There are two large villages in the viewshed, Kajiado and Isinya, but both are more than 5 km from the proposed route and residents are unlikely to notice the power line. Tourists using the A104 to travel from Nairobi to Amboseli will not be highly affected by the power line since it crosses the road where existing views already contain similar structures and signs of urbanisation are common.

There are, however, a number of highly sensitive visual receptors in close proximity to the power line and the power line will intrude considerably on their existing views. These visual receptors

are mostly residents with houses within 1 km of the route. Mitigation measures are unlikely to reduce the visual impact of the power lines on these visual receptors.

It is considered that the visual nature of the Kipeto landscape will be significantly altered once the wind farm has been constructed and should other wind farms be constructed the visual nature of the landscape should not be further altered subject to a landscape and visual impact assessment to be considered in the design of any potential future development.

8.2 Multiple Transmission Line

The transmission lines under consideration include

1. Kipeto-Isinya 100kV Transmission line
2. Suswa-Isinya 220kV Transmission line
3. Rabai-Isinya 400kV Transmission Line
4. Isinya-Embakasi Transmission line

The necessity to construct a transmission line to take the power from the wind farm rather than connecting to an existing line arises as the other lines belong to KETRACO and are part of their new transmission system. One of them is a 400 kV line, the other 220kV a line connecting Isinya with Suswa. Connecting to such a line "en route" would require a new 220 kV looped transmission substation to be built. . The wind farm needs to connect to Isinya on a dedicated line and cannot interfere with the transmission system. Each line has an exclusion area around it (the corridor) which needs to be respected.

Bats

Clearly, the convergence of these transmission lines in one site at Isinya, with attending activities during installation and operation phases is bound to change physical structure of environmental and associated ecological configurations. It is this change that may pose some levels of risks to bats ecology and hazard to individual bats.

Constructions activities during installations envisaged to affect the physical and subsequently impact on bats ecology have been mentioned above but summarized below to include, inter alia:

- constructing concrete foundations to hold steel lattice towers, clearance of tall vegetation on right of way,
- accumulation of soil plant, and other wastes around Isinya,
- trampling (by man and machine)on vegetation during construction in one general area,
- access tracks/roads along the lines

In view of the above activities, the most conspicuous risk in the installation phase is bat habitat loss or alteration. This has been addressed above for only Kipeto Transmission line. The extent and magnitude of impact of these multiple lines at Isinya is however greater (X4), than in the single Transmission line, and may last longer (5-15 years) before the bat community in the area adjust.

Assessment of bat habitat loss, alteration and disturbance ion of construction of multiple transmission lines at Isinya sub-station once mitigation has been considered is assessed as low risk.

8.3 Potential Future Wind Farm Development in the Area of Kipeto

It should be noted that while KEL has expressed an interest in developing a second phase Kipeto Wind Farm this interest is at the time of writing aspirational only.

No land has been signed up and negotiations with land owners at at a very early stage. In order to proceed with a phase 2 development it would be necessary to conduct feasability and wind measurement studies for at least 2 years. Should a commercial decision be taken at a later stage to develop a phase 2 project, environmental impact assessment in particular with a view to assessing the potential cumulative impact with Kipeto Wind Farm will commence. At the point of writing it is not considered necessary to include cumulative impact assessment with Kipeto Wind Farm Phase 2 as part of the assessment or as a supplement to the original ESIA submitted to NEMA.

Shoud a second Phase proceed in the future the following cumulative impacts would be anticipated

- Increased visual impacts
- Ornithological Impacts

- Ecology
- Noise
- Shadow Flicker
- House Movements

These impacts would need to be assessed according to the layout as part on an Environmental Impact Assessment.

9.0 Permits Required for the Project

Area	Permit/Authorization/Approval	Issuing Authority
Environmental	- Environmental Impact Assessment (EIA) License in respect of the Site	NEMA
Wind farm development	- Development permission - Approval of building plans in respect of the Wind Farm	Kajiado Council
Health and Safety	- Registration of the Wind Farm Site as a workplace - - Registration of KEL as an employer with respect to the Wind Farm Site	Director of Occupational Safety and Health Services (under the Occupational Safety and Health Act, 2007) Director of Occupational Safety and Health Services under the Work Injury Benefits Act, 2007
General Business licensing	- Incorporation if a company and certificate of incorporation - Single Business Permit in respect of the KEL offices - Income Tax registration - Value added tax registration, income tax registration and VAT registration	Registrar of Companies under the Companies Act Local council KRA
Customs	- Customs exemptions and clearances	KRA
Energy	- Electricity Generation License - Grid license	ERC ERC
Water	- Permits for drilling of boreholes	Council water board
Roads	- Approvals for upgrade of the off-site public roads	The Ministry of Roads and Public Works, the Kenya National Highways Authority, the Road Board and the Kenya

Area	Permit/Authorization/Approval	Issuing Authority
		Rural Roads Authority
Aviation	- Approvals for the height of turbines and sub-stations	Kenya Civil Aviation Authority
Employment	- Work permits for expatriate staff - Registration of KEL and KEL employees as contributors with the National Social Security Fund (NSSF)	The Immigration Department The NSSF under the NSSF Act