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Kenya Electricity Transmission Company Limited

ETHIOPIA – KENYA POWER SYSTEMS INTERCONNECTION PROJECT

Revision of Environmental and Social Impact Assessment and Resettlement Action Plan

FINAL ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

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ABBREVIATIONS

^{0}C	Degress Centigrade
AC	Alternating Current
AFD	Agence Française de Développement
AfDB	African Development Bank
BP	Before Present
Cap	Chapter
CBOs	Community Based Organizations
CEO	Chief Executive Officer
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CR	Critically Endangered
DC	Direct Current
EAPP	East African Power Pool
EELPA	Ethiopian Electric Light and Power Authority (now EEPCo)
EEPCo	Ethiopian Electric Power Corporation
EHS	Environment Health and Safety
EHS	Environmental, Health & Safety
EIA	Environmental Impact Assessment
EM	Environment Manager
EMCA	Environmental Management and Coordination Act
EN	Endangered
EPA	Environmental Performance Assessment
EPI	Environmental Performance Indicator
ERC	Energy Regulatory Commission (Kenya)
ESA	Early Stone Age
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GDP	Gross Domestic Product
GIS	Geographic Information System
GPS	Global Positioning System
Ha	hectare (100 x 100 meters)
HV	High Voltage
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IBA	Important Bird Area
ICT	Information and Communication Technology
IDP	Internally Displaced People
IESA	Integrated Environmental and Social Assessment Guidelines
ILRI	International Livestock Research Institute
IUCN	International Union for Conservation of Nature
KES	Kenya Shillings
KFS	Kenya Forest Service
Km	kilometre
km²	square kilometre
KPLC	Kenya Power & Lighting Company Ltd.
kV	Kilovolt
KWS	Kenya Wildlife Service
LIA	Later Iron Age
LSA	Later Stone Age
m	meters
masl	meters above sea-level

MoE	Ministry of Energy (Kenya)
MSA	Middle Stone Age
NIBI	Nile Basin Initiative
NELSAP	Nile Equatorial Lakes Subsidiary Action Program (NELSAP)
NEMA	National Environment Management Authority (Kenya)
NGOs	Non-governmental Organizations
NO_x	Nitrites
NYS	National Youth Service
O & M	Operation and Maintenance
OHTL	Overhead Transmission Line
OPGW	Optical Fibre Ground Wire
OSHA	Occupational Health and Safety Act
PAP	Project affected persons
PCBs	Polychlorinated Biphenyls
PCR	Physical Cultural Resources
PM	Particulate Matter
PM	Project Manager
PPA	Power Purchase Agreement
RAP	Resettlement Action Plan
RoW	Right-of-way
RPF	Reserrlement Policy Framework
SIA	Social Impact Assessment
SO_x	Sulphites
SPN	Savanna Pastoral Neolithic
TL	Transmission Line
ToR	Terms of Reference
VMGAP	Vulnerable, Marginalized Groups Action Plan
VU	Vulnerable

DECLARATION

This report is made in accordance to the requirements of the Environmental (Impact Assessment and Audit) Regulations, 2003, pursuant to The Environmental Management and Coordination Act, (EMCA) 1999 and those of the Donors, namely the World Bank (WB), African Development Bank (AfDB) and Agence Française de Développement (AFD).

Further, this report has been prepared in accordance with the terms and conditions of GAMMA SYSTEMS Contract with the KENYA ELECTRICITY TRANSMISSION COMPANY (KETRACO), Republic of Kenya.

To our knowledge, this report responds satisfactorily to the Terms of Reference as was provided by KETRACO and also to the requirements of the Environmental Management and Coordination Act, (EMCA) 1999 of the Republic of Kenya.

Signed for Date
KENYA ELECTRICITY TRANSMISSION COMPANY

Signed for Date
GAMMA SYSTEMS LTD
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1. EXECUTIVE SUMMARY

The Ethiopia Kenya Power interconnection project was conceived in 2006 when Ethiopia and Kenya signed a memorandum of understanding that agreed that a power system interconnection between the systems of Ethiopia and Kenya be established.

Ethiopia is endowed with a huge hydro generation potential which is estimated at approximately 45,000 MW. The Government of Ethiopia intends to develop these resources for domestic consumption and export and this proposed line is to act as a major highway to the southern countries such as Tanzania. The enormous potential for electricity trade in the Eastern Nile countries coupled with its socio-economic and environmental benefits will pioneer the idea of a regional power market and enhance the East African Power Pool (EAPP). A major setback to the development of such a market is insufficient transmission infrastructures. This project is expected to help overcome this setback and in addition, create transmission capacity needed in interchange of electric power between Ethiopia and Kenya, in the long run. Further, the project is expected to generate investment opportunities in electricity infrastructure and also give rise to development of other related industries.

Objective of the ESIA study

The objective of the ESIA study is to identify potential environmental and social impacts that could be associated with the project. Further the study is to propose measures to avoid, mitigate or/and offset the environmental and social potential negative impacts while enhancing the benefits arising from the interconnection. In addition, environmental and social management plan, monitoring program have been prepared.

Project Description and Justification

The Project Location

The proposed transmission line right-of-way (RoW) crosses from Ethiopia into Kenya approximately 90 km West of Moyale town (grid E 421519, N 397867) and traverses Marsabit, Samburu, Isiolo, Laikipia, Nyandarua and Nakuru. From Moyale the transmission line route runs adjacent to the Great North Highway (Marsabit – Moyale) in a southerly direction avoiding Marsabit National Park. From Marsabit area the route runs southwards at a maximum distance of 500 m parallel to the main Isiolo – Marsabit Highway to Laisamis.

At Laisamis Town the proposed RoW runs close to the road as it enters Losai game reserve keeping a range of about 400 m to 800 m off the road reserve then runs further on to Merille where it diverts slightly westwards running east of Matthews Range, 6 km east of the Lololokwe Mountain peak. It then runs through a stretch of fairly flat land covered by thorny shrubs and bushes, and then turns southwards to the Ngoborbit plateaus and ridges dropping altitude down into Laikipia.

In Laikipia, the propsed RoW continues through the extreme western section of Mpala Ranch which is covered by scattered thickets and bushes. Then it crosses Mutara River into Ndaragwa. The line runs on top ridge of Shamata and then sharply drops altitude to the flat plains of Olobolossat, 3.7 kilometres eastwards of Lake Ol Bolossat. It then traverses the Olkalou Settlement Scheme and cuts across Malewa River, climbing a steep hill then drops altitude to the flat land of Marangishu (karati) and on-wards to Kijabe after crossing the

Nakuru – Nairobi highways into plains east of Mt. Longonot into the proposed Suswa Substation.

The Ethiopia-Kenya Transmission Line Route

Technical Description

A completely new transmission line with self-supporting steel lattice towers with concrete foundations will be built from Sodo in Ethiopia to Suswa in Kenya. Substations will be built at Sodo (Ethiopia), and Suswa in Kenya. Approximate average construction span length of the line is 400 m and with 65m RoW corridor. The 2009 technical feasibility study recommends adopting a conceptual design featuring:

- ±500 kV HVDC bipolar overhead line, from Wolayta/Sodo S/S on the Ethiopian side to Suswa Kenyan side.
- Ground electrode lines at Wolayta/Sodo and Suswa
- Five 400 kV 1½ breaker diameters at Wolayta/Sodo on the Ethiopian side,
- Seven 400 kV 1½ breaker diameters at Longonot on the Kenyan side, including switched shunt compensation, dynamic compensation and stepdown transformers
- One synchronous condenser rated 200 MVAr at Longonot S/S.

Project Justification

The Ethiopia – Kenya Power Interconnection Project will usher in the regional energy trade which has for a long time been envisaged with the formation of the Eastern African Power Pool (EAPP). The overall objective of the EAPP is to facilitate regional integration and hence to realize sustainable growth and development.

The Project helps Ethiopia mobilize the necessary financial resources to exploit fully its enormous hydro-energy resources and thereby improving its economic growth and livelihood of its people. Kenya too will benefit from increasing its currently low level of power interconnection and also raise its level of industrial growth which has been hampered by the dearth and affordability of grid-connected power. . This development will help prepel Kenya towards achieving the Millennium Development Goals (MDGs) through improved economic growth, hence improved living conditions of its citizens and to acheve mid-level industrialized status in line with the Vision 2030 Strategy.

The transmission line will conduct power from clean energy sources in Ethiopia, thereby reducing the fossil fuel based thermal energy that is currently complementing hydro power energy in Kenya. This will mitigate emission of green house gases (GHG) and local pollutants associated with thermal energy and the project has the potential to earn both countries carbon credits.

Legislative Framework

The Constitution of Kenya 2010: under which environmental issues, land issues and compensation have been given prominence. The Bill of Rights, Article 42 provides for the rights of environmental protection of persons and the right to enact environmental laws.

The Environmental Management and Coordination Act No. 8 of 1999 (EMCA) **& Associated Regulations**: governs environmental issues including ESIA.

Applicable sector-specific legal framework will include provisions of the Energy Act 2006, environmental policies of KPLC and KETRACO and KPLC's Resettlement/Land Acquisition Framework.

Other relevant statutes and regulations are:

- Energy Act No. 12 of 2006 of the Laws of Kenya
- Transfer of Property Act Chapter Group 8

World Bank and African Development Bank Safeguard Policies:

The following Bank policies are triggered for the proposed Ethiopia-Kenya Power Interconnection Project:

1) *Environmental Assessment (OP/BP 4.01,)*
2) *Involuntary Resettlement (OP/BP 4.12)*
3) *Natural Habitats (OP/ BP 4.04)*
4) *Indigenous Peoples (OP/BP 4.10)*

A complete description of the World Bank safeguards and their triggers for applicability can be found on the World Bank's official web site www.worldbank.org and are summarized in the main text of this document.

The African Development Bank (AfDB) safeguard policies that are likely to be triggered include:

- Guidelines under the Handbook on Stakeholder Consultation and Participation in ADB Operations;
- Cooperation with Civil Society Organizations Policy and Guidelines;
- Environmental and Social Assessment Procedures for African Development Bank‟s Public Sector Operations;
- Annex 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,15, and 16 of the ESIA Procedures for AfDB Public Sector Operations;
- Gender Policy , 2001;
- Bank Group Policy on Power Reduction, 2004
- Involuntary Resettlement Policy, 2003;
- The African Development Bank Group Policy on Disclosure of Information, 2005; and
- African Development Bank Group‟s Policy on the Environment; 2004

Physical Environment

Geography and Topography

The proposed transmission line route traverses across the country from North to South through Marsabit, Samburu, Laikipia, Nyandarua and Nakuru Counties. Most of Marsabit County is low-lying at 400 and 700 masl. Land use in the county is mostly nomadic livestock herding. The county is home to the Burji, Boran, Ariaal and Rendille communities who are mainly traders, pastoralists and also carry out some irrigation farming. Samburu County is

categorized into three agro-ecological zones with different climatic zones, landform and soils, and having a specific range of potentials and constraints for land use.

Samburu County lies between 1,600 and 2,300 masl but less than 1% of its total land mass is arable. There are no gazetted forests in the county, but the hills cover an area of approximately 9,933 ha and covered by dense vegetation which provides potential for wildlife conservation. The county is vulnerable to natural hazards such as drought and floods along the Ewaso Ng'iro River and which give rise to rampant human confrontations for pasture and water. Recurring drought has resulted in loss of range biodiversity resulting in low vegetation cover. Constant migrations by the pastoral communities in search of water and pasture have enhanced environmental degradation.

Laikipia is semi-humid and is principally a rangeland with only some parts being arable and support fairly high populations through agriculture and animal husbandry. Nyandarua County mainly lies in the Aberdares highland, comprising the Kinangop Plateau, Ol Kalou/Ol Joro Orok Plateau and Ol Kalou/Ol Joro Orok Salient. Nyandarua borders Nakuru County which lies at an average altitude of 1,890 masl, in the Rift Valley Province. Soil composition in the county is complex as it is influenced by intensive variation in relief rainfall climate, past volcanic activities and the underlying rocks.

Soil

The soil distribution in the project area is complex and is influenced by intensive variation in relief, climate, past volcanic activities and the underlying rocks. The main soil types are calcic gleysols, andohaplic pheozems, gleyic cambisols, ando-calcic regosols, lithosols, and calcic xerosols, from the lacustrine plain through the volcanic plain to the volcanic hills respectively.

Generally, the soils in the project area have high phosphorus, calcium, magnesium and potassium concentrations but are low in respect of nitrogen and carbon. Pyroclastics-ashes, agglomerates and tuffs cover a considerable proportion of the project area over the entire volcanic plain in the Rift Valley. During the volcanic period of eruptions of the Mt. Longonot, easterly winds caused the heaviest accumulations of the ejected ashes to settle in and around the project area. More recent pyroclastics flows have resulted in acidic soil compositions. The ashes are usually interbedded with other volcanic soils..

Climate

Climate in the project area ranges from desert areas of Chalbi receiving less than 100 mm of rainfall to semi humid areas receiving a mean maximum of 600 mm in Samburu, Isiolo and parts of Laikipia. Rainfall is much higher within Nyandarua highlands averaging 1200 – 1800 mm reducing to average 700 mm around Sasumua. The average temperatures range between 26 and 32°C with temperatures decreasing southwards and highest within the Chalbi Desert.

Water Resources

The northern part of Marsabit County is mainly dominated by the Chalbi Desert. There are no perennial rivers in the county, except seasonal rivers which are water-bearing when rare and usually torrential rain falls in the desert. Samburu County has potential for both surface and sub-surface water sources. It has four perennial rivers: Ewaso N'giro, Isiolo, Kama and Bisanadi. Isiolo River is extensively used and is the main water source for Isiolo Town.

Preliminary assessments indicate that ground water and surface water potential in the region is limited. 43.5% of households in the region have access to tap water, and 18% of households have access to good quality water sources within a distance of 5 km. Further south has some perennial rivers notably river Pesi which is a tributary of the Ewaso N'giro.

Biological Environment

Vegetation

The vegetation in Marsabit and Samburu Conties can be described in four categories: woodland, dwarf shrub bushland, shrubland and thickets. The dominant tree species is Acacia. Fire-adapted grassland is common in the semi-arid central parts of Samburu County, which is partly the result of human activities including frequent fires, charcoal burning and over-grazing. The bushland is characterized by *Acacia tortilisis*, *Commiphora africana*, *Grewia* species and dwarf shrubs such as *Lippia carviodora* and *Vernonia cinerascens*. Shrub or Bush Grassland consists of grassland with scattered trees and shrubs having a combined canopy cover of less than 20%.

Some sections have Deciduous forests which are characterized by trees that lose their leaves during the dry season (e.g. Acacia and *Combretum* spp.). These are found between Shamata and Ndaragwa areas of Nyandarua County. The area of Laikipia ranches has three main vegetation types mixed Acacia bushland, open grassland and Acacia woodland. Within Naivasha in Nakuru County, only little natural vegetation is left in the project area. River Malewa which flows into Lake Naivasha originates from the Aberdare National Park and the adjoining gazetted forest. Vegetation in this region is humid *Afromontane* forest and bamboo.

Wildlife

Marsabit County is largely a wide expanse of wildlife dispersal area accommodating a wide range of animals including some rare species, such as Reticulated Giraffe, Beisa Oryx, and Somali Ostrich. Others include elephants, elands, buffaloes, zebras, giraffes, lions, baboons, gravy zebras, greater kudu and a few rhinoceros. The Somali Ostrich is also common in the Chalbi Desert. Wild herbivores, such as buffaloes are unevenly distributed over the project area with concentrations in Laikipia and Samburu areas.

The Laikipia – Samburu ecosystem is an important conservation area hosting a large diversity of wildlife notably elephants, lions, giraffe and the vulnerable reticulated giraffe and the wild dog. The greatest population are found within private conservancies and group ranches.

Lake Ol Bolossat and the associated wetlands support a diverse range of water fowl, which are either resident or migratory. Lake Naivasha is also important for riparian mammals, primarily the population of approximately 600 - 700 Hippopotamus amphibious, which represents the largest meta-population of this specie in the Kenya Rift.

Socioeconomic and Cultural Environment

Land use

The land use types of the project area can be categorized as agricultural, pasture and rangelands, settlements, conservation areas and forests. In Kenya land is the most important and widely coveted factor of production. It offers security through abode, in old age and eventually upon death which all account for the huge interest that is vested upon land in Kenya. Under the Trust Land Act, Cap 288, land in the pastoral counties of Marsabit and Samburu is mostly held in trust for the local communities by the respective County Councils. The pastoral communities in those counties exercise communal ownership and utilization of natural resources. Against this background the requirement for land to be set aside for construction of the proposed transmission line is likely to impose a major impact within the traversed route.

Existing infrastructure

Along the entire RoW, diverse infrastructure is encountered and this includes many power distribution lines, airstrips, roads, railway lines, etc. For some distance the proposed RoW runs along the Mai-Mahiu – Naivasha – Gilgil and the Isiolo – Marsabit – Moyale highways and some other minor roads. These roads will be crucial for access during construction and maintenance phases of the project, implying they will assist in mitigating potential adverse impacts of the proposed transmission line since they will reduce the need for new access roads.

Between the proposed Suswa substation and Marmanet, the proposed transmission line route runs parallel east of the proposed 400 kV HVAC transmission line to the proposed Lake Turkana wind-turbine power generating site. Optimum separation of the two proposed transmission lines will be determined because although running the two lines is likely to reduce the negative impact, mutual technical effects of the two lines running in parallel will have to be investigated. All existing and planned structures are economically and strategically crucial hence the need to flag them to ensure planning for their mutual co-existence and harmony on the side of the project.

Socioeconomic Characteristics

The main ethnic groups distributed along the project area include Gabra, Rendille and Samburu, in Marsabit, Samburu and Laikipia Counties; Kikuyu in Laikipia, Nyandarua and Nakuru Counties and Maasai in Laikipia and Nakuru Counties. The Maasai, Samburu, Rendille and Gabbra are mainly nomadic pastoralists. While the longest portion of line route lies within the land occupied by Gabbra, Rendille and Samburu (all pastoralists) its effect on the communities is low because they are sparsely populated in density and due to their migratory tendencies. The Kikuyu are the most affected because they have a relatively higher population density and are mainly settled peasant farmers. Other ethnic groups are mainly migrants to the project area. They include Meru, Kisii, Luhya, Luo, Turkana and Somali.

The proposed transmission line route traverses mainly rural areas of five counties. Most of the counties traversed are sparsely populated except the settlement areas of Nakuru and

Nyandarua counties. On the overall, heavily populated areas have been avoided during route selection.

Economic Characteristics

The settlement pattern in the traversed districts are characterized by the potentiality of land, land use system and water availability. Agriculture is dominant in most of the affected counties, In Marsabit, Samburu, Laikipia and Nakuru Counties; nomadic pastoralism is the dominant occupation. In the area around Lake Naivasha horticultural farming for export market is intensely practiced. Crop-based peasant farming, ranching, traditional livestock keeping (pastoralism), trade and business are the principal sources of income and livelihood in the project area. Livestock raring includes cattle, goats, sheep, donkeys and camel. In Nyandarua, Nakuru and parts of Laikipia County mixed farming is the dominant occupation. Common crops include: maize (94.9%), Potatoes(2%), wheat(1%), beans, onions(1%), Cabbage(1%) and horticulture.

Potential Impact and Mitigation/Enhancement Measures

Potential Positive Impacts

Positive socio-economic effects of the project during construction on those communities located in the vicinity of the transmission line would include short term employment, income generation by transporters, food selling individuals and shops and accommodation. At national level Kenya will get sustainable electricity supply from green sources. With the additional substations and transmission line, there will be increased capacity and reliability of power supply which will have a positive impact by being able to meet the ever rising power demand. Provision of energy has an in direct link to better living standards.

Development of ICT Hubs

Under the Vision 2030 strategy, Kenya is developing rural-based ICT networks that are geared to benefit the local populations and supply local schools with ICT terminals as ICT is being integrated into school curriculum in line with the country's MDGs. KETRACO's policy is to incorporate optical-fibre ground wire (OPGW) in all new lines. The OPGW will therefore be able to supply broad-band communication telecommunication hubs, mobile telephone networks and digital television to population centres and ICT to schools and digital villages withinthe project area.

Conservation Measures

Access to adequate and affordable energy for households and industry will help in rolling back the rate of deforestation and thus help in conserving forest resources and realize the environmental benefits such as water resources and biodiversity functions. Access to affordable energy will improve performance in virtually all sectors of the Kenyan economy.

Climate Change and Regional and Local Pollution

Considering that the sources of power are renewable sources, the project will cut down carbon emissions and NO_X,SO_X, *and PM* that are associated with thermal energy, and thus help in reducing global warming and cut down on regional and local pollution.

Potential Negative Impacts & Mitigation measures

The table below presents a summary of the potential impacts and proposed mitigation measures.

Environmental Impact	Description of Adverse Effects of Impacts	Proposed Mitigation Measures	Nature and Severity of Impact
Settlements and Community Facilities	• In order to establish a clear wayleave, removal of residential houses and private buildings will be one of the negative impacts of the project. Some of the social structures affected by the project include 3 churches, 3 schools, 1 health facility, a police post and a children's home.	• Where it is not possible to realign the line route further than already achieved so as to avoid the affected facilities and structures, compensation and assistance shall be provided to the community or individuals affected • More details about resettlement and compensation is provided under the RAP brief.	High, direct, permanent but impact can be lessened
Potential Aesthetic Impacts	• Visual intrusion of transmission line across the Laikipia and Samburu natural wilderness especially for tourism views. • To some, new transmission lines are viewed in a positive light because it represents economic development. • No other impacts on landscape is expected	• The OHTL routes have been established so as to meet the co-inhabitancy requirements imposed by the natural landscape, objects, buildings and facilities in the neighborhoods by ensuring that they merge into the existing landscapes. In particular, most of the transmission line route has been selected to follow hilltops where there is minimum human settlements and where the view of the conductors will be against the sky and thereby having less impact than when viewed sideways or from above against the background of the horizon or the ground.	High, direct permanent, reversable only upon decommissioning
Natural Vegetation	• Loss of exotic trees including Eucalyptus, Grevellia Robusta, Cypress, Pine trees, etc. Found on individual land holdings • Loss of forest land at Ndaragwa • Transient loss of vegetation along the line during construction.	• Clearance during construction be done manually without burning the cleared vegetation. • Vegetation clearance within the Protected Areas be done under supervision of KWS and KFS personnel. • Compensate value trees according to RAP recommendations • Compensatory planting of trees that are cleared or whose height is limited to 4.5m.	Medium, direct, temporary, reversable
Fauna	• Potential of physical hazards to birds, climbing animals and people. • Potential bird strikes around Dida Galgalu and Lake Ol Bolossat during the operation stage of the project • Potential interference with wildlife migration if construction activities across the ligration corridors coincide withe migration period	• To be mitigated at specifically identified locations by use installation of coloured warning spheres on the ground conductors atop the towers. • The design to include building raptor platforms on top of pylons for roosting and nesting; • Collect monitoring data on avifauna electrocuted along the proposed transmission line. • Install danger sign and anti-climbing barbed wire for safety purposes on every steel tower.	Low, indirect, permanent for birds, temporary for other fauna

Environmental Impact	Description of Adverse Effects of Impacts	Proposed Mitigation Measures	Nature and Severity of Impact
		• Ensure a safety officer is present at all the times during the construction phase. Conduct safety campaigns periodically among the population along the entire RoW. • The span between towers is on average 400 m and minimum height of conductors is 11 m, thus, the infrastructure configuration does not limit animal movements including elephants • Schedule construction so as not to coincide with animal migrations across migration corriddors and this will be included as a clause in construction contract.	
Impacts on Agricultural Land	• Transmission lines will affect farm operations and increase costs to farmers. • For farmers on the ROW, there will be temporary cessation of farming during construction of tower pads and stringing • Tree plantations and orchards will be affected as they will not be permitted to grow beyond 4 m height.	• KETRACO to provide monetary compensation for cessation of land use and any loss associated with compromised land productivity. Compensation details are provided under the RAP. • Some of the access roads required during project implementation should not become permanent if not required by community.	Low, direct, temporary and reversible.
Impacts on Drainage, Surface Waters and Water Resources	• Construction of towers could interfere with the natural drainage systems and modify flow of surface water, • Altered drainage can contribute to soil erosion, flooding, channel modification, downstream scouring and sedimentation in streams and other drainage channels. • Poor effluent discharge from workers camp at the Suswa station	• Positioning of towers away from natural drainages and floodways • Position towers so as to leave a protection zone of 15 m at river and streams and 5 m when crossing any drainage channels. Channel effluents to sceptic tank and run-off from work surfaces to a retaining pond.	Low, direct temporary and reversable
Land Excavation, Access Roads and Campsite	• Construction of access roads has potential impact to the environment from clearance of vegetation, compaction of land and a permanent loss of farming and grazing land.	• Designing transmission line route close to existing roads or line corridors. Rehabilitate temporary acces roads after completion of works • Minimize the number of new roads required, • Locate the campsite in such a way that they can have residual values like turning them into schools and other public facilities.	Low, direct, temporaray, reversable
Soil Erosion	• Soil disturbance occassioned by construction of foundations for transmission line towers and substation at Suswa could exacerbate soil erosion	• Restrict use of heavy machinery and vehicles to designated work areas • Install soil protection works in areas sensitive to erosion prior to undertaking construction.	Low, direct, temporary, reversable

Environmental Impact	Description of Adverse Effects of Impacts	Proposed Mitigation Measures	Nature and Severity of Impact
Noise, Ozone and Corona	• Noise associated with operation of trucks and heavy equipment in the vicinity of huma settlements	• Work schedules to avoid working ours at night especially around health centres • Work schedules in the vicinity of schools to be restricted to off school hours • Ozone concentrations around power lines have no health consequences as they have purely localized impacts.	Low to insignificant, direct, permanent
Electric and Magnetic Fields	• Studies on High Voltage electric overhead lines have not come up with any conclusive evidence of impacts on human health. • Vibrations associated with the high voltage power transmission caused by the conductors exposed to the dynamic load of wind	• The electro-magnetic field (EMF) decays very rapidly with distance from source and there should be no potential health risks for people living outside the 65 m wide wayleave corridor. • The design should incorporate vibration dumpers along the entire OHTL length to damp vibration. In any case it is expected that vibration on a DC line will mainly be caused by wind and not power flow.	Low, direct, permanent, reversable only up on decommissioning
Substance Abuse and Communicable Disease Control	• Substance (alcohol and drugs) abuse and spread of HIV/AIDS/STI and other Communicable diseases could be occassioned by workers across rural areas. • Potential risk of spread of sexually transmitted diseases such as HIV/AIDS/STI in the project area by workers not staying with their families.	• Mount intensive campaign of awareness, prevention and treatment will be undertaken among the workers and the communities living in the vicinity of the project. • Sensitization and education campaigns against substance abuse • The construction sites, contractor‟s accommodation areas, offices and store facility to be supplied with portable water and well-maintained sanitation and wastewater installations. • Employ non-skilled labour from within the community	Low, indirect, reversable in some cases
Archaeological and Historical Sites	• Potential damage caused by construction and maintenance work through digging, crushing by heavy equipment, uprooting trees, exposing sites to erosion or the elements, or by making the sites more accessible to vandals.	• In the event that archaeological resources are discovered during the construction process, a Chance Find Procedure as described in Performance Standard 8 of IFC to be implemented. The procedure includes record keeping and expert verification procedures, chain of custody instructions for movable finds, and clear criteria for potential temporary work stoppages that will be potentially necessary for rapid disposition of issues related to the finds.	Uncertain
Solid Waste	• The project does not envisage major excavation works; solid waste will therefore be minimal. Topsoil excavated	• Re-use some of the excavated soil for backfilling while the rest to be disposed off at designated areas.	Low, direct, temporary, reversable

Environmental Impact	Description of Adverse Effects of Impacts	Proposed Mitigation Measures	Nature and Severity of Impact
	from construction sites will be the main form of solid waste. • Other solid wastes will include metallic pieces, wooden planks, and stone debris.	• Dispose of waste in accordance with the NEMA guidelines. • Take particular care in forest reserves, national parks and other protected areas where materials and plants brought in during construction must be taken out at completion of the works.	
Impact on Ambient Air	• The air emissions from construction machinery and traffic will be low and will therefore have negligible impact on ambient air quality.	• Set the route away from dense settlements	Low to insignificant, direct, permanent until decommissioning
Impacts on Aviation and Communication	• Not expected since the set back from airfields is substantial	• The Kenya Civil Aviation Authority to be requested to conduct a survey along the RoW and advise on the safety distances of the RoW from the aerodromes and safe tower heights and/or need for installation of warning lights and/or warning spheres in the vicinity of the aerodromes and at any other point along the entire RoW	Low, fine elements are unclear
Potential Hazards	• Electrocution and fire by line snapping • Transmission tower/pylon collapse • Flooding and fire hazards of substation and transmission line	• A number of hazard management mechanisms could be devised to prevent and control potential hazards along the transmission line corridor and substations. These include prevention, control and management mechanisms.	Uncertain

Monitoring Program

During the monitoring program the Contractor‟s responsibility is to ensure that the construction works are carried out as per the detailed design, the measures defined in the ESMP, and the applicable National, AfDB and WB guidelines. All construction activities are carried out according to international best practice and adhere to the applicable requirements regarding health, safety and environment. Monitoring of the construction activities will be limited to the construction area, which includes the construction sites, temporary storage areas, workers camps and their adjacencies. The topics and parameters that will be considered as a minimum for the environmental monitoring of the Project are Water Quality Monitoring; Noise Levels Monitoring; Monitoring of Vegetation Clearing; Soil Erosion Monitoring; Monitoring Rehabilitation of Work Sites; and Monitoring of Health status and Accidents.

Public Consultation and Public Disclosure

The public and stakeholder consultations were carried out as follows:

- 11 public meetings at different locations on the proposed RoW,
- all Project Affected Persons (PAPs)were consulted (380 households)

- Two focus group discussions were held with the conservancies at Nanyuki and Wamba
- Key Government agencies consulted include Kenya Wildlife Service, Kenya Forest Service, National Environment Management Authority

During the consultations, the consultations focused on nature of potential environmental, social, historical and cultural, and economic impacts of the transmission line. Identification of major social impact issues, such as resettlement, community severance and vulnerable groups that are at particular risk of project impacts, and compensation for affected properties and assets. Data and information on the current usage and ownership of land in the RoW, fixed and movable structures, trees, wells and other assets, areas of significant squatting and/ or encroachment were sufficiently discussed. During Public consultations with PAPs and local communities people reaffirmed their support to the project. Officials and the local authorities agreed to ensure that no person will be allowed to encroach to the RoW after the cut-off date.

Resettlement Action Plan summary

The RAP study commenced with the review of Fichtner 2009 report and collection of baseline data which culminated in selecting of an optimized route which was approved by the EEPCO, KETRACO and the financiers. Field data in a proposed RoW band of 65 m wide was collected through household census and community consultations. During field data collection minor changes on the proposed RoW were effected so as to avoid physical and topographical structures. The field data was analyzed and results are discussed in this report.

Study findings indicate that the Kenyan section of RoW is 606 km long which gives a total land area within the RoW in Kenya as 39.39 km2. Some major community structures including schools, dispensaries, churches, etc were found to have been constructed on the proposed RoW established under the 2009 study. These structures have now been avoided and consequently the compensation cost has reduced drastically. A route change was also effected at the region near Wamba Town so as to avoid Matthews Range Forest Reserve. This deviation also resulted in drastic reduction of compensation requirements to households in the area. In particular, the route deviation in this area avoided many disadvantaged and marginalized groups that inhabit the area. Since some remote chances exist of interfering with cultural properties of these groups, under this RAP, a Vulnerable and Marginalized Groups Action Plan (VMGAP) was developed in line with the World Bank's OP 4.10 policy requirements.

Compensation has been worked out based on KETRACO's Resettlement Policy Framework (RPF), Kenyan statutes, WB and AfDB policies as well as other safeguard policies. Compensation for the affected land and property is worked out at the full market value. and worked out based on KPLC latest rates reviewed on 26th April 2011. Disturbance and assistance for the disadvantaged (marginalized and vulnerable), both at 15% was added to the assets value. For annual crops such as maize, beans, vegetables, etc and some perennial crops such as coffee, it was assumed that only 10% will be damaged during construction but actual compensation will be paid based on crops lost. Compensation for community assets was also computed using KPLC rates. The budget for compensation

worked out at approximately KShs. 1.2 billion which is equivalent to US$ 14,094,943 at exchange rate of KShs. 85 to the dollar.

The RAP report has set out a comprehensive governance structure, conflict resolution process and regular internal and external auditing of for RAP implementation process.

Conclusion

From a broader perspective, the project has low overall environmental impacts since it will source energy from green sources (hydro-electric) thus reducing environmental consequences of thermal energy production that is currently used to complement hydro-power production in Kenya. When alternatives are considered, it is clear that this project will provide Kenya the opportunity to reduce its carbon footprint over time.

The intensity of impacts will be relatively higher at the tower construction sites within the RoW and at the substation construction site at Suswa. These impacts are related to land degradation, noise, waste handling, air quality and vegetation clearance. These potential impacts are easy to mitigate through proper construction planning. However, impacts on vegetation could be locally substantial during construction phase since stringing may necessitate removal of some trees to create access. This impact on vegetation is transient and reversible. Impacts on wildlife during construction are related to possible effects on animal migration if tower construction and stringing across animal migration corridor coincide with their movements. This is easily mitigated by scheduling construction so that it does not coincide with animal migrations.This will be included in construction contracts.

Impacts on wildlife is rated as low during both construction and maintenance, partly because of the line has avoided important protected areas, but more importantly because the configuration of the line, with 400 m wide span between towers do not inhibit wildlife movements across the alignment. The potential increase in bird mortality occasioned by bird collision with the conductors around Lake Ol Bolossat is considered low because the line has been diverted by 3.7 km from the edge of lake Ol Bolossat to avoid flight path of birds coming in and out of the lake. For Dida Galgalu desert which is also considered an Important Bird Area, the ecological expanse is extremely large to the extent that deaths associated with bird collision will have insignificant impacts on the viability of avifauna in the area, although mitigatory measures will be implemented, such as coloured balls on the line. A thorough archaeological study was undertaken, and noarcheologically important sites were identified on the alignment. Nevertheless, a chance finds procedure will be followed, and a clause detailing such will be included in construction contracts.

During construction, potential impacts on local communities and enterprises are largely positive, as the construction activities provide direct job opportunities and indirectly create income from trading through supply contracts, food vendors, accomodation, entertainment etc. However these positive impacts are limited to the duration of the construction activities and would not have a significant sustainable positive impact on the local economy.

There are some 380 homesteads and 6 shops which will be wholly or partially affected. These have been identified and their compensation shall be undertaken as provided for in the RAP report.

The most important impact other than resettlement and impacts on livelihoods is the visual intrusion occasioned by the new power line. This may have adverse impacts on wilderness

tourism within the Laikipia – Samburu ecosystem. Attempts have been made to align the route to avoid proximity to tourist lodges and out of sight of tourist circuit. This impact is permanent throughout the life of the project. During Operation and maintenance, the constant pruning of trees to limit height to 4.5 m within the right of way will limit tree cover along the entire RoW. This latter impact can be mitigated by compensatory tree planting, especially in Nyandarua and Nakuru counties.

In general the impacts associated with this project are relatively easy to avoid or mitigate. The only permanent impact of significance is the visual intrusion occasioned by the towers and the conductors. However the alignment has avoided most trafficked tourism routes and lodges.