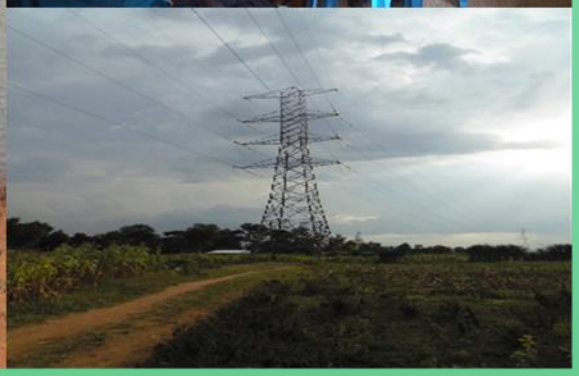
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED MYANGA- BUSIA- RANG'ALA- BONDO- NDIGWA HIGH VOLTAGE TRANSMISSION LINE PROJECT



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EXECUTIVE SUMMARY

Introduction

According to the Ministry of Energy, the existing power transmission system capacity is constrained particularly during peak hours when system voltages in parts of Nairobi, Coast, West Kenya and Mount Kenya drop below acceptable levels, causing occasional load shedding despite the availability of generation capacity.

To address these constraints, the Kenya Electricity Transmission Company (KETRACO) has identified the need for a number of new transmission projects. Among these projects is the 132kV Myanga – Busia – Rang'ala – Bondo - Ndigwa transmission line project. The project is aimed at enhancing the adequacy, reliability, and security of electricity power supply in Bungoma, Busia, and Siaya Counties. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages in the project areas.

The Kenya Government policy on all new projects requires that an Environmental and Social Impact Assessment (ESIA) study be carried out at the project planning phase in order to ensure that significant impacts on the environment are taken into consideration at the construction, operations and decommissioning stages.

This Environmental Impact Assessment has identified both positive and negative impacts of the proposed project to the environment and proposes mitigation measures in the Environmental Management Plan developed to address potential negative impacts, during the construction, operation and decommissioning phases of the project, for overall environmental sustainability.

Study Objectives

The principal objective of this assessment was to identify significant potential impacts of the project on environmental and social aspects, and to formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment and people's health through all of its phases (construction, implementation and decommissioning phases).

Study Methodology

The approach to this exercise was structured such as to cover the requirements under the Environmental Management and Co-ordination (Amendment) Act, 2015 as well as the Environmental Management and

Coordination (Impact Assessment and Audit) Regulations 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as decommissioning. In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, desktop studies, public consultations with members of the community in the project areas, survey, photography, and discussions with key people in KETRACO (the proponent).

The key activities undertaken during the assessment included the following:

- Consultations with the key project stakeholders including the project proponent, community members, County administration, opinion leaders and National and County Government departmental heads. The consultations were based on the proposed project, site planning and the project implementation plan;
- Physical inspections of the proposed project area which included observation of available land marks, photography and interviews with the local residents;
- Evaluation of the activities around the project site and the environmental setting of the wider area through physical observations and literature review;
- Review of available project documents; and
- Report writing, review and submissions.

Conclusion

An Environmental and Social Management Plan (ESMP) outline has been developed to ensure sustainability of the site activities from construction through operation to decommissioning. The plan provides a general outlay of the activities, associated impacts, and mitigation action plans. Implementation timeframes and responsibilities are defined, and where practicable, the cost estimates for recommended measures are also provided.

A monitoring plan has also been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the proposed project, statutory Environmental and Safety Audits must be carried out in compliance with the

national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

It is quite evident from this study that the construction and operation of the proposed project will bring positive effects in the project area including improved supply of electricity, creation of employment opportunities, gains in the local and national economy, provision of market for supply of building materials, informal sectors benefits, Increase in revenue, Improvement in the quality of life for the workers and community members, and Improved security.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and given that all identified potential negative impacts can be mitigated and that no community objection was received, the project may be allowed to proceed.

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LIST OF ABBREVIATIONS

AFD	Agence Francaise de Development
AfDB	African Development Bank
AGO	Automotive Gas Oil
AST	Above Ground Storage Tank
CB	Circuit Breaker
CT	Current Transformer
CVT	Constant Voltage Transformer
CO_2	Carbon Dioxide
CO	Carbon Monoxide
DO	District Officer
DOHSS	Directorate of Occupational Health and Safety Services
DC	District Commissioner
EA	Environmental Audit
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMCA	Environmental Management and Coordination Act
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ERC	Energy Regulatory Commission
GDC	Geothermal Development Company
GHGs	Green House Gases
GoK	Government of Kenya
HFO	Heavy Fuel Oil
IPP	Independent Power Producer
KenGen	Kenya Electricity Generating Company
KETRACO	Kenya Electricity Transmission Company
KFS	Kenya Forest Service
KPLC	Kenya Power and Lighting Company
Kshs.	Kenya Shillings
kV	Kilo Volt
KWH	Kilo Watt Hour
KWS	Kenya Wildlife Service

LCPDP	Least Cost Power Development Plan
LILO	Line In Line Out
L.R	Land Registration
mg/kg	Milli grams per kilogram
MoE	Ministry of Energy
MW	Mega Watts
MVA	Mega Volt Amperes
NEMA	National Environment Management Authority
NOX	Oxides of Nitrogen
OSHA	Occupation Safety and Health Act
PM	Particulate Matter
PPE	Personal Protective Equipment
REA	Rural Electrification Authority
SF_6	Sulphur Hexafloride
SHE	Safety Health and Environment
SOX	Oxides of Sulphur
STD	Sexually Transmitted Diseases
WRMA	Water Resources Management Authority

CHAPTER 1: INTRODUCTION

1.1: PROJECT BACKGROUND

Vision 2030 is Kenya's development blueprint covering the period 2008 to 2030. The objective of Vision 2030 is to help transform Kenya into a, "middle-income country providing a high quality of life to all of its citizens by the year 2030". The Vision outlines the Government of Kenya's economic growth objectives.

Vision 2030 recognizes the energy sector as one of the infrastructure enablers of the economic, social and political pillars underlying the Vision. The sessional paper No. 4 of 2004 on Energy recognizes that affordable, quality and cost effective energy services is an important prerequisite for attainment of accelerated social and economic growth and development. In view of these considerations, energy sector development is a key policy concern for Kenya's development.

To guide the energy sector development, the Ministry of Energy in 2011 developed the Least Cost Power Development Plan (LCPDP). In pursuit of the provisions of section 5 (g) of the Energy Act No. 12 of 2006 that mandates the Energy Regulatory Commission to prepare Indicative National Energy Plans, the Commission in conjunction with key stakeholders in the energy sector including; officers from the Ministry of Energy (MoE); Kenya Electricity Generating Company (KenGen); Kenya Power and Lighting Company (KPLC); Kenya Electricity Transmission Company (KETRACO); Geothermal Development Company (GDC); Rural Electrification Authority (REA); The Ministry of State for Planning, National Development; Kenya Vision 2030 Board, Kenya Investment Authority (KenInvest); Kenya Private Sector Alliance (KEPSA); and the Kenya National Bureau of Statistics (KNBS); updates the LCPDP every second year. This report focuses on developments in the electric power sub-sector and takes a long-term view of the sector, given a set of assumptions.

According to ERC annual report 2014/2015, The demand for electric power continued to rise significantly over the last five years driven by a combination of normal growth, increased connections in urban and rural areas as well as the country's envisaged transformation into a newly industrialized country as articulated in Vision 2030. However, the power market remained unbalanced with this demand not fully met by supply. This is mostly due to system constraints and weather challenges. The peak demand rose from 1468MW in 2013/14 to 1512MW in 2014/15. The supply of electricity showed a 6.8% increase from 8,839GWh in 2013/14 to 9280GWh in

2014/15. The recorded total consumption also demonstrated a significant increase, recording a total of 7655GWh compared to 7244GWh in 2013/2014.

The number of customers connected to the national grid increased by 30.5% from 2,767,983 in 2013/14 to 3,611,904 in 2014/15. The customer base had increased by 18.7% between 2012/13 and 2013/14. This increase in number of customers was as a result of the “last mile connectivity” by KPLC where life line customers were being connected at KES 1,160.00 and continued enhanced connectivity by the Rural Electrification Authority to schools and other public amenities. The sales of the commercial and industrial customer category increased marginally, from 3,819GWh in the year 2013/2014 to 4,030GWh in 2014/2015.

As at June 2015, Kenya had an installed electricity generation capacity of 2,299MW comprising of hydro (821MW), thermal (827MW), geothermal (598MW), wind (25.5MW), co-generation (26MW), and solar (0.57MW).

Table 1.1: Installed Capacity and Effective Power Generation

	Installed MW	**Effective MW**
Hydro	820.7	800
Geothermal	588.0	579.9
Thermal (MSD)	720.0	701.5
Temporary Thermal (HSD)	30.0	30.0
Thermal (GT)	60.0	54.0
Wind	25.5	25.5
Cogeneration	26.0	21.5
Interconnected systems	2,270	2,210
Off grid thermal	26.8	23.1
Off grid wind	0.66	0.61
Off grid solar	0.55	0.212
Imports	000	000
Total capacity	**2,299**	**2,234**

Source; KPLC 2014/2015

The existing transmission network lengths stands at 1,434km of 220kV and 2,513km of 132kV while the distribution network stands at 1,212km of 66kV, 20,778km of 33kV and 30,860km of 11kV lines respectively. Sub-station capacity expanded from 3,181MVA in 2013/14 to 3,612MVA in 2014/15.

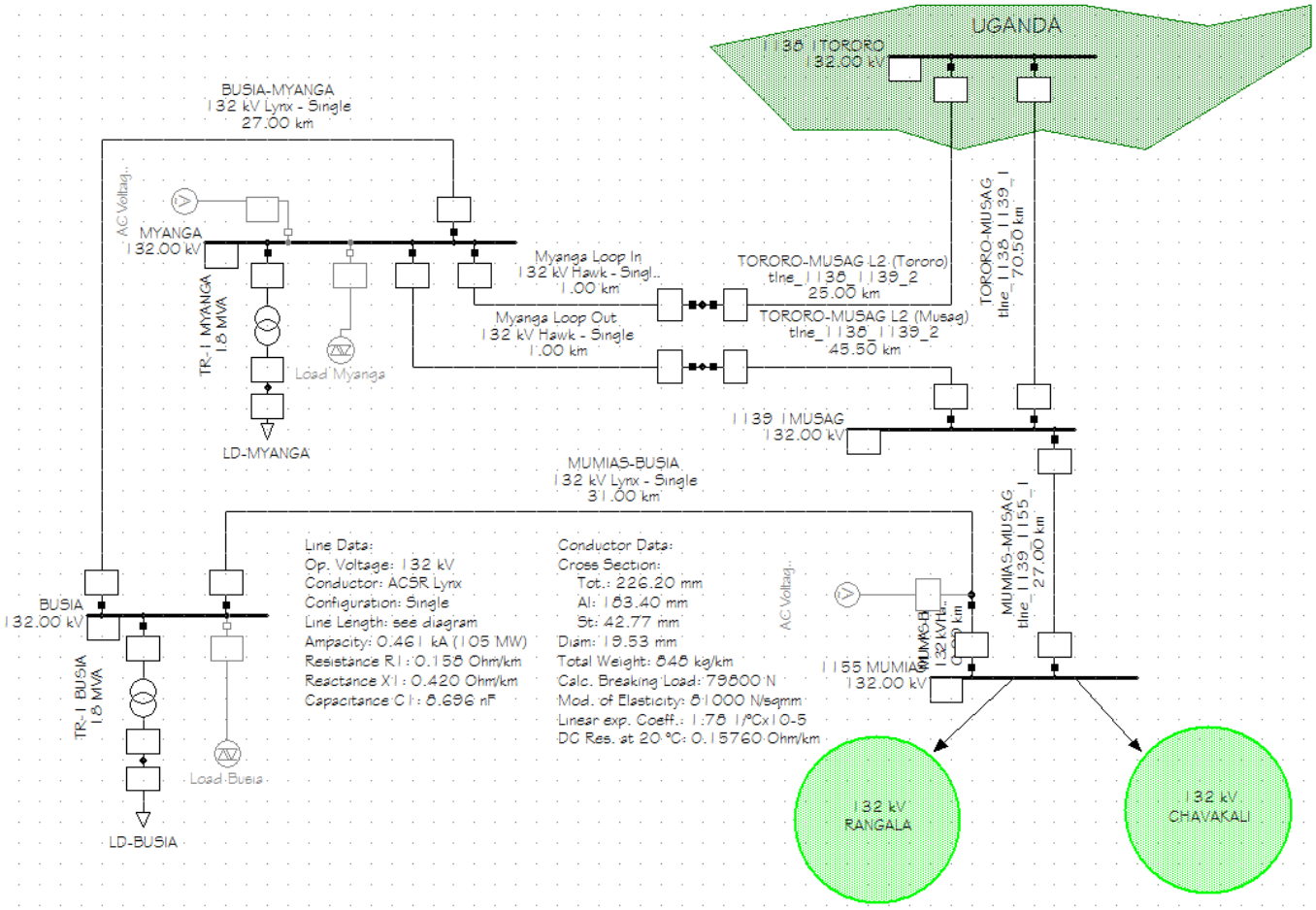
Table 1.2; Transmission Circuit Network (kms)

Voltage (KV)	2014/2015
220	1,527
132	2,527
66	1,212
33	21,370
11	32,823
415/240 or 433/250	23,502
TOTAL	**82,961**

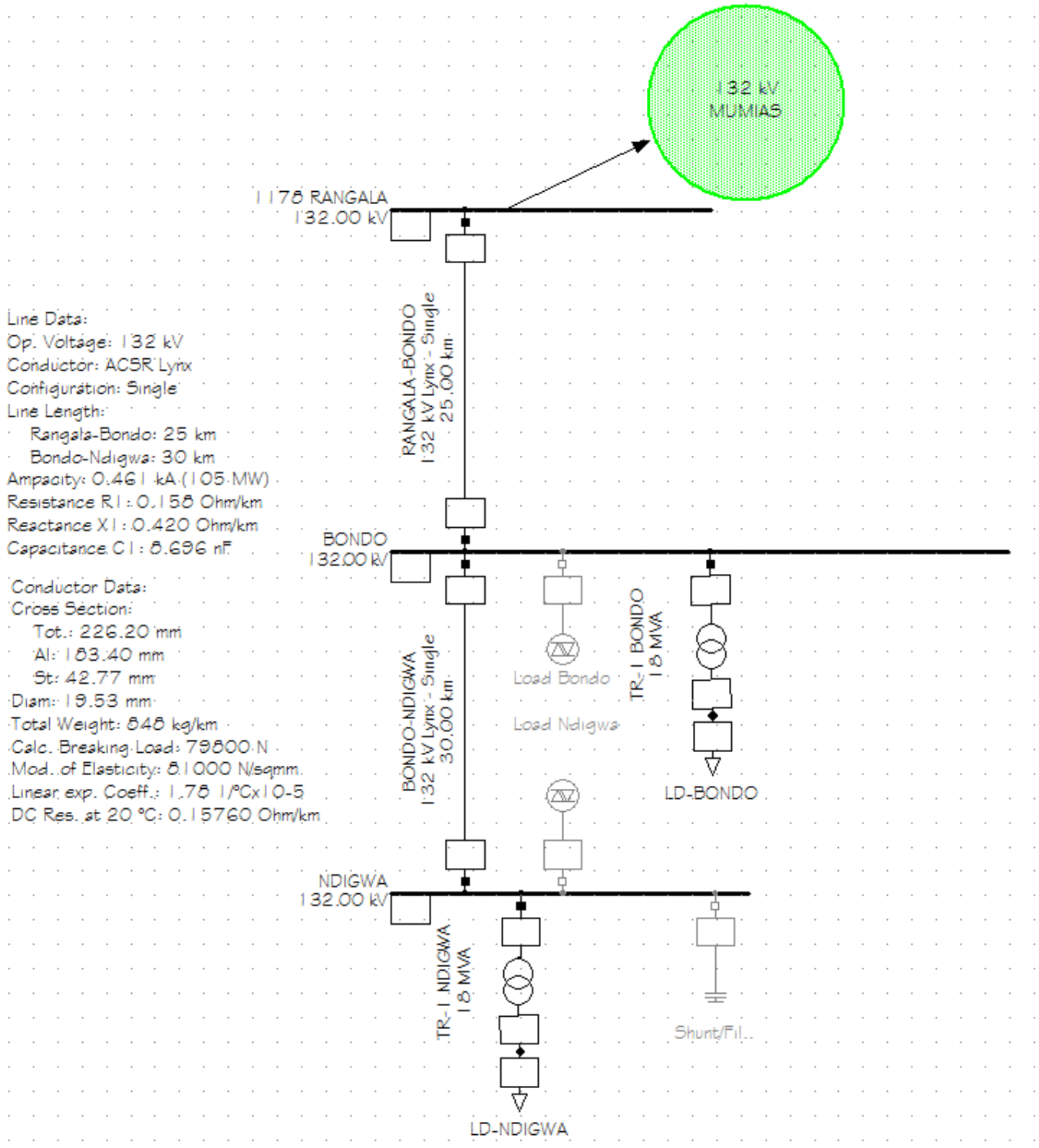
Source; ERC

The existing transmission system capacity is constrained particularly during peak hours when system voltages in parts of Nairobi, Coast, West Kenya and Mount Kenya drop below acceptable levels, causing occasional load shedding despite the availability of generation capacity.

To address these constraints, the Kenya Electricity Transmission Company (KETRACO) has identified the need for a number of new transmission projects. Among these projects is the 132kV double circuit Myanga – Busia – Rang'ala – Bondo – Ndigwa Transmission Line Project. The project is aimed at enhancing the adequacy, reliability, and security of electricity power supply in Siaya, Busia, and Bungoma Counties. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages.



Single Line Diagram for Busia Section



Single Line Diagram for Rang'ala-Bondo-Ndigwa Section

The Kenya Government policy on all new projects requires that an Environmental and Social Impact Assessment (ESIA) study be carried out at the project planning phase in order to ensure that significant impacts on the environment are taken into consideration at the construction, operation and decommissioning stages.

This Environmental Impact Assessment has identified both positive and negative impacts of the proposed project to the environment and proposes mitigation measures in the Environmental Management Plan developed to address potential negative impacts, during the construction, operation and decommissioning phases of the project, for overall environmental sustainability.

1.2: STUDY OBJECTIVES

The principal objective of this assessment was to identify significant potential impacts of the project on environmental and social aspects, and to formulate recommendations to ensure that the proposed project takes into consideration appropriate measures to mitigate any adverse impacts to the environment and people's health through all of its phases (construction, implementation and decommissioning phases).

The specific objectives of this ESIA were to:

- Identify and assess all potential environmental and social impacts of the proposed project;
- Identify all potential significant adverse environmental and social impacts of the project and recommend measures for mitigation;
- Verify compliance with the environmental regulations and relevant standards;
- Identify problems (non-conformity) and recommend measures to improve the environmental management system;
- Generate baseline data that will be used to monitor and evaluate the mitigation measures implemented during the project cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Prepare an Environmental Impact Assessment Report compliant to the Environmental Management and Co-ordination (Amendment) Act, 2015 and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

1.3: TERMS OF REFERENCE (TOR) FOR THE ESIA PROCESS

The following are the TOR for the ESIA process

- Description of the baseline environment (physical, biological, social and cultural)
- Detailed description of the proposed project
- Review Legislative and regulatory framework that relate to the project
- Identify potential environmental impacts that could result from the project
- Carry out public consultation on positive and negative impacts of the project
- Propose mitigation measures against identified environmental and social impacts of the project
- Development of an Environmental Management Plan to mitigate negative impacts
- Development of an Environmental Monitoring Plan
- Prepare an Environmental and Social Impact Assessment Report

1.4: SCOPE OF THE STUDY

The study has been conducted to evaluate the potential and foreseeable impacts of the proposed development. The physical scope is limited to the proposed site and the immediate environment as may be affected or may affect the proposed project. Any potential impacts (localized or delocalized) are also evaluated as guided by EMCA 2015 and the Environmental (impact assessment and Audit) Regulations, 2003. This report includes an assessment of impacts of the construction, operations and decommissioning of the proposed project site and its environs with reference to the following:

- A review of the policy , legal and administrative framework
- Description of the proposed project.
- Baseline information (bio-physical and socio-economic)
- Assessment of the potential environmental impacts of the proposed project on the biophysical, social-economic, religious and cultural aspect
- Recommendation of cost effective measures to be used to mitigate against the anticipated negative impacts
- Proposition of alternatives
- Problems (non-conformity) identification and recommendation of measures to improve the existing management system;
- Preparation of an Environmental and Social Impact Assessment Report compliant to the Environmental Management and Co-ordination (Amendment) Act, 2015 and the Environmental (Impact Assessment and Audit) Regulations (2003), detailing findings and recommendations.

1.5: ESIA APPROACH AND METHODOLOGY

The approach to this exercise was structured such as to cover the requirements under the EMCA, 2015 as well as the Environmental (Impact Assessment and Audit) Regulations 2003. It involved largely an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information was obtained through physical investigation of the site and the surrounding areas, desktop studies, survey, photography, public consultations with members of the community in the project areas, and discussions with key informants (local administration and heads of departments)

The key activities undertaken during the assessment included the following:

- Consultations with the key project stakeholder including the project proponent, community members, County administration, opinion leaders and National and County Government departmental heads. The consultations were based on the proposed project, site planning, project benefits, anticipated impacts, and the project implementation plan;
- Physical inspections of the proposed project area (site assessment) which included observation of available land marks, photography and interviews with the local residents;
- Evaluation of the activities around the project site and the environmental setting of the wider area through physical observations and literature review;
- Review of available project documents; and
- Report writing, review and submissions.

Below is an outline of the basic ESIA steps that were followed during this assessment:

Step 1: Screening

Screening of the project was undertaken to evaluate the need of conducting an EIA and the level of study. Transmission lines are listed under schedule 2 of EMCA, 2015 among projects requiring EIA before commencement. In addition, other considerations taken into account during the screening process included advice by local NEMA office, the physical site location, zoning, nature of the immediate neighbourhood, sensitivity of the areas surrounding the site and socio-economic activities in the area, among others.

Step 2: Desk Study

Documentation review was a continuous exercise that involved a study of available documents on the project including the feasibility study, project set-up plans and architect's statement, land ownership documentation, environmental legislation and regulations, County development plans, location maps, etc.

Step 3: Site Assessment

Site assessment was conducted between 13th and 16th July 2017 to establish:

- The general environment and its sensitive receptors found within the environs of the project site.
- Flora, fauna and avifauna found on the site;
- The site landscape
- Surface water bodies within the neighbourhood of the site and;
- Land ownership, usage and conflicts

Step 4: Public Consultation

Detailed stakeholders consultations for this study were undertaken from 13th to 16th and also between 24th and 28th July 2017. These consultations were conducted in the form of:

- Key Informant Interviews and questionnaires
- Open-ended questionnaires and
- Public Barazas,

Step 5: Reporting

The ESIA Study Report was written in accordance with the Environmental (Impact Assessment and Audit) Regulations, 2003.

CHAPTER 2: PROJECT DESCRIPTION

2.1: PROJECT DESCRIPTION

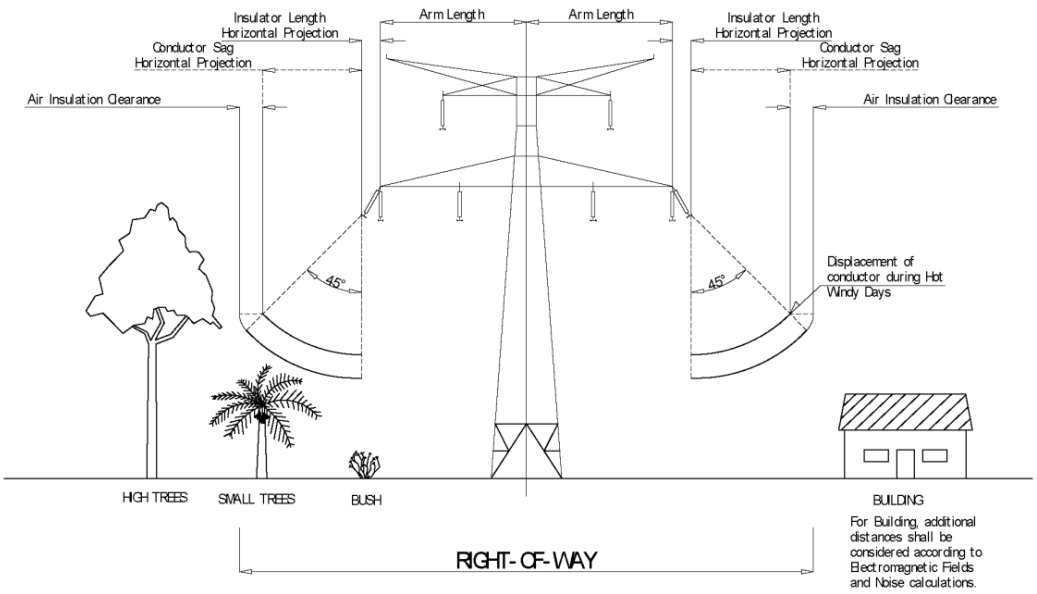
The project will essentially involve the construction of a 132kV double circuit transmission line from Myanga to Ndigwa, through Busia, Rang'ala, and Bondo

Detailed scope of work for the project is as follows:

1. Transmission Line
    a) 132kV Myanga – Busia – Rang'ala – Bondo – Ndigwa Overhead Power Line (123km)
    b) 132kV Tororo/Musanga Tee to the proposed 132kV Substation at Myanga (1km)
2. Substations
    a) 132kV Switching station at Myanga
    b) 2x23 MVA 132/33kV Substation at Busia
    c) Bay Extension of 132kV Rang'ala Substation
    d) 1x23 MVA 132/33kV Substation at Bondo
    e) 1x23 MVA 132/33kV Substation at Ndigwa

2.2: TRANSMISSION LINE DESIGN

2.2.1; Right-of-Way Requirements



A way-leave corridor is a particular width from the centre of the high voltage transmission power line that should be maintained clear so that the safety of lives of people and property is ensured. It is furthermore important to note that the corridor under the high voltage transmission power lines pro-vides for the safety of lives and allows access to routine maintenance work. The width of this corridor is dependent on the reference voltage and should be maintained clear, to ensure safety in the event that a power line conductor snaps. The proposed width for this line being a double circuit, is 40m

2.2.2; Air Space Protection

Where it is likely that the power line is hazardous to aviation and avi-fauna safety because of its height and location, spherical markers will be used to identify overhead wires. The Kenya Civil Aviation Authority (KCAA) regulations, establish standards for determining obstructions in navigable airspace. Issues such as size and height of tower/poles, right-of-way needs, maintenance access, and impacts to the approach zone, clear zone, or safety zone has to be evaluated and approved by KCAA to utilize property near airports and airstrips.

2.2.3; Conductor Clearances

Conductor Vertical Clearances

The following are the minimum vertical clearances to be ensured from the line conductors at maximum sag (inclusive of 0.3m included in sag calculations to accommodate conductor creep) to ground level or objects and crossings as described.

Above terrain in general, including minor roads/tracks	7.0
Above main (paved) roads	8.0
Above secondary (unpaved) roads	8.0
Above railways	8.5
Above steep or swampy ground, inaccessible to vehicles < 3.0m, and above water at max. flood level, except navigable rivers	6.5

Design Factors of Safety

The following design factors are for steel lattice towers and are true for 132 kV lines

Conductors, earthwire and optical fibre earthwire at final maximum working tension based on ultimate nominal breaking load.	3.00
Conductors, earthwire and optical fibre earthwire at still air everyday temperature final tension based on ultimate nominal breaking load	5.00

Tension clamps and mid-span joints based on conductors, earthwire and optical fibre earthwire ultimate nominal breaking load.	0.95
Insulators and Fittings (based on failing load) ▪ under normal working conditions ▪ under broken string conditions	 3.00 3.00
Steel Lattice Towers ▪ Steel towers under normal working conditions ▪ Steel towers under broken wire conditions ▪ Steel towers under maintenance conditions ▪ Cascade Collapse for suspension towers	 2.00 1.50 2.00 1.00
Foundations ▪ Foundations under normal working conditions ▪ Foundations under broken wire conditions ▪ Foundations under maintenance conditions ▪ Factor against overturning/uprooting	 2.50 1.75 2.00 1.20

2.2.4; Tower Layout

Transmission line tower; courtesy of KETRACO staff

Possible Tower Configurations

With regard to line design, there are four (4) different variants, which are technical feasible:

Conventional overhead line (Steel lattice towers with individual foundations)

- Advantages: cost effective design (regarding investment cost); ease of construction (no heavy equipment required).
- Disadvantages: space requirements (easement / permanent land take), visual impact (in urban areas).

Compact overhead line (Self-supported steel lattice towers with monoblock foundations for suspension towers.)

- Advantages: economic design, ease of construction,

- Disadvantages: slightly higher cost for (heavier) suspension towers, access to crane is required.

Tubular steel pylons / Pre-stressed concrete poles.

- Advantages: reduced easement / land take (because of smaller base), visual impact.
- Disadvantages: considerably higher cost than for steel lattice towers, requirements concerning access (temporary land take / destruction) and construction (heavy equipment/ noise).

2.2.5; Tower Type Family Recommendation

Taking into account the cost and space available the best option is to use tower structures of the self-supporting lattice-type galvanized steel frame with square bases, individual concrete foundations per leg, body and leg extensions, cross arms for phase and earth conductors.

Corrosion protection shall be of hot dip galvanization (minimum 610 g/m²).

The towers shall be fitted with anti-climbing devices at 3m from the ground, step-bolts on two diagonally opposite legs starting above the anti-climbing to the top, name plate and phase plates following the specifications of the Client.

Taking into account the possible theft of tower members, the towers shall be fitted with anti-theft bolts from ground level to the anti-climbing device level.

Tower dimensions

Regardless of dimensions such as footprint, member slope, cross-arms attachment to body width, which is the results of the static calculation and experience of the designer, a tower is defined by other typical dimensions listed below:

- phase to phase distance
- phase to earthwire distance in regards of the location of the earthwire to ensure an optimum against lightning strikes
- attachment height to ground of the suspension and tension string
- phase to structure clearance (which has to be followed by the strings as well as the jumpers of the tension towers)

Tower Height

The minimum tower height H is calculated and equals the sum of the following:

- h1 - Minimum permissible ground clearance
- h2 - Maximum sag (at highest conductor temperature)
- h3 - Vertical spacing between conductors
- h4 - Vertical clearance between ground wire and top conductor

H = h1 + h2 + h3 + h4

2.2.6; Definition of Spans

Each type of tower is characterized by a set of spans called "Typical spans" whose values are involved not only in the calculation of distances between phases, distance to ground, height above ground, but also in the calculation of forces acting on the structures (weight, wind load, etc.).

Those typical spans are:

The basic span is the most economical horizontal distance between two consecutive towers. It is the basis for determining the height of attachment above the ground conductor of the lowest points. It therefore affects mostly the normal height of the tower.

The maximum span is the maximum horizontal distance that can separate two towers. It is the basis for determining the characteristic dimensions of the tower cross-arms and mainly distances between conductor and earthwire

The wind span is mainly used to determine the horizontal force acting on the tower structure. For anchoring supports, wind range is the distance over which the wind is expected to act perpendicularly to the cable. It is equal to the arithmetic mean of adjacent spans of a support.

The weight span is the horizontal distance between the points where the tangent to the parabola is the horizontal distance between the points where the tangents to the curve of the two adjacent spans are horizontal.

2.2.7; Selection of Conductors

The phase conductors used by KETRACO are all of ACSR type, namely with Code Names LYNX, CONDOR and HAWK. Within the project we will try to us as far as possible the same conductor types:

Voltage Level	Phase Conductor Type ACSR
132 kV	1 x LYNX
400 kV	3 x CONDOR

2.2.8; Selection of Shield Wires

Conventional Earth Wire – Type ACS

The earth wire fulfils two functions:

- Shielding the phase conductors from direct lightning strikes
- Reliable high capacity communication channel by using OPGW (Optical Ground Wire).

Because earth wires are usually required to have less sag than the phase conductors, they are normally either ACS or steel construction.

Standard earth conductors used in most of the lines are aluminium-clad steel conductors. They are standardised according to IEC 61089, EN 50182, Table F21 or ASTM B416. The standard earth wire is type ACS at KETRACO.

2.2.9; OPGW Shield Wire

Fibre optic cable links are today the foundation of communications systems, since they have the advantage of large capacity, high speed, and long distance transmission. At the same time they are not influenced by electromagnetic fields and do not show any cross-talk, which is very important for installations on high voltage (HV) lines.

The most common method for this is to install an **OP**tical **G**round **W**ire (**OPGW**), which contains optical fibres, as a substitution of an existing ground wire.

The main characteristics of an OPGW are:

- the mechanical strength, which is mainly determined by the amount of steel;
- the short time current capacity, which is mainly determined by the amount of aluminium (alloy); and
- the number of optical fibers.

The fibres OPGW shall follow the following specifications and recommendations:

Optical fibre:	CCITT (recently ITU-T) recommendation, IEEE 1138, Annexure A for short circuit tests
IEC 60794	Optical Fibre Cables

IEC 61395	Creep test for stranded conductors
EN 187 000	Optical Fibre Cables (Generic specification)
EN 187 100	Optical Telecommunication Cables (Sectional specification)
EN 187 200	Sectional Specification: Optical Cables to be used along Electrical Power Lines (OCEPL)
EN 187 201	Family specification OPGW
EN 187 204	Family specification OPPC
EN 188 000	Optical Fibres (Generic specification)
IEC 60104	Aluminium-magnesium-silicon Alloy Wire for Overhead Line Conductors
IEC 60304	Fibres and binders colours
IEC 60865-1	Short-circuit Currents - Calculation of Effects.
IEC 60889	Hard Drawn Aluminium Wire for Overhead Line Conductors
IEC 60949	Calculation of Thermally Permissible Short-circuit Currents, taking into Account Non-adiabatic Heating Effects.
IEC 61089	Round Wire Concentric Lay Overhead Electrical Stranded Conductors.
IEC 61232	Aluminium-clad Steel Wires for Electrical Purposes
IEC 61597	Overhead Electrical Conductors – Calculation Methods for Stranded Bare Conductors
ITU G.652	Characteristics of a Single-mode Optical fibre

2.2.10; Foundation Design

The foundations shall be of pad and chimney concrete reinforced type. Piles may be employed in bad and buoyant terrain (lake and river crossing). The foundations capacity shall be determined in regards of a soil investigation.

The safety factors shall be as per “Design Factors of Safety”:

- 2.50 in regards of the yield strength of the steel for normal load cases
- 1.25 in regards of the yield strength for exceptional load cases

For the purposes of classification, foundation type selection, the basically soils to be found in the project area have been divided into the groups as per following table.

Soil Type	Soil Conditions
S1	Rock such as granite (with different levels of different minerals included), lightly weathered
S2	Very good soil such as hard clay, dense sand, very weathered rock
S3	Good/Normal soil such as medium-dense or loose soils, such as firm clay and medium sands
S4	Poor soft soil / backfill material
S5	Very poor soil such as waterlogged soils, swamps, soils below water table for a significant period of the year

2.2.11; Tower Footing Resistance

Lightning strikes to towers lead to an increase of the tower's potential, which is essentially determined by the tower footing resistance. If this potential exceeds the electric strength of the insulators, back-ward flashovers occur across the insulators, which, especially when they occur in the direct vicinity of the switchgear, can cause high over-voltage and over-voltage with high rates of change. Here, linking the last towers to the switch gear earthing system as a remedial measure is a suitable method if significantly reducing the tower footing resistance and of preventing backward flashovers across the insulators of these towers. For economic reasons however, this measure is generally restricted to portal and first tower seen from the substation.

Earthing of tower structure shall be made as required by soil conditions and the value of earth resistance at each tower location. One or more ground rods per tower shall be installed depending on the requirements. The design is dependent of the soil resistivity to be performed during the survey by the Contractor.

KETRACO's values for the nominal footing resistance of steel lattice towers are:

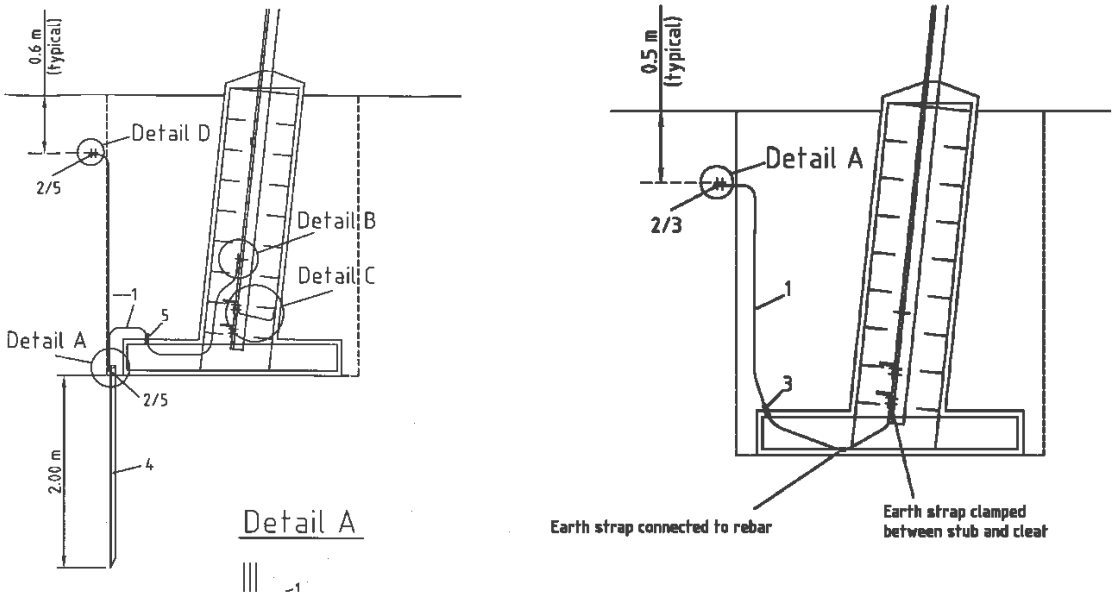
Voltage (kV)	Footing Resistance Ω
132	10
225	10
275	10
400	10

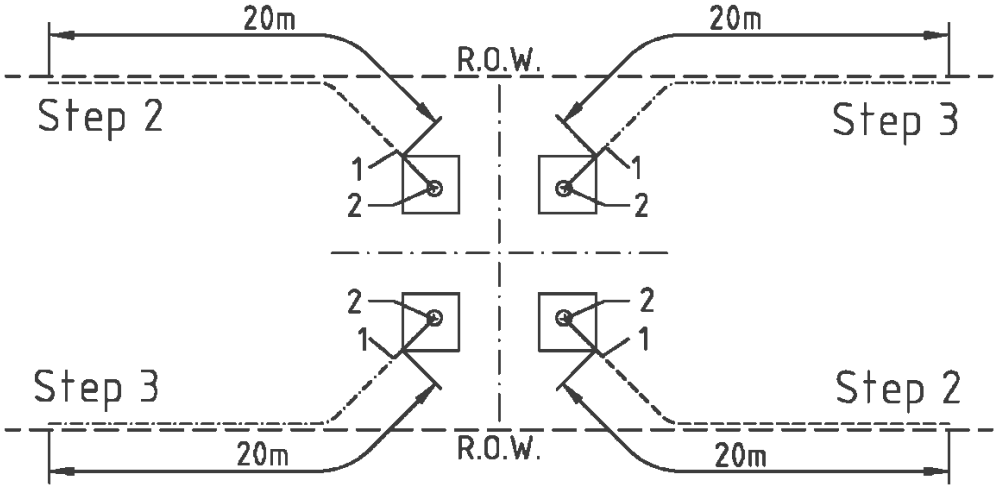
It is propose the use of ground rods of a 35 x 35 x 4 mm diameter cruciform and 3.0 metre long steel rods. Ground rods shall be hot-dip galvanised. The ground rods shall be buried or driven at the base of the tower leg

foundation. In order to avoid vandalism of the earthing material it is propose to connect the foundation steel and tower leg to the earth conductors beneath the soil surface; this is a proven practice at ESKOM South Africa.

Where the measured tower footing resistance is greater than the required value, earth improvements shall be made by additional ground rods or earthing counterpoise cable connected to each tower leg. Earthing cables (counterpoise) shall be of galvanised steel wire with 11.5mm diameter.

The terminal towers shall be connected to the substation earthing grid.





2.2.12; Other Accessories

The following equipment must be included:

- Tower number plates, phase plates, warning plates;
- Anti-climbing devices;
- Spacers for bundled conductors;
- Anti-theft protection bolts.

2.3: SUBSTATION DESIGN

2.3.1; Introduction

Suswa substation; courtesy of KETRACO staff

The design of the substations will consider:

- the most economical means of achieving the full development requirements;
- the stage-by-stage developments of the substations. In some cases, this may involve preferred build of full diameters, co-ordinating the full diameter built with the demand forecast and generation expansion plan;
- any reactive compensation requirements;
- the future inclusion of distribution level substations;
- the co-ordination of overhead line entries, avoiding circuit cross-overs where possible;

- the required insulation withstand level of external insulation for substations to be constructed at altitudes greater than 1000 m above sea level.

The proposed substation layouts shall take into account the results of the system analysis, technical and economic aspects as well as standards of KETRACO in regard to equipment and operation.

The new substations shall be designed as conventional outdoor air insulated 132kV and with a substation control building housing 33kV switchboard, control and protection, communication and auxiliary equipment.

Space for additional bays shall be considered as well. For substation to be extended such as Rangala the availability of space will be checked in a site visit to the concerned sites. The results will be considered in the design report.

The layout shall consider the incoming overhead lines, easy access to the equipment and extension possibilities. The control building shall be located in a way to have clear view on the outdoor equipment and the access to the area. The whole substation area shall be fenced.

The substations configuration will be of the single busbar, double busbar system or breaker and a half. For single busbar substations space for future upgrade to double busbar shall be foreseen.

The standard layout used and recommended by KETRACO is:

Voltage	**Type**	
400 kV	Air insulated outdoor	Breaker and a half
220 kV	Air insulated outdoor	Breaker and a half
132 kV	Air insulated outdoor	Single Busbar, single breaker Double Busbar, single breaker
33 kV	Indoor	Single bus

For the 132kV voltage level, it is recommended to use single and double busbar types.

2.3.2; Space Requirements

KETRACO'S guidelines in minimum substation land sizes are as follows.

Voltage	Type	Space [acres]	Space [m²]
132 kV	Air insulated outdoor	5	20.234
220 kV	Air insulated outdoor	10	40.468
400 kV	Air insulated outdoor	50	202.340

Common Requirements for Substations

2.3.3; Power Transformers

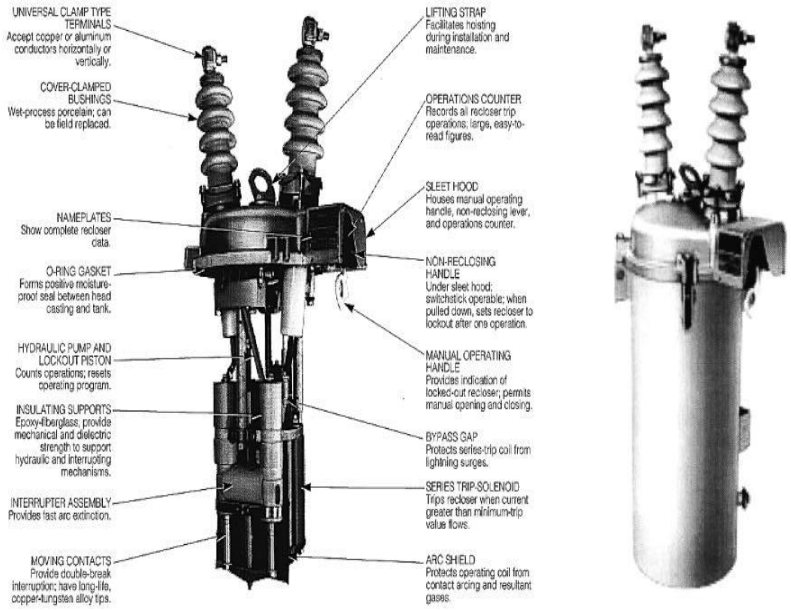
Power transformer; courtesy of KETRACO staff

The transformers shall be of the conservator type, fitted with external coolers and an on-load tap and shall comply with IEC 60076.

Note that the average maximum ambient temperature in any one day is 30 ºC. The maximum temperature rise shall therefore not exceed 55 K of the top oil and 60 K of the winding above the maximum ambient temperature of 40 ºC.

For temperature correction due to attitude reference is made to IEC 60076 which limits the temperature rise further when tested at the operation altitude.

2.3.4; Circuit Breakers



Typical Single-Phase Hydraulically Controlled Oil Circuit Breaker. Courtesy of Cooper Power Systems

The circuit breakers shall comply with IEC 60056.

The circuit breakers shall be of single-pressure, sulphur hexafluoride (SF6) type with self-contained power-operated spring-charged operating mechanism.

- three-pole outdoor type, for the 132kV transformer breakers;
- single phase tripping and reclosing for all line breakers ≥ 132kV.

Each pole of the breaker shall have a mechanical position indicator. The device shall be labelled "ON" and "OFF" and these shall be clearly visible.

The circuit breakers shall be suitable for, single-pole high-speed auto reclosing. The rated operating duty shall be as follows:

- 0-t-CO-t'-CO t - 0.3 sec t' - 3 min
- CO.-.t2-CO t2-15 sec

Three Pole type breakers may have one operating mechanism common to all three poles while single pole type breakers shall have independent operating mechanism per pole.

The control voltage for closing and opening commands and for the operating mechanism motor(s) shall be:

- 110Vdc + 10% - 20%, unearthed, from battery

A "Local/Remote" selector switch and a set of open/close push buttons shall be provided on the control cabinet of the circuit breaker to permit its operation through local or remote push buttons. In the case of a complete failure of the operating mechanism all switches shall be operable manually by means of a lever or crank or another feature.

The circuit breaker shall be supplied with steel supporting structure.

2.3.5; Isolators and Earth Switches

The isolators and accessories shall conform in general to IEC 62271-102

Isolators shall be motorized outdoor off-load type. The operating mechanism for the isolating switches shall be provided for local and remote electrical operation. The earthing switches shall be only manually operated. The auxiliary voltage for the operation of the closing and opening devices shall be 110Vdc, + 10% - 20. Operating motors shall be provided for 240/415Vac 50 Hz or 110Vdc operation.

A "Local/Remote" selector switch and a set of open/close push buttons shall be provided on the control cabinet of the isolator to permit its operation through local or remote push buttons. In the case of a complete failure of the operating mechanism all switches shall be operable manually by means of a lever or crank or another feature. Isolators shall have mechanical interlocking to the associated earth switches.

All disconnecting and earthing devices within the substation shall be interlocked in a manner that ensures that they always operate safely. The system employed shall satisfy two distinct categories:

Operational interlocking. Interlocking associated with normal system operation and switching and intended to ensure that unsafe switching actions are prevented. Such interlocking shall be achieved by electrical means in a manner that permits the equipment to perform any safe operation. Contacts used for interlocking shall be directly driven auxiliary contacts of the main device.

Maintenance interlocking. Interlocking associated with a series of switching operations whose purpose is to render the equipment or sections of the substation safe for access and maintenance by personnel. Such interlocking shall be achieved by mechanical key type interlocks.

2.3.6; Surge Arresters

The lightning arresters shall be of the metal oxide gapless type, complying with IEC 60099-4. Arresters shall be of hermetically sealed units, self-supporting construction, suitable for mounting on tubular.

The surge arresters shall be of heavy-duty station class 3 and gapless type without any series or shunt gaps.

The surge arresters shall be capable of discharging over-voltages occurring during switching of unloaded transformers, reactors and long lines.

132kV class arresters shall be capable for discharging energy equivalent to class 3 of IEC on two successive operations. Surge counters shall be supplied for each single phase arrester.

2.3.7; Tariff Metering

The meters shall conform fully to IEC 60687 for class 0.2s Energy Meters and any other relevant specifications. The class and accuracy of the meters shall be coordinated with the CT and VT tariff metering cores.

The meters shall be programmable and relevant software and connection cable to laptop shall be provided. Meters complying with IEC 61334-4-4-1(DLMS Standard protocol) shall be required. The meters shall have memory and be capable of storage of at least 12 months load profile and other data e.g. freezed Monthly readings.

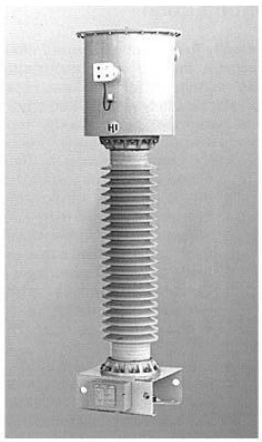
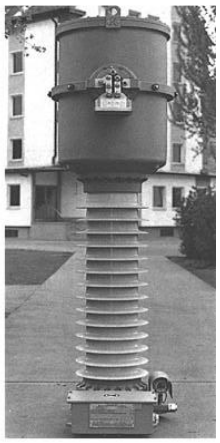
The meters shall be capable of bi-directional metering so as to record faithfully, both export and import quantities. The accuracy shall be as per IEC 60687 in both directions.

2.3.8; Measuring Transformers

The output of the measuring transformers for measuring and protection purposes shall be determined according to the technical requirements, but shall not be less than 125% of the overall computed (design) burden of the connected apparatus and conductors. However, the transformer shall not be loaded less than 60 % of rated burden.

- Power frequency test voltage on secondary windings, 1 min. 2,5 kV
- Overvoltage inter-turn test, 1 min. 3.5 kV

Current Transformers

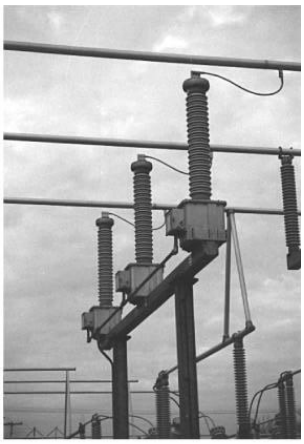
High-Voltage Current Transformers. Courtesy of Haefely Trench, Scarborough, Ontario, Canada

The characteristics of the current transformers shall comply with the provisions stipulated in IEC 61869 (replacing IEC 60044).

The current transformers shall be designed to carry continuously a current of 120% of the primary rated current. Rated output shall be chosen from preferred standard values in such a manner that secondary burden is between 25% and 100% of the rated burden.

Voltage Transformers





Capacitor Voltage Transformers With and Without Wave Trap. Courtesy of Haefely Trench, Scarborough, Ontario, Canada.

The characteristics of the voltage transformers shall comply with the provisions stipulated in IEC 60044 and IEC 61869 (and IEC 60358 for capacitive voltage transformers).

2.3.9; Earthing

The substation earthing system shall be designed principally according to IEEE 80 – 2000 and IEEE 2012 Guide to Safety in AC Substation Grounding.

The earthing system shall consist of the earth electrode system in the ground under the switchyard, and of the earthing conductors, over-ground, around fences and in the buildings.

2.3: TRANSMISSION LINE ROUTE

The route of traverse and proposed substation sites are roughly defined by coordinates as follows;-

MYANGA – BUSIA – RANG'ALA – BONDO - NDIGWA TRANSMISSION LINE COORDINATES

Datum: (Arc 1960 Zone 36N)		
PID	**Easting(m)**	**Northing(m)**
0	647975.6269	17464.1912
1	648025.6432	17532.23111
2	648052.1013	17531.44142
3	648130.1492	17404.44578
4	648137.9766	17373.36316
5	648049.0192	17392.05673
6	648040.8516	17409.39567
7	648028.4392	17428.10258
8	648137.9766	17373.36316
9	648130.1492	17404.44578
10	648078.6518	17488.23978
11	648182.4497	17491.94959
12	648213.1414	17369.18268

Myanga Substation Datum: (Arc 1960 Zone 36N)		
E	**N**	**PID**
653666.65	61374.08	1
653485.73	61441.44	2
653559.30	61553.05	3
653733.92	61496.16	4

Busia Substation Datum: (Arc 1960 Zone 36N)		
Easting(m)	**Northing (m)**	**PID**
629019.0937	50625.38942	1
628926.6763	50780.31273	2
629021.0898	50837.28479	3
629103.7722	50681.84177	4

Bondo Substation Datum: (Arc 1960 Zone 36S)		
PID	**Easting (m)**	**Northing(m)**
1	644882.6425	9989941.037
2	644914.3926	9990185.513
3	645142.993	9990171.225
4	645112.8305	9989950.562

Ndigwa Substation Datum: (Arc 1960 Zone 36S)		
PID	**Easting (m)**	**Northing(m)**
1	647252.3217	9963625.151
2	647130.6132	9963671.453
3	647196.7591	9963806.391
4	647325.0823	9963749.506

Busia – Rangala section of the transmission line		
Description	**Easting**	**Northing**
T-OFF	34° 9'43.25"	0°27'24.14"
AT1	34° 9'41.28"	0°24'32.11"
AT2	34°11'13.92"	0°20'45.12"
AT3	34°14'50.94"	0°15'25.16"
AT4	34°19'0.05"	0°11'23.75"
AT5	34°19'58.78"	0° 9'42.84"
SSTN	34°19'53.46"	0° 9'20.12"

2.4: PROJECT JUSTIFICATION

Currently electricity is accessible to less than 20% of the total population and approximately 5% of rural population. The government's goal is to accelerate access rate to 40% of rural population by 2040.To achieve this, the government has prepared the Energy Scale up program covering the period 2008 to 2017.This would be approached from among others, improvement and expansions of the system networks. This project will contribute in the expansion of the transmission network.

2.5: PROJECT BUDGET

The estimated cost of the project is approximately US Dollars twenty one million, ninety eight thousand and eighty three (US$ 21,098,083)

2.6: TARGET GROUP FOR THE ESIA REPORT

The ESIA Report has been prepared for use by different stakeholders to be involved in the construction, operation, and decommissioning of the proposed project. The report contains useful information on policies and procedures to be adhered to, implementation modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of project activities. The information will be useful in planning, implementation, management and maintenance of the transmission line project.

In this regard, the report is useful to the following stakeholders:

- Funding agencies and donors;
- Relevant government ministries and agencies for policy implementation;
- Affected and Interested persons;
- Planners and Engineers to be involved in preparation of designs and plans for the project;
- Contractors to be engaged in the project;

- People to be involved in the management and operation of the project.

2.7: ANALYSIS FOR ALTERNATIVES

One of the functions of the Environmental and Social Impact assessment process is to describe and evaluate various alternatives to the proposed project. Alternatives examined during the study are discussed below;

2.7.1; The "Do Nothing" Option

For this project, the no-development option would mean the proposed project will not be implemented. The implications of this would be no additional reliability and security of electricity supply to Siaya, Busia and Bungoma Counties and the surrounding regions. Given that the level of impacts associated with the project are low and that there is high probability of mitigation of these negative impacts, the "no-go" option would not be the most viable option in this instance.

2.7.2; Demand-side Management Option

Demand Side Management (DSM) is a function carried out by the electricity supply utility aimed at encouraging a reduction in the amount of electricity used at peak times. This is achieved by influencing customer usage to improve efficiency and reduce overall demand. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity. By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. One of the basic tools is the price differentiation (such as time-of-use tariffs) between peak demand time and low demand time. This option is practiced to a certain extent, but is currently not considered feasible for managing the level of growth forecast for Siaya, Busia, and Bungoma Counties.

2.7.3; Line Routing Alternatives

The transmission line will affect 3no. schools and a community center consisting of a hospital, a special school, and an Administration Police camp (Appendix II). It is strongly advised that, the proponent reroute the line to avoid these utilities. Introduction of angle points (with small angles of less than 45 degrees) just before the utilities will remedy the situation.

2.7.4; Alternative Processes and Materials

Highly refined mineral insulating oils are used to cool transformers and provide electrical insulation between live components. Sulfur hexafluoride (SF_6) may also be used as a gas insulator for electrical switching equipment and in cables, tubular transmission lines and transformers. Polychlorinated Biphenyls (PCB) can be used as a dielectric fluid to provide electrical insulation. SF_6 is a greenhouse gas with a significantly higher Global Warming Potential (GWP) than carbon-dioxide. PCB is a highly toxic substance that is no longer

commonly used for electrical insulation. For this project the proponent is advised to use mineral insulating oil for cooling and insulation and to minimize or completely stop the use of SF_6 and PCB.

CHAPTER 3: ENVIRONMENTAL SET-UP OF THE PROPOSED AREA

3.1: BACKGROUND

Siaya County

Siaya County is one of the six counties in the Nyanza region. The land surface area of Siaya County is 2,530km² and the water surface area is 1,005 km^2. It is bordered by Busia County to the North West, Vihiga and Kakamega counties to the North East, Kisumu County to the South East and Homa Bay County across the Winam Gulf to the South. The water surface area forms part of Lake Victoria (the third largest fresh water lake in the world). It approximately lies between latitude 0º 26´ South to 0º 18´ North and longitude 33º 58´ and 34º 33´ East.

Busia County

Busia is one of the forty seven (47) counties of Kenya and it is situated at the extreme western region of the country. The County borders three other counties which include: Bungoma to the north, Kakamega to the east and Siaya to the south west. Part of Lake Victoria is in the County on the South East and borders the Lake with the Republic of Uganda to the west. It lies between latitude 0º and 0º 45 north and longitude 34º 25 east.

Bungoma County

The County lies between latitude 0^0 28' and latitude 1^0 30' North of the Equator, and longitude 34^0 20' East and 35^0 15' East of the Greenwich Meridian. The County covers an area of 3032.4 Km^2. It boarders the republic of Uganda to the North west, Trans-Nzoia County to the North-East, Kakamega County to the East and South East, and Busia County to the West and South West.

3.2: PHYSIOGRAPHIC AND NATURAL CONDITIONS

3.2.1; Population

Siaya County

The total population of Siaya County as at 2012 was estimated to be 885,762 persons (KNBS 2012 Population projections) comprising of 419,227 males and 466,535 female. The county has an annual population growth rate of 1.7 per cent and is projected to increase to 964,390 persons in 2017(456,441 males and 507,949 female).

Busia County

The 2012 population of Busia was estimated to be 816,452 with females numbering 425,622 (53.13%) and the males 390,830 (47.87%) respectively. By the year 2017, the population is estimated to have grown to a total of 953,337 (456,356 males and 496,981 females). Out of the estimated total population in 2012, a total of 144,616 (17.71%) people were below the age of five years while in 2017 the number is expected to be 168, 862.

Bungoma County

The 2013 projected population for Bungoma County based on the growth rate of 3.1% is 1,557,236 (Male 760,564 Female 796,672). The projections for 2015 give the County a population of 1,655,281 (Male 808,449, Female 846,832) and by 2017 the population is projected to be 1,759,499 (Male 859,350 and Female 900,149). The Male to Female ratio is 1: 1.2. The County has a growing population with varying demographics, which include fertility, mortality, birth rates, migrations, immigrations among others.

3.2.2; Climate and Rainfall

Siaya County

The County experiences a bi-modal rainfall, with long rains falling between March and June and short rains between September and December. The relief and the altitude influence its distribution and amount. Siaya County is drier in the western part towards Bondo and Rarieda Sub-Counties and is wetter towards the higher altitudes in the eastern part particularly Gem, Ugunja and Ugenya Sub-Counties. On the highlands, the rainfall ranges between 800mm – 2,000mm while lower areas receive rainfall ranging between 800 – 1,600mm.

Temperatures vary with altitude rising from 21° C in the North East to about 22.50° C along the shores of Lake Victoria while in the South, it ranges from mean minimum temperature of 16.3° C and mean maximum temperature of 29.1° C. Humidity is relatively high with mean evaporation being between 1,800mm to 2,200mm per annum within the County. The relative humidity ranges between 73 per cent in the morning and 52 per cent in the afternoon. Climate variations are evident in all these areas due to human activity distorting some of the statistics above.

Busia County

Busia County receives an annual rainfall of between 760mm and 2000 mm. 50 per cent of the rainfall falls in the long rain season which is at its peak between late March and late May, while 25 per cent falls during the short rains between August and October. The dry season with scattered rains falls from December to February.

The temperatures for the whole county are more or less homogeneous. The annual mean maximum temperatures range between 26°C and 30°C while the mean minimum temperature range between 14°C and 22 °C.

Bungoma County

The County experiences two rainy seasons, the long-March to July and short rains-August to October. The annual rainfall in the County ranges from 400mm (lowest) to 1,800mm (highest).

The annual temperature in the County vary between 0°c and 32°c due to different levels of attitude, with the highest peak of Mt. Elgon recording slightly less than 0°c. The average wind speed is 6.1 km/hr.

3.2.3; Ecological Conditions

Siaya County

Ecologically, the County spreads across agro-ecological zones LM1 to LM 5. According to the Kenya Soil Survey and Integrated Regional Development plan for the Lake Basin Development Authority, the lower part of the County and especially the shores of Lake Victoria can be categorized into semi-humid, semi-dry Lower Midland zones (LM4 and LM5).These zones cover the whole of Uyoma in Rarieda Sub-County and Yimbo in Bondo Sub-County. The lower central parts of the County, covering the whole of Sakwa and Asembo in Bondo and Rarieda Sub-Counties respectively and the lower parts of Boro Division are classified as the midland zone LM3. The northern part of the County comprising Gem, Ugunja and Ugenya Sub-counties and the upper parts of Boro Division in Siaya Sub-County are classified as the low-midland zones (LM2 and LM3).These are sub-humid and humid zones with reliable precipitation. There are also pockets of upper midland zones (about 30sq.kms) in Yala Division, Gem Sub-County with a high potential for agricultural activity.

Busia County

Whereas most parts of Busia County have sandy loam soils, dark clay soils cover the northern and central parts of the County. Other soil types are sandy clays and clays.

To the extreme northern part of the county, the land formation and structure makes it suitable for both food and cash crops like tobacco and cotton. The lower northern part covering parts of Nambale, Butula and Amukura in Teso South are suitable for maize, robusta coffee and sugar cane cultivation.

The central and southern parts of the County are suitable for maize, cotton and horticultural crops. Apart from the lower parts of Funyula Sub-county and Bunyala to the south which require irrigation, large areas of

Budalang'i Sub-County towards the lower reaches of Rivers Nzoia and Yala require drainage; most parts of the County have high potential for agriculture and promises of faster growth.

Bungoma County

The County is within the Lake Victoria Basin, rising from 1200 metres in the west and southwest to over 4,000 metres to the North of Mt. Elgon. Apart from Mt. Elgon region, the rest of the County is underlain by granite, which forms the basement system. Mt Elgon forest ecosystems support life systems through the hydrological cycle and Plant production through the pollination process. The forested areas also provide soil nutrients through the decomposition of biomass, consequently supporting both soil and terrestrial species.

3.2.4; Forestry

Siaya County

Siaya County has only hill top forests with varied indigenous tree species while some parts are enriched with exotic species such as eucalyptus species, *Callitris robusta, Grivellea robusta, Cupressuss lusitanica*, *Pines species, Cassia species, Tarminilia species* and *Jacaranda mimisifilia* among others. Most of the hills are under County Government as trust lands and they include; Regea hill, Akara hill, Got Osir, Mbaga, Ramogi and Odiado among others.

Busia County

Busia County has a natural forest covering the hills of Samia and Budalang'i while other parts of the county have on farm woodlots that have been integrated with agricultural farming. Busia County has two gazetted replanted forests mainly located in Budalang'i sub-county totaling to only 528.8 Ha. The un-gazetted forest is not mapped since they are on individual holdings.

Bungoma County

The County has one gazetted forest reserve in Mt Elgon covering an area of 618.2 km^2. Other small scale forests and woodlands are owned by individuals and institutions such as Webuye Pan Paper Mills. However, the County has several hill tops and high grounds such as Sang'alo, Chetambe, Kabuchai etc. which can be put under forests. These sites should be gazetted and protected to facilitate afforestation programmes.

3.2.5; Wildlife

Siaya County

The varieties of wild life found in the County include hippopotamus (Lake Victoria, River Yala), crocodiles (Yala Swamp, parts of the Lake Victoria), Sitatunga (Yala Swamp) and monkeys and leopards. The County has several species of fish, but the most popular ones are Nile perch, *Rastrineobola argentea* (Locally known as

Omena) , *Hatlochromines* (locally known as Fulu or Wiu) and Nile Tilapia. The first species have a very high commercial value and is responsible for the economic break through which has been experienced along the shore of Lake Victoria. Others are bushpig (mainly in Yala Swamp), Hyenas (Got Abiero, Utonga), various species of snakes e.g. pythons, cobras and various species of birds.

Busia County

Main types of wild life found in the County include hippopotamuses, wild pigs and velvet monkeys found in pockets of the county, mainly around the lake shores. These are among the endangered animal species and therefore require protection.

3.2.6; Water Resources

Siaya County

The county has to major rivers namely: River Yala and River Nzoia. These two rivers, which form the county's drainage systems of major river basins with numerous tributaries, drain directly into Lake Victoria. The seven major tributaries (small rivers) are Huro, Akala North, Nyamonye, Woroya, Dande and Seme Awach which have a combined discharge rate of 7.42m^3/sec. They are potentially important sources of water needed for both farming and domestic use.

There are several swamps, wetlands, dams and pans. The major lakes in the County are: Lake Victoria, Kanyaboli, and Lake Sare. Ground waters are found in Nyanzan rock aquifer system and Kavirondian rock aquifer system. Generally, the County has good potential of ground water. The potential however, diminishes as one approaches the lake. There are also several springs and shallow wells. There are several sampling points for ground and surface water done on quarterly basis for water analysis to determine the quality.

Surface water resources are the rivers, streams, lakes while underground waters are those waters found underground and drawn through bore holes and shallow wells. There is abundant surface water available in the County but underground water potential is generally scarce and more so pronounced in Bondo and some parts of Siaya.

The quality of the available water resource is affected by human activities along the water courses which pollutes the water. Pollution is evidenced by the presence of high turbidity in the water sources resulting in very high cost of treatment.

The northern parts of the county, especially in Ugenya and Ugunja Sub-Counties, have abundant subsurface water resources. This is evidenced by the occurrence of underground water at shallow levels of less than 15m deep.

Although the central part of the County has exhibited greater potential of underground water, the occurrence tends to be at a slightly deeper level of between 15m and 25m. Exploitation of underground water on the southern parts of the County, especially along the shores of Lake Victoria, has fewer prospects. Underground water in parts of the county is found at over 25m deep, and is saline.

Run-off water can also be collected in small surface dams and earth pans. This alternative is particularly suitable for drier parts of the County in Uyoma, Sakwa and Usonga which have several suitable sites for small dams. In Rarieda, water pans have been done to help boost the water volume in the sub county. Surface water in the County should be used for human consumption only after treatment due to wide spread environmental contamination from both man and livestock.

Busia County

The water resources in the County include rivers, streams, dams, pans, wells, springs, roof catchment and scattered boreholes. The County has several rivers criss-crossing it and large water mass of Lake Victoria which borders Budalang'i and Funyula Sub-counties. Malaba and Malakisi rivers, whose source is Mt. Elgon traverses the county through the Teso Sub-counties, while the Sio River traverses Nambale and Funyula. River Nzoia originates from Trans Nzoia County through Bungoma County and empties itself into Lake Victoria. There are 237 springs, 458 shallow wells and 154 boreholes.

The quality of water from rivers, streams, water vendors and unprotected springs is poor due to environmental degradation and pollution. To ensure sustainable utilization of water resources and uphold quality standards, the County needs a water resource Master Plan to strengthen the management of water institutions so as to enhance citizen participation and social accountability of water service providers. The use of Public Private Partnerships (PPPs) approach is essential in attracting capital for water and sanitation investments.

Bungoma County

The water resources in the County include rivers, streams, dams, pans, wells, springs, roof catchment and scattered boreholes. The quality of water from rivers, streams, water vendors and unprotected springs is poor due to environmental degradation and pollution. However, water sourced from protected springs, covered

boreholes and wells is safe from contamination. Most households source their water from springs and apply domestic treatment mechanisms using chemicals such as water guard and purifying devices such as life straw.

The average distance to the nearest water source is 1.5 km in rural areas while in urban areas it is 0.5 km. Most households in rural areas depend on individual piped, roof catchment and communal water points such as boreholes, springs and wells. In some areas, schools with water sources also serve the neighboring communities.

3.2.7; Energy Access

Siaya County

The main sources of lighting in the County include: tin lamps, lantern, electricity, pressure lamps, gas lamps, wood fuel and solar. The main sources of cooking fuel used in the households include firewood constituting 82.5 per cent, charcoal at 13.6 per cent while 1.3 per cent of the households use paraffin. These indicate that the demand for wood fuel is high and continues to rise. This has negatively impacted on the forest cover within the County and there is urgent need for up scaling agro-forestry programmes and also encouraging households to use energy conserving jikos and alternative energy sources especially solar energy.

Busia County

According to the 2009 Population and Housing Census, firewood remains the main source of energy with 97.85 per cent of the households relying on it for cooking and heating. On the other hand, 1.9 per cent of the households use kerosene while 0.45 per cent uses Liquid Petroleum Gas(LPG). The majority of the population (89.55 per cent) in the County rely on kerosene as the main source of lighting and 3 per cent use electricity. Electricity is mainly used in the urban centres.

Bungoma County

According to the 2009 Population and Housing census, the main sources of energy in the County include: firewood (93.4%), charcoal (4.7%) and biomass residue (3.5%). the main sources of lighting fuel include: paraffin (96.65%), firewood (3.8%), and dry cells (2.3%). Electricity connectivity stands at a mere 1.5%. Efforts to increase the connectivity are ongoing through matching up facilities between Constituencies Development Fund and Rural Electrification Authority (REA). There is potential for wind energy, solar and hydro power plants along Kuywa and Nzoia rivers.

3.2.8; Land Use

Siaya County

Land in Siaya County is categorised based on the Constitution of Kenya 2010 as follows: private land, public land and community land.

Private land, which forms most of the land in the county, is the category of land owned by private individuals. The rights and interests of this category of land have been fully ascertained through the process of land adjudication and therefore relatively easy to acquire for investment purposes. There however still exist sections whose rights and interest have not been determined and the county government needs to intervene to have the process finalised.

Approximately 2059 square kilometres of land is arable and a major form of land use is peasantry agriculture. Only small potion Siaya town has been set aside for industrial use. There is need to demarcate more land for industrial use in major urban centres in the county.

Most of the lands in the rural areas are under general boundaries prone to a lot of boundary disputes, while in Urban centers there are fixed surveys which are free from disputes. The first category requires that this general surveys be geo-referenced to reduce the number of disputes arising from the boundaries.

Mean holding size, land suitability, use, availability, agro ecological zones

The average farm size in the County varies from sub-County to sub-County, for instance the average farm size for small scale farmers in Bondo sub-County is approximately 3.0 Ha while in Siaya sub-County is 1.02 Ha. The average farm size for large scale farm stands at approximately 7.0 ha.

Due to high cost of processing land transactions and succession charges, there are a lot of informal land subdivisions in the County.

Percentage of land with title deeds

As at 2012, 259,124 farmers had been issued with title deeds. Most of these titles however, bear names of the forefathers while the current occupiers of the land are third generation owners with no titles.

This means that there are limited collateral for securing loans to undertake different kind of business, hence reducing the possibility of micro-investments within the County and the region at large. During the plan period, efforts are expected to be made to formalize land ownership

Busia County

The Constitution of Kenya 2010 provides that land in Kenya shall be held, used and managed in a manner that is equitable, efficient, productive and sustainable. It categorizes land as public, community, or private depending on who has the ultimate power or authority over its access, use or utilization, ownership and control.

In Kenya, and Busia County in particular, land is a fixed resource with an ever increasing demand. County land uses include: Agriculture, forestry, mining, construction of human settlements, business, social and public amenities. Land is also used as collateral to obtain credit as well as for aesthetic purposes. Spatial Planning should be emphasized to enable sustainable utilization of land and air spaces.

Mean holding size, land suitability, use, availability, agro ecological zones

The average land holding size in Busia County is 2.34 Hectares. This is characterized with the minimum small holder owning less than 0.4 Hectares, while the average large scale holder owns 6 Hectares of land. Large land holders are found in Teso North and Teso South Sub-counties while small holders are concentrated around Matayos Sub-county. This implies that there is uneven land holding and increasing fragmentation through sub-division and selling. These call for a change of cultural value system and attitudes towards land use. There is need to control fragmentation of land and also enforce the regulations on agrarian zones within the framework of County and National Land Policy.

Percentage of land with title deeds

According to Kenya Integrated Household Budget Survey(KIBHS) 2005/07, only 31.35% of land parcels in the County have title deeds whereas 68.65% of households reside on ancestral lands with no official documents of ownership. There is need for proper land adjudication and demarcation of public, private and community land within the existing legal framework.

Bungoma County

Land is a natural resource which is fixed in supply and yet the demand is ever increasing. The County has 2,880.78 Km^2 of arable land mainly for crop farming and livestock production.

County land uses include: Agriculture, forestry, mining, construction of human settlements, business, social and public amenities. Land is also used as collateral to obtain credit as well as for aesthetic purposes. Spatial Planning should be emphasized to enable sustainable utilization of land and air spaces.

Mean holding size, land suitability, use, availability, agro ecological zones

The average holding size in the County for small scale farm sizes is 1.5 acres, while for large scale farms is 10 acres. This implies that land sizes are declining due to fragmentation of land into uneconomical units/parcels. This calls for a change of value system and attitudes towards land use. There is need to control fragmentation of land and also enforce the regulations on agrarian zones within the framework of National Land Policy.

Percentage of land with title deeds

According to KIBHS 2006/07, only 34.1% of land parcels in the County have title deeds whereas 65.9% of households reside on ancestral lands with no official documents of ownership. There is need for proper land adjudication and demarcation of public, private and community land within the existing legal framework.

3.3: PROJECT SITE DESCRIPTION

3.3.1; Transmission Line Route Description

Detailed description of the transmission line route is in appendix I.

The proposed 132 kV overhead transmission line will take off from the proposed substation site located at Bukirimi Village near Myanga village Market in Siombe Sub-Location, Kimaiti Location, Bungoma County. The proposed substation is located between TL tower 91 and 92 of the existing double circuit Tororo - Musaga 132 kV overhead transmission line.

Proposed site for Myanga substation

The TL then proceeds to Mungatsi before terminating at the proposed Busia Substation site, 4.5 km east of Busia Town near St. Stephen Bugengi Primary School at Bugengi Corner Point.

Nambale Township

Proposed site for Busia substation

At the Busia Substation site, the TL takes a southwesterly direction towards the existing Rang'ala substation running parallel to the Kisumu- Busia highway. The proposed transmission line will take off from the eastern side of Rang'ala Substation then turn to a southerly direction towards Bondo, crossing the Kisumu - Busia Road next to the junction of Rang'ala - Siaya Road.

Sega Township

Rang'ala Substation

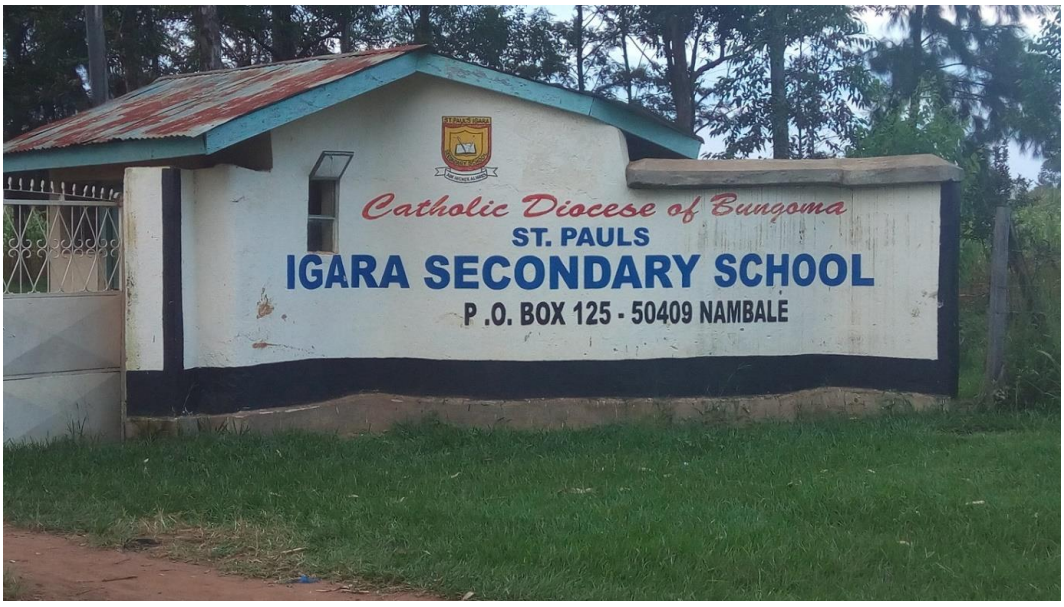
Proposed site for Bondo substation

From Bondo substation, the TL crosses Bondo - Kisian Road and then continues for another 30 km to Ndigwa. At the proposed Bondo Substation, the TL to Ndigwa will take off from the southern side of the proposed site and will shortly turn with a southerly slight angle through sparsely populated farmlands to terminate at the proposed Ndigwa substation site.

Proposed site for Ndigwa substation

Public Utilities to be affected.

The transmission line will affect 3no. schools and a community center consisting of a hospital, a special school, and an Administration Police camp. It is strongly advised that, the proponent reroute the line to avoid these utilities. Introduction of angle points (with small angles of less than 45^0) just before the utilities will remedy the situation.



St. Pauls Igara Secondary School; Myanga

Keyo Kodindo Primary School Bondo

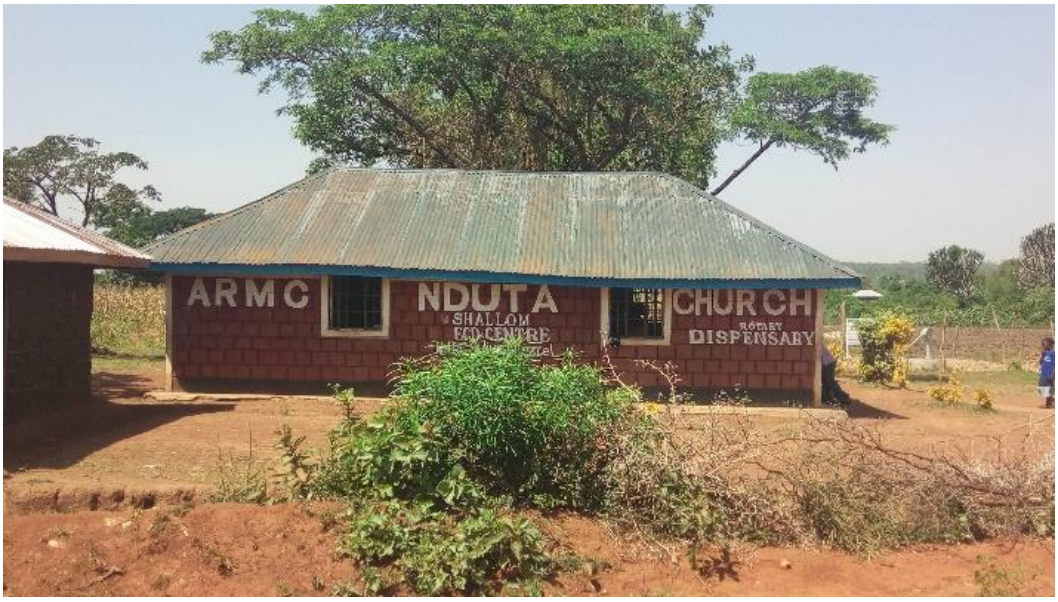
Omboye Primary School, Rarieda

Madiany special school

Madiany Sub-County Hospital

Madiany AP Camp

The line also affects a church but the church faithful were of the opinion that, if given good compensation they can build a better church in the same compound but outside the way-leave corridor.



3.3.2; Baseline Biophysical

Appendix II gives detailed floral and faunal report for the Myanga – Busia – Rangala – Bondo - Ndigwa transmission line

Flora

The proposed 132kV transmission line from Myanga to Ndigwa through Busia and Bondo proposed substations at least 123km long with a wayleave of 40m. Along most of its length, the line traverses densely settled and cultivated areas. Most of the stands of natural vegetation have therefore been modified for settlement and agricultural practices. Where natural vegetation survives it is largely secondary.

Plate 6 a,b: Agro-ecosystems of the study site

The local communities in the study area are heavily dependent on natural resources for livelihood and currently nearly all the natural vegetation has disappeared owing to major land use changes such as clearing forests and swamps for cultivation. This is evident in Myanga, Mungatsi, Nambale, Matayos, Siaya, Bondo, Ndigwa among others. However, within the farmlands and around homesteads, there are reasonable number of trees including: *Albizia gumifera, Markhamia lutea, Spathodea nilotica, Vitex keniensis, Syzygium cuminii, Syzygium guineense, Ficus sycomora, Azadirachta indica Eucalyptus spp, Croton megalocarpus, Casuarina equisetifolia* etc.

Plate **7; Eucalyptus forest observed along the proposed transmission route**

The locals depend on vegetation for different purposes mainly firewood, construction, charcoal burning and mostly towards the side of Siaya, Bondo and Ndigwa for medicinal purposes, religious rites and transmission of cultural values. The forestry resources on the farms through agro-forestry practices provide the bulk of the forest product for domestic use in the area.

Plate 8 a,b: Spathodea nilotica and Jacaranda mimosifolia in the proposed line route

Most of the agricultural areas crossed have a mixture of crops including coffee, tea, bananas, sugarcane, cassava, sorghum, maize, sweet potatoes, beans, tomatoes, cotton etc. These crops are shorter than 2m which means their cultivation can still continue under the power line thus considered less significant in relation to proposed project.

Bushes were prominent in the areas of the proposed transmission line and those observed comprised of the *Vepris pilosa, Lantana camara, Rhus natalensis, Grewia similis, Acacia mellifera, solanum mauritianum etc*.

These are generally woody species but short (less than 3m tall) with canopy spreading near the ground. The species sometimes occur as singles or clusters forming bushy shapes.

The rocky outcrop vegetation of the site was highly distinct from the adjacent hills and grasslands. This was characterized by the presence of large shrubs and small trees such as *Diospyros lycioides, Aloe Africana, Aloe aculeate, Aloe broomii* and *Rhus erosa*. Due to the restricted nature and the presence of the low trees and various succulents within this habitat type, it is ecologically sensitive from a flora perspective.

The evidence from the site visit suggests that large amounts of water move through some of the areas as indicated by a number of rivers like Nzoia, Yala, Sio, Walatsi, Musokoto. The vegetation within these areas in many respects showed high abundance of species such as papyrus reeds, cyperus spp Fergesia murielae, *Themeda triandra, Aristida diffusa, Phylostachys aurea* and *Cassia didymobotrya.* These vegetation fills an important niche that connects the water edge with dry land, and in so doing, accomplishes a number of functions:

- Trees and shrubs that border and overhang rivers and swamps moderate the temperature.
- The roots of plants provide structure and strength, collect sediment and thus prevent banks from being washed away.
- The vegetation soaks up and store water during high rainfall events and help to prevent floods.

Plate 9: A riparian vegetation observed in Ugunga, Ambururu swamp

Plate 10 a, b: Section of River Sio adjoining the line route

Plate11 a,b: Ochot swamp in observed in Bondo, Ndira village

Plate 12: Section of River Walatsi adjoining line route

Plate 13: Riparian zone of Rivr Nzoia adjoining line route

Plate 13b: A Photo showing part of Alksi river adjoining line route encroached by people

Plate 13c: Gardens in Nambale village along the line route

Development within these areas would be likely to result in erosion and degradation. From flora and fauna biodiversity perspective as well as ecosystem service point of view, they should be avoided.

Overall vegetation condition of the site can be considered to be average to good condition. Although palatable grass species such as *Themeda triandra* were common within the run-on areas, unpalatable species such as *Chrysocoma ciliata* which increases as a result of overgrazing were dominant across large parts of the site.

Flora and species richness

Areas traversed by the proposed power transmission line have been considerably altered by human activities. The areas surveyed along the line route generated a total of 223 plant species in 164 genera and 57 families of which 178 species were trees and shrubs. The woody species that were most abundant are: *Albizia gumifera, Markhamia lutea, Spathodea nilotica, Vitex keniensis, Syzygium cuminii, Syzygium guineense, Ficus sycomora, Azadirachta indica Eucalyptus spp, Croton megalocarpus, Casuarina equisetifolia.* Most of the non woody species observed such as *Leonatis nepotifolia, Senna floribunda, Tagetes minuta, Sida acuta* which are all weeds of cultivation and/or typical of waste lands.

Plate 14: Agroecosystem in Bondo mostly dominated by Markhamia lutea (in the background)

Plate15: A photo of Cuscuta californica, a parasitic plant in Bondo along the line route

Fauna

Very few data exists on mammal occurrence and diversity in the study area since they don't have any protection status. These areas have largely been depleted of medium to large sized mammals which were either hunted for meat or killed on sight because were vermin. No wild mammals of conservation concern were encountered and/or heard of along the proposed transmission line route.

A few large mammal species were reported by local residents to have previously lived in some areas along the line route but have now been locally exterminated. Since none of the mammals of conservation concern were encountered, it is not considered that the proposed transmission line will have significant conservation concern regarding terrestrial mammals.

The construction process will have some impact on the habitat for fauna. Apart from relatively direct loss of habitat, changes to soil temperatures and vegetation cover will also impact the abundance and community structure of fauna.

The main livestock found in the study area are the indigenous cows, goats, sheep, pigs and donkeys.

A total of 23 species were reported to ever have been seen by local people in different areas along the proposed line route.

Birds

Although most of the area including that to be followed by proposed power transmission line, is cultivated, it retains considerable bird population. Birds are mobile and in this study, a good number were observed which was then augmented with the existing data on forest birds or water birds of the study area.

Farmland sites had numerous trees, including a big variety of native species such as *Markhamia lutea*, which was particularly common, as well as fruit trees such as *Artocarpus heterophyllus.* Many birds depend upon trees for roosting, nesting or feeding. There was no real forest along the transmission line route, but many forest generalist and visitor species are found outside forest in areas with plenty of trees.

Numbers of species in other categories were relatively small, and the four regionally-listed species are all widespread. These are the Grey Parrot (R-NT), Spot flanked Barbet, White-headed Saw-wing and Red-chested Sunbird. Only a small population of aerial species (swifts, bee-eaters, swallows) were encountered. There were few open areas of grassland, hence few species of that specialty, and only 7 Afrotropical migrants.

3.3.3; Physical Cultural Resources (PCR) – Archeological and Cultural Heritage

Physical cultural resources, are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or underwater. Their cultural interest may be at the local, provincial, or national level, or within the international community. Examples of PCR include;

Human-made

- Religious buildings such as temples, mosques, churches
- Exemplary indigenous or vernacular architecture
- Buildings, or the remains of buildings, of architectural or historic interest
- Historic or architecturally important townscapes
- Historic roads, bridges, walls, dams, fortifications, water works
- Archaeological sites (unknown or known, excavated or unexcavated)
- Commemorative monuments
- Historic sunken ships

Natural

- Holy waters and holy wells

- Sacred waterfalls
- Sacred groves and individual sacred trees
- Historic trees
- Sacred mountains and volcanoes
- Caves currently or previously used for human habitation or social activity
- Paleontological sites (ie., deposits of early human, animal or fossilized remains)
- Natural landscapes of outstanding aesthetic quality

Combined Human-made and Natural

- Sites used for religious or social functions such as weddings, funerals, or other traditional community activities
- Places of pilgrimage
- Burial grounds
- Family graves in the homestead
- Historic gardens
- Cultural landscapes
- Natural stones bearing historic inscriptions
- Historic battlegrounds
- Combined human and natural landscapes of aesthetic quality
- Cave paintings

Movable

- Historic or rare books and manuscripts
- Paintings, drawings, icons, jewellery
- Religious artefacts
- Historic costumes and fabrics
- Memorabilia relating to the lives of prominent individuals or to events such as historic battles
- Statues, statuettes and carvings
- Modern or ancient religious artefacts
- Pieces broken off from monuments or historic buildings
- Unregistered archaeological artefacts
- Antiquities such as coins and seals
- Historic engravings, prints and lithographs
- Natural history collections such as shells, flora, minerals

Result of assessment and way-forward

During the assessment, none of the above PCRs was found. However, chance finds cannot be disqualified. During excavations for the tower bases, workers may come across Archaeological finds.

Upon discovery of a heritage site or an Archaeological find, the construction site will be stopped, the site if possible will be restricted using tapes or local materials, and relevant authorities including local administration officers and the museums of Kenya informed for further instructions.

CHAPTER 4: RELEVANT LEGISLATIVE AND REGULATORY FRAMEWORKS

4.1: INTRODUCTION

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from economic and social development programmes that disregarded environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished or is in the process of development. The NEAP process introduced environmental assessments in the country culminating into the enactment of the Policy on Environment and Development under the Sessional Paper No. 6 of 1999.

An EIA is a legal requirement in Kenya for all development projects. The Environmental Management and Co-ordination (Amendment) Act, 2015, is the legislation that governs EIA studies. This project falls under the Second Schedule that lists the type of projects that are required to undergo EIA studies in accordance with section 58 (1- 4) of the Act. Projects under the Second Schedule comprise those considered to pose potentially negative environmental impacts.

Kenyan law has made provisions for the establishment of the National Environment Management Authority (NEMA), which has the statutory mandate to supervise and co-ordinate all environmental activities. Policies and legislation highlighting the legal and administrative requirements pertinent to this study are presented below.

4.2: THE CONSTITUTION

The Kenyan Constitution states that every person has the right to a clean and healthy environment, which includes the right –

a) to have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69 and
b) to have obligations relating to the environment fulfilled under Article 70.

Article 69 observes that;

(1) The State shall—

a) Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits;

b) Work to achieve and maintain a tree cover of at least ten per cent of the land area of Kenya;
c) Protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities;
d) Encourage public participation in the management, protection and conservation of the environment;
e) Protect genetic resources and biological diversity;
f) Establish systems of environmental impact assessment, environmental audit and monitoring of the environment;
g) Eliminate processes and activities that are likely to endanger the environment; and
h) Utilize the environment and natural resources for the benefit of the people of Kenya.

(2) Every person has a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

4.3: POLICY

Kenya Government's environmental policy aims at integrating environmental aspects into national development plans. The broad objectives of the national environmental policy include:

- Optimal use of natural land and water resources in improving the quality of human environment
- Sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations
- Conservation and management of the natural resources of Kenya including air, water, land, flora and fauna
- Promotion of environmental conservation through the sustainable use of natural resources to meet the needs of the present generations while preserving their ability to meet the needs of future generations
- Meeting national goals and international obligations by conserving bio-diversity, arresting desertification, mitigating effects of disasters, protecting the ozone layer and maintaining an ecological balance on earth.

4.4: LEGAL FRAMEWORK

Application of national statutes and regulations on environmental conservation suggest that the Proponent has a legal duty and social responsibility to ensure that the proposed development be implemented without compromising the status of the environment, natural resources, public health and safety. This position enhances the importance of this environmental impact assessment for the proposed site to provide a benchmark for its sustainable operation.

Kenya has approximately 77 statutes that relate to environmental concerns. Environmental management activities were previously implemented through a variety of instruments such as policy statements and sectoral laws as well as through permits and licenses. Most of these statutes are sector-specific, covering issues such as public health, soil erosion, protected areas, endangered species, water rights and water quality, air quality, noise and vibration, cultural, historical, scientific and archaeological sites, land use, resettlement, etc.

Some of the key national laws that govern the management of environmental resources in the country are hereby discussed however it is worth noting that wherever any of the laws contradict each other, the Environmental Management and Co-ordination (Amendment) Act, 2015 prevails.

4.4.1; The Environmental Management and Co-ordination (Amendment) Act, 2015

Provides for the establishment of appropriate legal and institutional framework for the management of the environment and related matters. Part II of the Environment Management & Coordination (Amendment) Act, 2015 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to partly ensure this is achieved, Part VI of the Act directs that any new programme, activity or operation should undergo environmental impact assessment and a report prepared for submission to the National Environmental Management Authority (NEMA), who in turn may issue an EIA license as appropriate. The approval process time frame for Project Reports is 45 days and for full EIA Study is 90 days.

This Project falls within Schedule 2 of EMCA 2015 and therefore requires an EIA. The Proponent has commissioned the environmental and social impact assessment study in compliance with the Act. The Proponent shall be required to commit to implementing the environmental management plan laid out in this report and any other conditions laid out by NEMA, prior to being issued an EIA license.

4.4.2; The Environmental (Impact Assessment and Audit) Regulations, 2003

The regulations observe that; No proponent shall implement a project -

a) likely to have a negative environmental impact; or
b) for which an environmental impact assessment is required under the Act or these Regulations;

Unless an environmental Impact Assessment has been concluded and approved in accordance with the Regulations.

This Study is aimed at ensuring compliance of these regulations. The study has collected information on project design, the relevant baseline data, conducted an elaborate public consultation process and created an Environmental and Social Management Plan(ESMP) and a monitoring plan (ESMoP) that if implemented will ensure conservation and protection of environment and improved livelihoods.

4.4.3; Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009.

The regulations observe that, except as otherwise provided in the Regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermittent or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise.

The Proponent shall observe policy and regulatory requirements and implement the measures proposed in this documenting as an effort to comply with the provisions of the Regulations.

4.4.4; Environmental Management and Coordination, (Water Quality) Regulations 2006

The Regulations observe that, every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act. It further observes that, no person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such substance in or near it, as to cause pollution.

It goes on to state that, no person shall:

a) discharge, any effluent from sewage treatment works, industry or other point sources into the aquatic environment without a valid effluent discharge license issued in accordance with the provisions of the Act.

b) abstract ground water or carry out any activity near any lakes, rivers, streams, springs and wells that is likely to have any adverse impact on the quantity and quality of the water, without an Environmental Impact Assessment license issued in accordance with the provisions of the Act; or

c) cultivate or undertake any development activity within a minimum of six meters and a maximum of thirty meters from the highest ever recorded flood level, on either side of a river or stream, and as may be determined by the Authority from time to time.

The Proponent will observe the requirements of these regulations especially during the construction phase.

4.4.4; Environmental Management and Co-ordination (Waste Management) Regulations, 2006.

The regulation observes that;

1. No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle.
2. Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations.
3. Without prejudice to the foregoing, any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose off such waste in a designated waste disposal facility.
4. Any person whose activities generate waste, shall segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority.
5. Any person who owns or controls a facility or premises which generates waste shall minimize the waste generated by adopting the cleaner production principles.

The Proponent shall observe the guidelines as set out in the environmental management plan laid out in this report as well as the recommendation provided for mitigation /minimization /avoidance of adverse impacts arising from the Project activities.

4.4.5; Environmental Management and Co-ordination (Air Quality) Regulations, 2009.

The objective of these Regulations is to provide for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air. The regulations observe that;

1. No person shall-
   a) act in a way that directly or indirectly causes, or is likely to cause immediate or subsequent air pollution; or
   b) emit any liquid, solid or gaseous substance or deposit any such substance in levels exceeding those set out in the First Schedule.

c) No person shall cause emission of the priority air pollutants prescribed in the Second Schedule to exceed the ambient air quality limits prescribed in the First Schedule.

2. No person shall cause emission of the priority air pollutants prescribed in the Second Schedule to exceed the ambient air quality limits prescribed in the First Schedule.
3. No person shall cause the Ambient Air Quality levels specified in the First Schedule of these Regulations to be exceeded.
4. No person shall cause or allow particulate emissions into the atmosphere from any facility listed under the Fourth Schedule to these Regulations in excess of those limits stipulated under the Third Schedule.
5. Any person, being an owner of premises, who causes or allows the generation, from any source, of any odour which unreasonably interferes, or is likely to unreasonably interfere, with any other person's lawful use or enjoyment of his property shall use recognised good practices and procedures to reduce such odours to a level determined by the odour panel, including any guidelines published by the Authority for reducing odours.

The Proponent shall observe policy and regulatory requirements and implement the mitigation measures proposed in this document in an effort to comply with the provisions of these Regulations on abatement of air pollution.

4.4.6; Environmental Management and Coordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulation, 2009.

The Objectives of these Regulations include-

a) to provide for the conservation and sustainable use of wetlands and their resources in Kenya;
b) to promote the integration of sustainable use of resources in wetlands into the local and national management of natural resources for socio-economic development;
c) to ensure the conservation of water catchments and the control of floods;
d) to ensure the sustainable use of wetlands for ecological and aesthetic purposes for the common good o all citizens;
e) to ensure the protection of wetlands as habitats for species of fauna and flora;
f) provide a framework for public participation in the management of wetlands;
g) to enhance education research and related activities; and
h) to prevent and control pollution and siltation.

The Proponent shall comply with the provisions of these regulations

4.4.7; Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006.

The regulations observe that;

(1) A person shall not engage in any activity that may-

a. have an adverse impact on any ecosystem;
b. lead to the introduction of any exotic species;
c. lead to unsustainable use of natural resources,

Without an Environmental Impact Assessment Licence issued by the Authority under the Act.

The Proponent shall comply with the provisions of these regulations

4.4.8; Environmental Management and Coordination (Controlled Substances) Regulation, 2007, Legal Notice No. 73

The Controlled Substances Regulations defines controlled substances and provides guidance on how to handle them. The regulations stipulate that controlled substances must be clearly labelled with among other words, “Controlled Substance-Not ozone friendly’’ to indicate that the substance or product is harmful to the ozone layer. Advertisement of such substances must carry the words, “Warning: Contains chemical materials or substances that deplete or have the potential to deplete the ozone layer.” Persons handling controlled substances are required to apply for a permit from NEMA.

Proponent will not use controlled substances in the operation of the project. Hazardous materials such as PCB based coolants will not be used in the transformers, capacitors, or other equipment.

4.4.9; The Occupational Health and Safety Act, 2007

This is an Act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The Act has the following functions among others:

- Secures safety and health for people legally in all workplaces by minimization of exposure of workers to hazards (gases, fumes & vapours, energies, dangerous machinery/equipment, temperatures, and biological agents) at their workplaces.
- Prevents employment of children in workplaces where their safety and health is at risk.
- Encourages entrepreneurs to set achievable safety targets for their enterprises.
- Promotes reporting of work-place accidents, dangerous occurrences and ill health with a view to finding out their causes and preventing of similar occurrences in future.

- Promotes creation of a safety culture at workplaces through education and training in occupational safety and health.

Failure to comply with the OSHA, 2007 attracts penalties of up to Ksh. 300,000 or 3 months jail term or both or penalties of Ksh. 1,000,000 or 12 months jail term or both for cases where death occurs and is in consequence of the employer

The report advices the Proponent on safety and health aspects, potential impacts, personnel responsible for implementation and monitoring, frequency of monitoring, and estimated cost, as a basic guideline for the management of Health and Safety issues in the proposed project.

4.4.10; The Public Health Act (Cap. 242)

The Act Provides for the securing of public health and recognizes the important role of water. It provides for prevention of water pollution by stakeholders, among them Local Authorities (county councils). It states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health.

The Proponent shall observe policy and regulatory requirements and implement measures to safeguard public health and safety.

4.4.11; Physical Planning Act (Cap286)

The Act provides for the preparation and implementation of physical development plans and for related purposes. It gives provisions for the development of local physical development plan for guiding and coordinating development of infrastructure facilities and services within the area of authority of County, municipal and town council and for specific control of the use and development of land.

The Proponent shall secure all mandatory approvals and permits as required by the law.

4.4.12; Occupiers Liability Act (Cap. 34)

Rules of Common Law regulates the duty which an occupier of premises owes to his visitors in respect of danger and risk due to the state of the premises or to things omitted or attributes an affliction on his/her health to a toxic materials in the premises.

The Proponent shall endeavour to ensure that the management of health and safety issues is of high priority during the operational phase of the project.

4.4.13; The Standards Act Cap 496

The Act is meant to promote the standardization of the specification of commodities, and to provide for the standardization of commodities and codes of practice; to establish a Kenya Bureau of Standards, to define its functions and provide for its management and control. Code of practice is interpreted in the Act as a set of rules relating to the methods to be applied or the procedure to be adopted in connection with the construction, installation, testing, sampling, operation or use of any article, apparatus, instrument, device or process.

The Act contains various specifications touching on electrical products. The Proponent shall ensure that commodities and codes of practice utilized in the project adhere to the provisions of this Act.

4.4.14; Energy Act, 2006

The Act prescribes the manner with which licenses shall be obtained for generating, transmitting and distributing electricity. The provisions of this Act apply to every person or body of persons importing, exporting, generating, transmitting, distributing, supplying or using electrical energy; importing, exporting, transporting, refining, storing and selling petroleum or petroleum products; producing, transporting, distributing and supplying of any other form of energy, and to all works or apparatus for any or all of these purposes. The Act establishes an energy commission, which is expected to become the main policy maker and enforcer in the energy sector. This commission among other things shall be responsible for issuing all the different licenses in the energy sector.

The Proponent shall observe the guidelines as set out in the Energy Act

4.4.15; Land Acquisition Act (Cap. 295)

This Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. Section 3 states that when the Minister is satisfied on the need for acquisition, notice will be issued through the Kenya Gazette and copies delivered to all the persons affected. Full compensation for any damage resulting from the entry onto land to things such as survey upon necessary authorization will be undertaken in accordance with section 5 of the Act. Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to sections 8 and 10 along the following parameters:

- Area of land acquired,
- The value of the property in the opinion of the Commissioner of land (after valuation),
- Amount of the compensation payable,

- Market value of the property,
- Damages sustained from the severance of the land parcel from the land,
- Damages to other property in the process of acquiring the said land parcel,
- Consequences of changing residence or place of business by the land owners,
- Damages from diminution of profits of the land acquired.

The Proponent shall adhere to the requirements of the Act in the implementation of land acquisition.

4.4.16; The Registered Land Act Chapter 300 Laws of Kenya:

This Act provides for the absolute proprietorship over land (exclusive rights). Such land can be acquired by the state under the Land Acquisition Act in the project area.

The Proponent shall comply with the provisions of the Act in the acquisition of Registered Land.

4.4.17; The Land Adjudication Act Chapter 95 Laws of Kenya

This Act provides for ascertainment of interests prior to land registrations under the Registered Land Act.

The Proponent has undertaken a survey and commissioned a study which complies with the provisions of the Act. Public consultations have also been undertaken extensively in the affected project area.

4.4.18; The Antiquities and Monuments Act, 1983 Cap 215

The Act aim to preserve Kenya's national heritage. Kenya is rich in its antiquities, monuments and cultural and natural sites which are spread all over the country. The National Museums of Kenya is the custodian of the country's cultural heritage, its principal mission being to collect, document, preserve and enhance knowledge, appreciation, management and the use of these resources for the benefit of Kenya and the world. Through the National Museums of Kenya many of these sites are protected by law by having them gazetted under the Act.

The proponent shall follow due procedures in case of unearthing any antiquity.

4.4.19; The Civil Aviation Act, Cap 394

Under this Act, the Kenya Civil Aviation Authority (KCAA) has to authorize and approve the height of the mast for the purpose of ensuring the safety of flying aircraft over the proposed project area.

The Proponent shall comply with the provisions of the Act in seeking authorization from KCAA.

4.5: INTERNATIONAL OBLIGATIONS

4.5.1; World Bank's Safeguard Policies

Relevant World Bank Safeguard policies for this project include;

1. OP 4.01; Environmental Assessment
2. OP 4.04 - Natural Habitats
3. OP 4.10 - Indigenous Peoples
4. OP 4.11 - Physical Cultural Resources
5. OP 4.12 - Involuntary Resettlement

The Proponent shall comply with the provisions of the safeguard policies

4.5.2; United Nations Framework Convention on Climate Change, 1992

The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

The Proponent shall comply with the provisions of this convention

4.5.3; United Nations Convention on Biological Diversity, 2000

The objectives of this Convention are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

The Proponent shall comply with the provisions of this convention

4.5.4; Ramsar Convention – on Wetlands of International Importance especially as a Waterfowl Habitat

The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".

The Proponent shall comply with the provisions of this convention

CHAPTER 5: STAKEHOLDER CONSULTATION

5.1: INTRODUCTION

Stakeholder consultation was undertaken among people living in the environs of the proposed transmission project as an integral part of the ESIA study. The aim was to ensure that all stakeholder interests were identified and incorporated in project development: at planning, implementation, and operation phases.

The specific objectives for consultation process were to:

- Create public awareness about the proposed project
- Seek public opinion and concerns relating to the project and more specifically problems they anticipate and ways of overcoming them.
- Obtain professional advice from sector heads including departmental heads and local administration
- Consultatively and in a participatory way identify potential positive and negative impacts of the project and seek remedial measures
- Sell the project to the public for their acceptance and ownership

These meetings enabled interested and affected parties to contribute their concerns (views and opinions on the proposed project) which might have been overlooked during the scoping exercise. Findings of stakeholder analysis were very important in predicting impacts and development of ESMP. Public consultations for the proposed project followed several steps as described below:

5.2: IDENTIFICATION OF STAKEHOLDERS

The proposed project will typically involve land acquisition for construction of permanent structures and/or infrastructure including steel pylons, transformers, towers, bus bars, among other infrastructure. Of necessity, land for the location of these permanent structures must be acquired. Communities living within the environs of the proposed site were identified as Project Affected Persons (PAPs).

This study also identified a second category of stakeholders comprised of GoK officers in charge of diverse sectors, which are likely to be impacted by the project. This category was also consulted as key informants on sectoral policy and to advise the ESIA study on mitigation measures to be put in place so as to minimize adverse impacts in respective sectors. This category also included local policy makers and opinion leaders, local administration, local authorities and civic leaders.

5.3: APPROACH TO STAKEHOLDER CONSULTATIONS

A detailed stakeholder consultation for this study was undertaken from 13th to 16th and also between 24th and 28th July 2017. These consultations were conducted in the form of:

5.3.1; Key Informant Oral Interviews:

The following people were consulted:

Siaya

1. ICT Officer, Water Resources Management Authority
2. Sub County Agricultural Officer , Ministry of Agriculture
3. Human Resource and Administration Officer, SIBO Water and Sanitation Co. LTD
4. Project Account Assistant, Kenya Redcross Society
5. Deputy Director Physical Planning, CGS Siaya
6. Department Officer – Planning, Department of Finance and Economic Planning
7. Registration Officer, Kenya National Registration Bureau
8. Deputy County Director of Livestock, Directorate of Livestock
9. Fisheries Officer, Directorate of Fisheries
10. Forester, Kenya Forest Service
11. Public Health Officer, Ministry of Health

Busia

1. Physical Planning Officer, Department of Physical Planning, Ministry of Lands
2. Public Health Officer, Ministry Health and Sanitation
3. Employment Officer, Ministry of Labour
4. Assistant Director of Agriculture, Ministry of Agriculture and Animal Resources
5. Ecosystem Conservator, Kenya Forest Service.
6. Clerical Officer, Ministry of Energy and Petroleum

Bungoma

1. Chief Officer, Ministry of Water and Natural Resources
2. Senior clerical officer, Ministry of Agriculture and Fisheries
3. Senior Forester, Kenya Forest Service
4. County Chief Officer, Ministry of Environment, Natural Resources and Ecotourism
5. County Labour Officer, Ministry of Labour.

5.3.2; Key Informant Questionnaires:

Open-ended questionnaires were administered to stakeholders comprised of GOK officers and civil society groups in charge of diverse sectors which are likely to be impacted by the project. Concerns, views and opinions from a total of 22 respondents were received.

5.3.3; Community Questionnaires:

Open-ended questionnaires were administered to households, and small business enterprises neighboring the site. Concerns, views and opinions from a total of 262 respondents were received.

5.3.4; Public Baraza

Public barazas were held in Ndigwa, Pap Kodero, Bondo, Siaya, Rangala, Sega, Bumala, Mundika (Busia), Nambale and Myanga, with the assistance of the local administration and leaders. In the Barazas, the team introduced themselves, their consultancy and the proponent; explained to the communities the proposed project; highlighted the advantages of the project; informed the participants that, they had been contracted among others to help develop an environmental management plan that would ensure any negative impacts of the project are mitigated and that the participants had been identified as an important stakeholder who would assist in developing the management plan and therefore the reason for the visit; they then gave the participants a chance to ask questions which were then answered.

The issues and benefits as identified by the participants are highlighted below;

SEGA; NORTH UGENYA LOCATION, (24th July 2017 - 10:00 am at Sega Polytechnic)

Issues	Benefits
The proposed project should be implemented very fast to reduce power outages	It will create job opportunities for the youths
KETRACO should be able to take care of the accidents related cases that result from negligence and faults from their side	The proposed project will promote industrialization.
This project should be started and completed unlike other projects that are mentioned and not started.	There will be less or no power outages
The project should ensure fast and affordable rural electrification.	It will promote business activities

KETRACO should ensure fair and reasonable compensation with the shortest time possible for those who will be affected by the proposed project.	It will promote security in the area
The proponent should consider employing the locals at the onset of project implementation so as to benefit the community.	It will reduce the cost of electricity and electrification.
Electric fire breakouts that causes danger and threats should be minimizes.	The project will improve living standards of the community.

Public consultation in Sega

RANG'ALA (24th July, 2017 - 3.00 pm at Rang'ala Market)

Issues	**Benefits**
Consideration of electric faults and over voltages that are a risk to the security of our electrical assets.	It will provide security
Difference between KenGen, KETRACO and Kenya Power.	The project will create employment opportunities.
Frequent power blackouts should be reduced.	It will reduce the cost of electricity
Compensation of the affected land, houses and ecosystems should be looked into	It will increase the reliability and adequacy of electric power.

The project should reduce the cost of electricity to the rural community	I will attract industrialization.
	It will improve the living standards of the community and boost the economy.


Photos showing Public consultation in Rang'ala.

NDIGWA; SOUTH UYOMA (25th July 2017 - 10.45 am, Ndigwa Catholic Church)

Issues	Benefits
Factor in issues of displacement and tree cutting as a result of implementing the project.	Create business opportunities i.e. welding barber shops, posho mills that require electricity to operate.
Actively involve the community for project ownership.	Reduction of electric costs.
Consider community safety during project implementation.	Reduction of power shortages
Compensation to the affected individuals in the community should be done satisfactorily.	Improve security in the area.
Ensure transformer blows and electric faults are reduced to minimize risks.	Increase power reliability.
Difference between Kenya Power, KETRACO and KenGen.	Promotes urbanization.
When the project will start.	Improve the economy of the area.

Participants from Ndigwa, South Uyoma Location

PAP KODERO (25th July 2017 - 2.00 pm, Owimbi Chief's Camp)

Issues	**benefits**
Compensation should be done satisfactorily in good time.	Improve functions of facilities like hospitals,
The project should be implemented as fast as possible.	Improve livelihood through job creation within the community.
Ensure electric faults minimized to mitigate electrical fire breakouts.	Ensure and promote security once implemented.
Over voltage should be highly considered during the project implementation.	Promote education
Difference between KETRACO and Kenya Power.	Reduce power blackouts.
Duration of the project	Improve the economy of the area.
Exact areas where the transmission line will pass.	Promotes entrepreneurship in the community
The criteria for selecting the local community for employment during the project implementation.	Promotes modern farming.
The negative impacts of the project to the community and the mitigation strategies	Promote clean water supply.
The difference between the proposed transmission lines and the electric lines being used now. If electricity will pass through the	

same lines.	


Participants from Pap kodero, Owimbi Chief Camp

BONDO (26th July, 2017 - 9am, Awelo Chief Camp)

Issues	**Benefits**
Compensation of land and other assets that will be affected should done satisfactorily.	Reduce power outages in the area.
The exact route the power line will pass through	Creation of job opportunities
When the project will begin.	Create business opportunities
The length (of the transmission line) a sub-contractor can be tendered.	Provide security due to presence of security lights
If the wayleave can be used for other economic activities.	Promote healthy lifestyles of the community members
The benefits of the project to the community members whose properties will not be affected.	Boost economy of the area and county as a whole.
The cost of electricity after the project implementation.	Promotes rural electrification

Bondo participants

SOUTH EAST ALEGO; SIAYA (26th July 2017 - 2.00pm, Karemo Chief's Camp)

Issues	Benefits
Faster and reliable electricity distribution should be ensured	Development of factories
The duration of the project	Employment opportunities thus improving living standards
The measures put in place to ensure youth employment	Enhance youth income generation
The voltage of the power that will be transmitted.	Eradicate poverty
Compensation strategies	Promotion of food security, improved transport and education in the community.
Reasons why Kenya Power is not efficient and reliable	Improved agriculture and crop production.
Medical insurance for the labourers should be considered	Promotes security
Duration of notice for those who will be displaced during the project implementation.	Promotion of safe and reliable energy.


Public consultation in Karemo, Siaya

BUMALA (27th July 2017 - 10.00 am, Bumala Chief's Camp)

Issues	Benefits
How the decisions were reached on transmission line route	Reduced cost of living as a result of economic growth
Definition and roles of KETRACO	Creation of job opportunities and employment
The relationship between the proposed project and the current electricity.	Promote industrialization
Benefit of the project to the community	Reduction of frequent power blackouts
The strategies that will be put in place to ensure equal employment to the locals.	Increase production and productivity as a result of adequate and reliable power.
KETRACO should make the transformers safe because recently there has been transformers blow-outs.	Promotion of security.
The negative impacts of the proposed projects should be considered and measures put in place to mitigate the risks.	Improvement of other sectors such as health, agriculture and education
The project should ensure long term employment for the local youths.	
The duration the project will take to be fully implemented.	



Bumala Baraza

BUKHAMU WEST; BUSIA (27th July 2017 - 2.00 pm, Mundika CDF Offices,)

Issues	**Benefits**
The project should not be political or should not be done under political influence.	Attraction of big investments
The duration the project will take to reach Mundika.	Promotes security
Such projects should not be initiated during campaigns since it may be associated to politics.	Creation of employment opportunities.
Who will the proponent employ and how will it be done.	Development of health and education sectors.
The benefits of the proposed project to the community.	Promotion of modern agriculture and livestock production.
The household who will be directly affected should be compensated fairly and satisfactorily.	Development and increase of business opportunities.

Particpants followeing proceedings at Busia meeting

MYANGA (28th July, 2017 - 9:30 am Save our Soul Global Mission Church)

ISSUES	BENEFITS
This is the best project ever and it should be implemented as soon as possible.	Creates employment.
Reasons for slow service delivery by Kenya Power.	Improve security
Compensation should be done satisfactorily.	Promote business activities
Some households do not allow power lines to pass through their home. This should be addressed to avoid conflicts.	Provision of reliable and adequate power in the community
Benefits of the project to the elderly	Reduced cost of electricity
Unskilled workers who will be employed should be paid well in good time	Promotes industrialization
Consider occupational health issues	Promotes the economy and living standards of individuals.


Public consultation at Myanga


NAMBALE (27th July, 2017 - 4:00 am at Nambale D.D.O Conference Hall)

ISSUES	BENEFITS
Labour offered should include the skilled and unskilled personnel within the community members	The county will become an investment hub
Compensation should be timely and fair.	Promotion of self-reliance through business activities.
Labour offered should include the unskilled and skilled personnel (especially the youth) within the community members	Creation of business activities i.e. welding, barber shops and posho mills
The period the project will take to be	Promotion of communication networks

completed and when it will start.	
The possible health effects associated with the transmission line and the necessary safety precautions.	Introduction of industrialization.



Community members from Nambale.

5.4: Outcome of the Stakeholder Consultations:

5.4.1; Important Issues as raised by key informant

Siaya

- There should be compensation in case some piece of land is taken
- Local labor to be observed
- Development and Planning regulations should be strictly adhered to.

Busia

- The project should consider the effects of danger during construction of the lines.
- There should be sanitation meetings for communities who will be affected prior to implementation of the project
- That proposed project to abide by all the acts of parliament and policies that protect the human life and dignity
- Ensure there is no structure under the transmission lines
- The proposed project is very much supported so long as all environment and social issues are strictly observed.
- KETRACO should consider the effects of the proposed projects on agricultural lands that the transmission lines will cover and compensate.

- Ecosystem rehabilitation in the affected areas should be considered by planting trees to create a balance
- Youth engagement in agriculture is likely to shift to other competitive ventures that depend on electricity e.g. cyber café, welding, kiosks etc. and agricultural lands are likely to be used for commercial businesses.

Bungoma

- The project implementation should start as soon as possible since there cannot be development without power
- Trees that will be cleared along the new lines should be replaced elsewhere to improve and maintain forest cover.
- All developers of electricity must fully participate in water catchment conservation to ensure steady hydropower generation
- A thorough assessment should be carried out and various intervention put in place because we have experienced massive tree cutting due to electric power transmission.
- Use of highly coated electricity cables in forested areas.
- Resource mapping should be done to identify routes that will lead to minimal tree destruction, conservation of community lands, private lands and roads.
- As labour department we believe that concerns, rights, and safety of community members and workers engaged will be addressed and taken care of.

5.4.2; Some of the benefits as identified by key informant

Siaya

- It would be an important undertaking since Siaya town experiences frequent power black outs on a daily basis. The proposed project will go a long way in resolving such issues.
- Alego, Usonga has high frequency of power outages discouraging investors both small scale and large scale agro processing
- The project will reduce the pump down time which is usually long due to frequent power blackout within the count
- Pump break down as a result of power surge will reduce tremendously if the project is completed to the specification thus reduces the maintenance cost usually incurred by the company.
- Continuous supply of water to customers will be in place thus increases the water company's monthly revenue.
- This will increase access to electricity thus increase in supporting office work resulting to overall efficiency

- The project will improve service delivery, create more opportunities for business and hence boost economic development
- The project is likely to positively contribute to the solid wellbeing of the population.
- Economic activities will be enhanced and therefore improving the quality of life to the population.
- There are limited high vegetation along the proposed line. There is likely to be limited environmental influence.
- Promote security
- We support the project because it will boost the power supply in the area. It will also help create employment and improve on social amenities. It will help in agro processing of agricultural products by availing power which is much needed
- Siaya does not have steady electric power and the side effect is that when power resumes, it negatively affects electrical appliances such as mobile phones, refrigerators and light bulbs. The proposed project is highly welcome if it will address such issues.

Busia

- The proposed project will help the population with the coverage to come up with small scale business and even industries thus improving livelihood of the community.
- It will improve rural electrification thus realization of clean energy.
- With adequate power, so many other projects will come up that will boost the economy
- Electricity is key in all development projects that create employment thus improving health and general living standards.
- There is indeed inadequate power supply in the targeted counties that affects various activities that should be carried out effectively.
- We need the project to promote agro processing and value addition through stable, reliable, and efficient supply of electricity.
- Reliable power is also important for preservation of agricultural and animal products such as milk and horticultural produce.
- Security that the proposed project will as a result of stable and reliable power attracts investment in agriculture and livestock production.

Bungoma

- KETRACO should endeavour to transmit more power in Bungoma County to reduce frequency of power blackout.
- It will re-reinforce the power in the area thus reducing frequency of blackouts.
- It will reduce the cost of electrification.

- The proposed project will boost power to areas that experience power shortages
- The project will improve rural development network, Lighting system in rural setup will also be improved.
- Upon the completion of the project, there shall be lots of job opportunities as a result of high value industries.

5.4.3; Important Issues as raised by the community

- The project implementation should start as soon as possible
- How long the project will take and how soon it will begin.
- There should be compensation to those affected.
- Possibilities of employment opportunities to both skilled and unskilled.
- If there are any disadvantages of the transmission line to the residents.
- If electricity will be cheaper.

5.4.4; Some of the benefits as identified by the community

- There will be reduced power outages
- There will be improved standard of living once the project is completed.
- Formal and informal employment will be created in the areas that will have boosted power..
- Business and industrialization will improve.
- Security will improve in the areas.
- There will be reduced cost of electricity

5.5: Overall picture from the stakeholder consultations.

The overall picture emergent from the stakeholder consultations is that their attitude towards the project is positive and desirous.

In addition, the project is seen as being strategic to stabilising power supply which is crucial to sustained economic growth. In order to sustain this overwhelming public support, the project development should proceed simultaneously with resolution of stakeholder concerns.

CHAPTER 6: RESETTLEMENT ACTION PLAN (RAP)

6.1: INTRODUCTION

A Resettlement Action Plan (RAP) is a document drafted by a project proponent (where there is a likelihood of people being resettled due to the project) or an appointee of the project proponent, specifying the procedures to be followed and the actions to be taken to properly resettle and compensate affected people and communities.

A RAP must identify the full range of people affected by the project and justify their displacement after consideration of alternatives that would minimize or avoid displacement. The RAP outlines eligibility criteria for affected parties, establishes rates of compensation for lost assets, and describes levels of assistance for relocation and reconstruction of affected households.

The Myanga – Busia – Rang'ala – Bondo - Ndigwa high voltage transmission line is a linear project and will lead to Linear resettlement. Linear resettlement describes projects having linear patterns of land acquisition (highways, railways, canals, and power transmission lines). In sparsely populated rural areas, a linear project such as an electric transmission line may have minimal impact on any single landholder. Compensation is characterized by a large number of small payments for the temporary loss of assets such as structures, crops and land. If well designed, linear projects can easily avoid or minimize the demolition of permanent structures. Conversely, in a densely populated urban area, a linear project such as a road upgrading may require the demolition of structures along the project right-of-way, thereby significantly affecting large numbers of people. Linear resettlement contrasts with site specific resettlement because of the problems that frequently arise when resettlement actions have to be coordinated across multiple administrative jurisdictions and/or different cultural and linguistic areas.

6.2: OBJECTIVES OF RAP

The main objectives of a RAP is to;

- To avoid or minimise involuntary resettlement;
- To ensure that affected individuals and households and/or displaced communities are meaningfully consulted, have participated in the planning process, and are adequately compensated to the extent that at least their pre-displacement incomes have been restored and that the process has been a fair and transparent one to ensure that people and enterprises affected by the project are compensated for any loss of property and/or socio-economic displacement as a result of the project;

- To provide project affected people (PAPs) with the opportunities to restore or improve their living standards and income earnings capacity to at least pre-project levels; and
- To provide guidelines to stakeholders participating in the mitigation of adverse social impacts of the project, including rehabilitation/ resettlement operations in order to ensure that PAPs will not be impoverished by the adverse social impacts of the project.

6.3: COMPONENTS OF RAP

An effective RAP will have the following essential components;

- identification of project impacts and affected populations;
- a legal framework for land acquisition and compensation;
- a compensation framework;
- a description of resettlement assistance and restoration of livelihood activities;
- a detailed budget;
- an implementation schedule;
- a description of organizational responsibilities;
- a framework for public consultation, participation, and development planning;
- a description of provisions for redress of grievances; and
- a framework for monitoring, evaluation, and reporting.

6.4: METHODOLOGY AND SCOPE

For the preparation of this indicative RAP, a census survey was carried out to identify the Project Affected Persons (PAPs), and their structures which will be affected. A valuation of the structures to be affected was done and an estimate of the amount of money to be compensated for each structure provided. The census was, however, limited to the 40m way – leave corridor.

Valuation method used for land and structures considered the current replacement cost of lost asset as well as types and levels of compensation under Kenyan law. For trees, reference was made to Diameter at Breast Height (DBH) and Kenya Gazette Supplement No.132, the Forest Act. A 15 percent disturbance cost was added as per KETRACO's Resettlement Policy Framework.

It is imperative to note here that, the processes preceding the construction phase of the project, which include EIA License approval, mobilization of project funds, and sourcing for a contractor, may take a considerable duration of time (on average KETRACO projects take 18 months to reach construction phase) and that by the time of construction;

1. More people may have resettled on the way-leave corridor and
2. Property prices may have escalated

Conducting an elaborate RAP at this time may not be the most appropriate. An effective RAP is done immediately before the construction phase of the project.

This RAP report, therefore, is an indicative Resettlement Action Plan and should form a guide to a more elaborate RAP to be conducted by the project proponent immediately before project construction phase.

The report comprises the findings of the site visit carried out and the census survey against the background of the national legal and institutional frameworks, and the World Bank Involuntary Resettlement Policy (OP/BP 4.12). It provides an overview of the affected households and communities, structures on the way-leave at the time of the study, and an estimate budget to be used by the proponent for the purposes of compensating Land, structures, and trees. The report also contains a comprehensive Terms of Reference (TOR) – appendix IV - to be used by the project proponent for an elaborate RAP immediately before the construction phase.

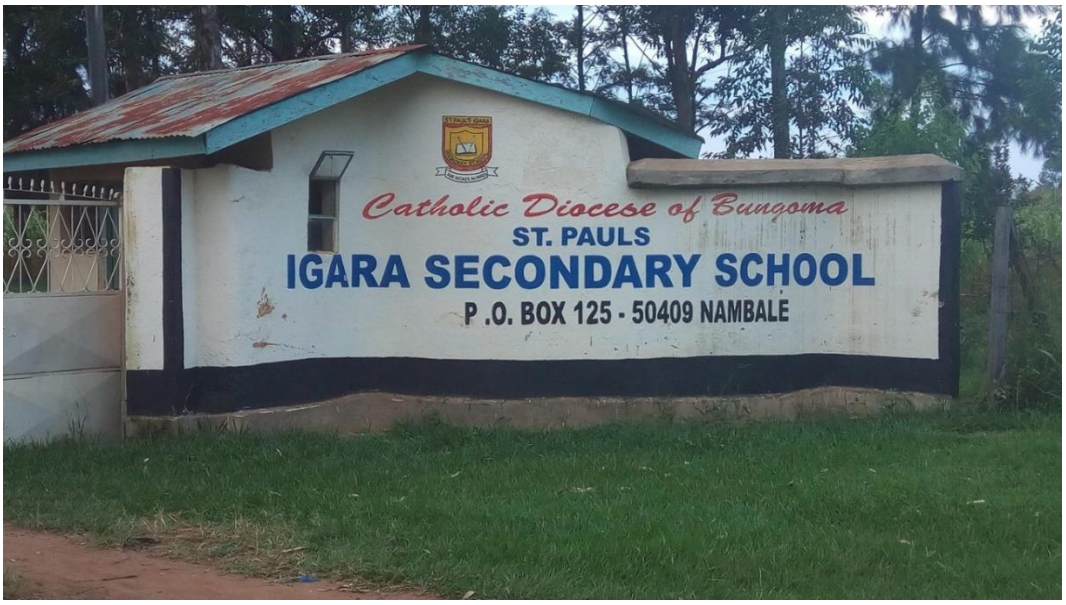
6.5: RESULTS

6.5.1; Results Summary

From the census results, the 40m corridor over the distance of 123km of the transmission line will affect a total of 1,061 households. The transmission line will affect a total of 872 acres of land at an approximated cost of Ksh. 174,344,644. A total of 426 different types of structures will have to be relocated and this will cost KETRACO approximately Ksh. 502,200,000 and a total of 1,760 different types of trees will be affected at an approximated cost of Ksh. 14,561,100. Detailed results of the RAP are given in appendix III.

6.5.2; Public Utilities to be affected

The transmission line will affect 3no. schools and a community center consisting of a hospital, a special school, and an Administration Police camp. It is strongly advised that, the proponent reroute the line to avoid these utilities. Introduction of angle points (with small angles of less than 45^0) just before the utilities will remedy the situation.



St. Pauls Igara Secondary School; Myanga

Keyo Kodindo Primary School Bondo

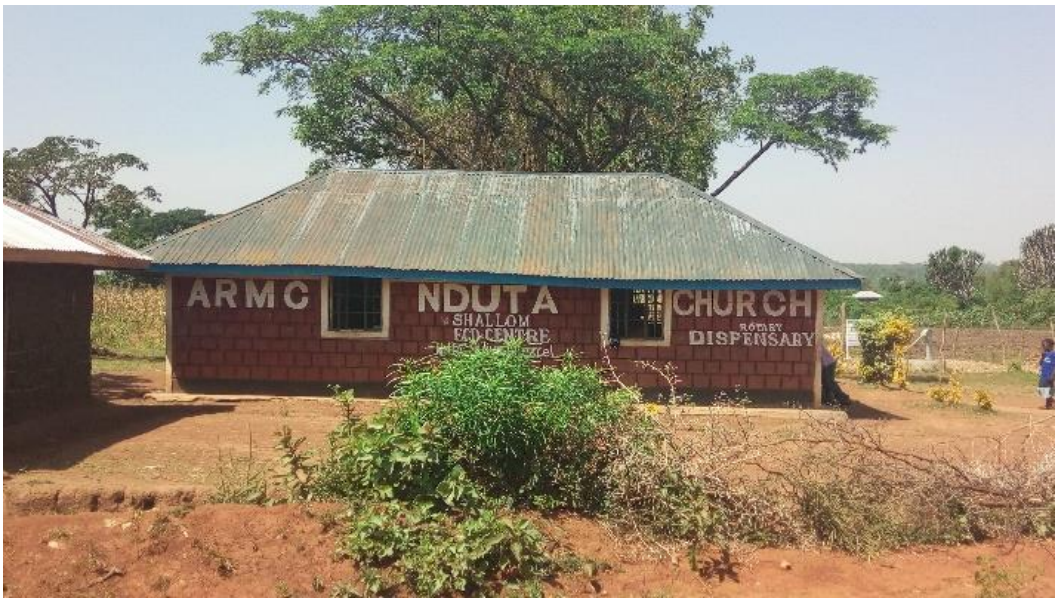
Omboye Primary School, Rarieda

Madiany special school

Madiany Sub-County Hospital

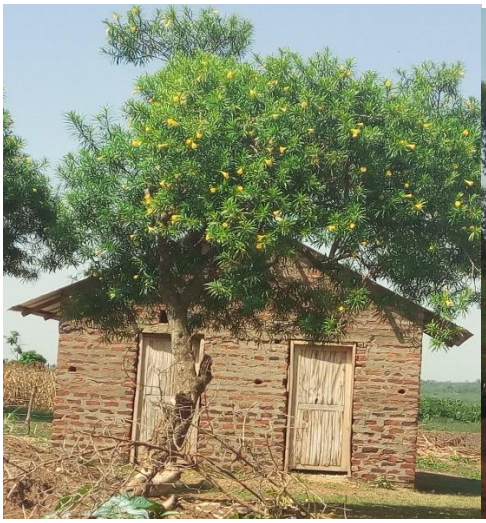
Madiany AP Camp

The line also affects a church but the church faithful were of the opinion that, if given good compensation they can build a better church in the same compound but outside the way-leave corridor.



6.5.3; Housing typologies amongst the PAPs

The type of housing in the project areas are of different kinds including permanent, and semi-permanent houses and huts, toilets and sheds. The following are some of the structures on the way-leave.

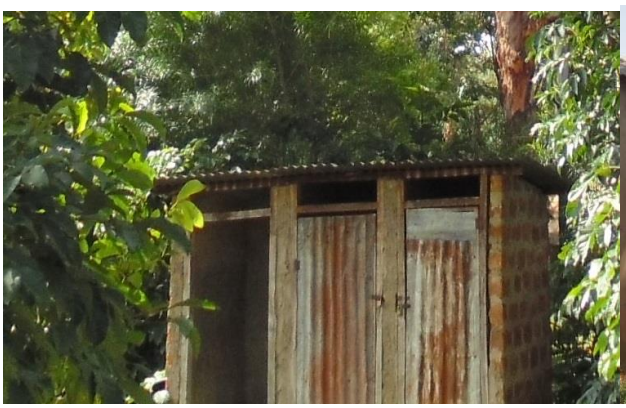











CHAPTER 7: POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECT

7.1: INTRODUCTION

A summary of the main potential impacts of the proposed project based on stakeholders' views; Assessment of the project area and evaluation of project processes, JBIC Environmental Checklist 15: Power Transmission and Distribution Lines; World Bank Project/Site Screening Criteria Worksheet; KETRACO ESIA Screening Form; ADB Guidelines; and consultants' previous experience in undertaking ESIAs is discussed below.

7.2: POSITIVE IMPACTS

Broadly, the identified positive impacts associated with the proposed transmission line project include;.

7.2.1; Reliable and Secure Electricity Power Supply

The project will enhance the adequacy, reliability, and security of electricity power supply in Bungoma, Busia, and Siaya Counties. The Counties at the moment are mainly fed by 33kV distribution lines, and cannot host heavy industries that are power intensive. With a potential for heavy industries in the counties, the need for adequate, reliable, and secure power cannot be overemphasized. The project will also help meet the increasing demand for power supply and minimize the frequency of power outages (blackouts).

7.2.2; Contribute towards reduction in Greenhouse Gas emission

Current electricity power transmission mode in the Counties is mainly through 33kV distribution lines. Studies show that, the 33kV distribution lines loose up to 30 per cent of the power they transmit. High voltage transmission lines on the other hand are efficient and hardly lose any power they are transmitting. The project therefore, will contribute towards saving power loses which translates to reduced generation of excess power (lost during transmission) and therefore a reduction in the generation of greenhouse gasses. The project will further eliminate the need for diesel generated power and reduce dependence on fuel-wood. This will again help reduce emission of greenhouse gasses.

7.2.3; Contribute towards lowering the cost of electricity

The project as stated above will help reduce transmission loses by about 30 percent. This will translates into reduced power production costs and as a consequence the final power tariffs per kilowatt hour charged to Kenya Power customers.

7.2.4; Employment Opportunities

The construction of the proposed project will create employment opportunities for both skilled and unskilled personnel. The proponent has committed to ensure that priority is given to the local community.

7.2.5; Contribution towards reduction of environmental pollution

Studies show that, the dominant energy source in the county is fuel-wood. The project will provide alternative energy source and thus reduce reliance on fuel-wood thereby contributing towards among others, the national goal of meeting the minimum forest cover

7.2.6; Gains in the Local and National Economy

Expected gains in the local and national economy from the construction and operation of the proposed project will be in the form of consumption of locally available materials including: fine and course aggregates, timber, cement, glass, metal, and among other construction materials; taxes levied from contractors and employees; and income from business associated with the project.

7.2.7; Informal Sector Benefits

The project will require supply of large quantities of building materials most of which will be sourced locally. It will also spur the growth of small business enterprises including kiosks to serve construction workers and employees, barbershops, mills, cell phone charging, photocopying shops among others.

7.2.8; Development of Other Sectors

Increase in reliability and security of power supply in the region will enhance efficiency and productivity of other sectors including health, education, water supply, agriculture and livestock production, industry, etc.

7.2.9; Security

With increased lighting in the project area and presence of guards on the project site the security of the area will be enhanced.

7.3: NEGATIVE IMPACTS

The following negative impacts are also associated with the proposed project.

7.3.1; Noise Pollution

The construction and decommissioning works of the project will most likely be noisy due to the moving machines (mixers, tippers, drilling etc) and incoming vehicles to deliver construction materials to site or take away debris.

7.3.2; Generation of Exhaust Emissions

Exhaust emissions are likely to be generated by the motored equipment during the construction and decommissioning phase of the proposed project. Motor vehicles that will be used to ferry construction materials, take away debris during decommissioning phase or those used for general operation activities (operation phase) will also have impacts on air quality

7.3.3; Dust Emissions

Dust emission is likely to occur during the site clearance, excavation and spreading of the topsoil during construction of the substations and excavation of foundation for steel towers. They are also likely to occur during the decommissioning phase. Motor vehicles accessing the site may also lead to dust emissions.

7.3.4; Solid and Liquid Waste Generation

It is expected that solid waste will be generated in all phases of the project. The generated waste will include; drums, paper, plastic, cables, metal, transformers, capacitors, drywall, wood, glass, paints, adhesives, sealants, fasteners, wastewater etc

7.3.5; Oil Spill Hazards

Motorized machinery on the proposed site may be containing moving parts which will require continuous oiling to minimise the usual corrosion or wear and tear. There is also a potential for oil spills and accidents during oil transportation, storage and operations of the transformers and batteries.

7.3.6; Destruction of Existing Vegetation and Habitats

The project will require a way-leave of 40 meters width for the 123km. Within the way-leave, selective clearing of vegetation will be necessary to (1) remove any tall trees that pose a risk to the transmission line, (2) give way for the construction of the towers; and (3) give room for workers to do survey work and stringing of the transmission line. Also vegetation within sections of the substations that will hold the power lines and buildings will be cleared.

7.3.7; Disturbance of Faunal Species

The potential impacts to faunal species are restricted to disturbance of their habitats, their feeding, breeding and general movements. Disturbance could also be caused by presence of labour force, poaching, noise and vibration. Overall, the impact on wildlife during construction is considered low to insignificant.

7.3.8; Avifauna Mortalities

During the assessment, various types of avifauna were recorded. The transmission line therefore, is quite likely to have impacts on the birds. Avifauna mortality by power lines can either be due to bird electrocution or bird strikes by the conductors. The separation between the conductors of the transmission line shall be a minimum of 30m and therefore, bird electrocution will be highly unlikely. Bird strike by the conductors is however, likely and in a few circumstances may lead to mortality.

7.3.9; Impacts on Workers' and Community Health and Safety

Workers and community members in the project area may be exposed to various risks and hazards including falling from height during construction of towers (may lead to fatality), falling objects, collapsing of excavations, road accidents, slips and trips, flammable and explosive substance, electrical shocks, dust, noise and vibrations, poor hygiene, fire, bruises and cuts, etc

7.3.10; Soil Erosion

There are possibilities of soil erosion occurring during the construction stage of the project especially during rainy and windy seasons. Where the transmission line pass near wetlands, soil erosion may lead to deposition in the watercourses and other wetlands causing siltation.

7.3.11; Visual and Aesthetic Impacts

The physical presence and profile of the proposed project will alter the visual and aesthetic effects of the surrounding area.

7.3.12; Incidences of Electrocution

Various stakeholders were concerned by the fact that, the project may lead to members of the community being electrocuted. Some were even worried that, touching the pylons may lead to electrocution. While it is true that the proposed project will be dealing with electricity, the safety design of the project leaves very little chance of electrocution. The conductors are 30m high, the towers at some height are surrounded by barbed wire and have clear danger warnings to deter people from climbing, and should a tower collapse or a conductor snap, a signal is sent in seconds which results in an immediate shut down.

7.3.13; Perceived Danger of Electrostatic and Magnetic force

Electric power lines are considered a source of power frequency, electric and magnetic fields, which may have a perceived health effect. The strength of both electric and magnetic fields is a function of the voltage and the lateral distance from the power lines to the receptor. Many studies published during the last decade on occupational exposure to Electro-Magnetic Fields (EMF) have exhibited a number of inconsistencies and no

clear, convincing evidence exists to show that residential exposures to electric and magnetic fields are a threat to human health. However, the EMF decrease very rapidly with distance from source and there should be no potential health risks for people living outside of 40m corridor.

7.3.14; Increase in Social Vices

With an increase in the population of the area boosted by the project employees the social set up of the area will be affected. This change may be in the form of loose morality, an increase in school drop-out due to cheap labour, child labour, and increased incidences of HIV/AIDS and other communicable diseases.

7.3.15; Cultural Heritage and Archaeological Finds

Though not identified during the EIA assessment, the transmission line may traverse through cultural heritage areas. Further, during excavations for the tower bases, workers may come across Archaeological finds.

7.3.16; Land take – Resettlement and Loss of Use

As mentioned earlier, the proposed project will require a corridor of 40m width. Within the 40m corridor, no structures or tall trees are allowed. All other forms of land use including grazing and farming are allowed. Resettlement and loss of land use for this particular project is therefore, highly likely.

7.4: PROPOSED MITIGATION MEASURES

The following are proposed mitigation measures to avoid, offset or minimize the identified negative impacts.

7.4.1; Noise Pollution

Ensure that noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum for the safety, health and protection of workers within the vicinity of site and nearby communities. The contractor will adhere to the EMCA Noise and Excessive Vibration Pollution Control Regulation, 2009 and will be required to implement noise control measures amongst exposed work force and community. This will include provision of hearing protective devices such as ear plugs and ear muffs; avoiding construction or demolition activities during the night, education and awareness programmes and creation of a buffer to propagate against noise pollution among other noise control measures.

7.4.2; Generation of Exhaust Emissions

To mitigate against exhaust emissions, the proponent is advised to sensitise truck drivers and machine operators to switch off engines when not in use; regularly service engines and machine parts to increase their efficiency and reduce generation of exhaust emission; and where feasible use alternative non-fuel construction equipment.

7.4.3; Dust Emissions

The proponent will endeavour to minimize the effect of dust on the surrounding environment resulting from site clearance, excavation, spreading of the topsoil, demolition works and temporary access roads to ensure protection of health and safety of workers and communities. Control measures will include, use of PPE; regular sprinkling of water on dusty areas and temporary access roads; and observing set speed limits among other measures.

7.4.4; Solid and Liquid Waste Generation

To avoid waste generation or to minimize the amount of waste generated, the following measures are recommended;

- use of an integrated solid waste management system i.e. the 3 R's: Reduction at source, Reuse and Recycle;
- accurately estimate the dimensions and quantities of materials required;
- use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time;
- providing facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage;
- use of building materials that have minimal or no packaging to avoid the generation of excessive packaging waste;
- providing waste collection bins at designated points on site;
- disposing waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws.
- drainage and effluent from storage areas, workshops and camp sites shall be captured and treated before being discharged into the drainage system in line with applicable government water pollution control regulations;
- construction waste shall not be left in stockpiles along the road, but removed and reused or disposed of on a regular basis
- proper procedures for the management of human waste will be put in place in order to prevent outbreak of diseases;
- place in strategic places signs against littering and dumping of wastes;
- audits waste generation and develop Waste Reduction Action Plans (WRAP).

7.4.5; Oil Spill Hazards

The proponent will endeavour to prevent petroleum products used in the substations which include bitumen, oils, lubricants and gasoline from contaminating soils and water resources (ground and surface water). To accomplish this, the proponent will;

- install oil trapping equipment in areas where there is a likelihood of oil spillage;
- collect the used oils and re-use, re-sell, or dispose of appropriately using expertise from licenced waste handlers;
- prepare a written substations response plan and display it on strategic areas and train workers on specific procedures to be followed in the event of a spill;
- immediately institute clean up measures in case of an oil spill;
- design the substations to have spill prevention and detection systems to protect the environment especially where the transformers will be located;
- design appropriate protection devices against accidental discharge of transformer oil substances;
- route drains through an oil/water separator;
- ensure regular inspection and maintenance of the transformers to minimize spillage;
- ensure that all waste oils from maintenance of transformers and other associated equipment should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan.

7.4.6; Destruction of Existing Vegetation and Habitats

To minimize destruction of existing vegetation and habitats, the proponent will;

- conduct selective clearing of vegetation on the way-leave corridor. Avoid unnecessary vegetation clearing; only tall trees that pose a danger to the transmission line and vegetation on the foot plinth of the tower to be removed.
- specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage;
- with assistance from community, KFS and KWS, KETRACO to initiate a tree planting exercise. School Greening Programmes in schools that are along the transmission line would be very useful.
- On the un-used portions of the acquired substations land; design and implement an appropriate landscaping programme for the substations site;

7.4.7; Disturbance of Faunal Species

To minimize effects on faunal species

- Ensure no worker engage in acts of poaching
- Restrict construction to day time
- Observe applicable Game Reserve regulations
- Bush clearing to be selective. Only tall trees on the wayleave corridor or vegetation on the footprints of the towers to be removed
- Consult the local KWS officer and conservancy owners to advice on construction timings to avoid disturbing wildlife.

7.4.8; Avifauna Mortalities

To minimize bird collisions leading to their mortality, the proponent will undertake wire marking to alert birds of the presence of power lines, allowing them time to avoid collision and will build raptor platforms for bird roosting and nesting

7.4.9; Impacts on Workers' and Community Health and Safety

The proponent will implement all necessary measures to ensure health and safety of the substations workers and the general public during construction, operation and decommissioning of the proposed substations as stipulated in the Occupational Safety and Health Act, 2007

7.4.10; Soil Erosion

To reduce soil erosion, the proponent will;

- apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil;
- ensure that construction vehicles are restricted to use existing graded roads;
- implement a storm water management plan that minimizes impervious area infiltration by use of recharge areas and
- use of detention and/or retention with graduated outlet control structure will be designed.

7.4.11; Visual and Aesthetic Impacts

To reduce impacts on visual and aesthetic values of the area, the project proponent will;

- undertake extensive public consultation during the planning of the project;
- design structures at the site in such a way as to improve the beauty of the surroundings;
- restore site areas through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to re-introduce visual barriers;
- design and implement an appropriate landscaping programme.

7.4.12; Incidences of Electrocution

To reduce incidences of electrocution, the proponent will;

- ensure strict adherence to the safety designs established;
- put in place a maintenance system to ensure physical integrity of project components;
- ensure that access to the live sections of the project should only be by authorization and trained personnel;
- erect a perimeter fence on substations to deny unauthorized people access the substations;
- place warning signs on strategic places;
- conduct periodic awareness and sensitization campaigns for the neighbouring communities.

7.4.13; Perceived Danger of Electrostatic and Magnetic force

The proponent will conduct education and awareness campaigns to dispel fear among community on the effects of electrostatic and magnetic forces

7.4.14; Increase in Social Vices

To minimize project effects on local social set up, the proponent will;

- conduct periodic sensitization forums for employees on ethics, morals, general good behavior and the need for the project to co-exist with the neighbours;
- offer guidance and counseling on HIV/AIDS and other STDs to employees;
- provide condoms to employees; and
- ensure enforcement of KETRACO's policy on sexual harassment and abuse of office.

7.4.15; Cultural Heritage and Archaeological Finds

Upon discovery of a heritage site or an Archaeological find, the construction site will be stopped, the site if possible will be restricted using tapes or local materials, and relevant authorities including local administration officers and the museums of Kenya informed for further instructions.

7.4.16; Land take – Resettlement and Loss of Use

- Conduct a detailed and elaborate RAP
- Conduct consultation meetings with Project Affected Persons
- Ensure timely compensation for loss of property and land use.
- Ensure adherence to country legal legislations and World Bank Safeguard Policy 4.12 on Involuntary Resettlement

CHAPTER 8: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

8.1: ESMP FOR THE CONSTRUCTION PHASE

Table 8.1: ESMP for the construction phase of the proposed project

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Minimization of Noise and Vibration				
Noise and vibration	**1.** Sensitise construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	KETRACO & Contractor	Entire construction period	0
	2. Sensitise construction drivers to avoid running of vehicle engines or hooting	KETRACO & Contractor	Entire construction period	0
	3. Regular servicing of engines and machine parts to reduce noise generation	KETRACO & Contractor	Entire construction period	0
	4. Ensure that all generators and heavy duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels.	KETRACO & Contractor	Entire construction period	Design cost
	5. Trees to be planted around the site to provide some buffer against noise propagation	KETRACO & Contractor	Entire construction period	40,000
	6. The noisy construction works will entirely be planned to be during day time when most of the neighbours will be at work.	KETRACO & Contractor	Entire construction period	0

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	7. Provide necessary PPE to workers who may be exposed to high levels of noise and ensure proper and constant use	KETRACO & Contractor	Entire construction period	Ear plugs and ear muff @5000 each
	8. All construction equipment and machinery to be used must be tested to verify if they are compliant with Kenya and the internationally acceptable standards of noise.	KETRACO & Contractor	Entire construction period	
2. Abate Air Pollution				
Dust emission	**1.** Ensure strict enforcement of on-site speed limit regulations	KETRACO & Contractor	Entire construction period	0
	2. Avoid excavation works in extremely dry weather			0
	3. Sprinkle water on graded access routes when necessary to reduce dust generation by construction and vehicles			100,000
	4. Stockpiles of earth should be enclosed / covered / watered during dry or windy conditions to reduce dust emissions			0
	5. PPE to be provided to employees and ensure proper and constant use			Dust coats and dust masks@5000 per employee
Exhaust emission	**1.** Sensitise truck drivers and machine operators to switch off engines when not in use			0
	2. Regular servicing of engines and machine parts to reduce exhaust emission generation			0
	3. Alternative non-fuel construction equipment shall be used where feasible			0

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
3. Minimize solid and liquid waste generation and ensure efficient waste management during construction				
Increased solid waste generation	**1.** Use of an integrated solid waste management system i.e. the 3 R's: 1. Reduction at source 2. Reuse 3. Recycle	KETRACO and Contractor	Entire construction period	0
	2. Accurate estimation of the dimensions and quantities of materials required.			0
	3. Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time			0
	4.Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage			Design cost
	5. Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste			0
	6. Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at site			0
	7. Waste collection bins to be provided at designated points on site			20,000
	8. Dispose waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws.			20,000/month
Generation of wastewater	**1.** Provide means for handling sewage generated at the construction site	KETRACO and	One-off	Design cost

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies	Contractor	Entire construction period	0
	3. Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated			10,000 - quarterly
4. Minimize Oil Spills				
Oil spills Hazards	**1**. Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of vehicles.	KETRACO and Contractor	Continuous	Design cost
	2. In case of an oil spill, immediate clean up measures will be instituted			
	3. Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment to prevent spills and the contamination of soil, ground and surface water		One-off	10,000
	4. A written substations response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill.		One-off	0
	5. Collected used oils should be re-used, disposed of appropriately by licenced waste handlers, or be sold for reuse to licensed firms		Continuous	10,000 per month
5. Minimize vegetation disturbance at and or around construction site				

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Destruction of existing vegetation and habitat	**1.** Conduct selective clearing of vegetation on the way-leave corridor. Avoid unnecessary vegetation clearing; only tall trees that pose a danger to the transmission line and vegetation on the foot plinth of the tower to be removed.	KETRACO and Contractor	Continuous	0
	2. Ensure proper demarcation and delineation of the project area to be affected by construction works.			0
	3. Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage.			0
	4. Designate access routes and parking within the site.			0
	5. With Assistant from community, KWS and KFS, initiate a tree planting exercise		Entire construction period	50,000
	6. Design and implement an appropriate landscaping programme for the substations site.			50,000
	7.Support community initiatives in tree planting	KETRACO and community	Entire project period	50,000
6. Minimize Disturbance on faunal species				
Disturbance on wildlife	**1.** Ensure no worker engage in acts of poaching	KETRACO, and Contractor	Entire construction period	0
	2. Restrict construction to day time			
	3. Observe applicable Game Reserve regulations			
	4. Bush clearing to be selective. Only tall trees on the wayleave corridor or vegetation on the footprints of the towers to be removed			

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	5. Consult the local KWS officer and conservancy owners for advice on construction timings to avoid disturbing wildlife.			
7. Minimize occupational health and safety risks				
Impacts on workers' and community health and safety	**1**. Ensure strict compliance with the Occupational Safety and Health Act (OSHA) 2007	KETRACO, DOHSS and Contractor	Entire construction period	100,000
	2. Prohibit access by unauthorized personnel into the construction site			0
	3. Train all employees and regularly sensitize them on safe working procedures			30,000
	4. Periodic community sensitization of the dangers posed by the project		Quarterly during the entire construction period	50,000
	5. Place warning signs where necessary		Whenever necessary	20,000
	6. Provide necessary PPEs to workers		Continuous	20,000
	7. Erect a perimeter fence to enclose the substations		One-time off	Design cost
8. Reduce soil erosion and storm-water runoff				
Soil erosion and storm-water runoff	**1.** Surface runoff and roof water shall be harvested and stored in tanks so that it can be used for cleaning purposes.	KETRACO and Contractor	Entire construction period	20,000
	2. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed.		First quarter	

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	3. Apply soil erosion control measures such as levelling of the project site to reduce run-off velocity and increase infiltration of storm water into the soil.			
	4. Ensure that construction vehicles are restricted to use existing graded roads		Entire construction period	
	5. Ensure that any compacted areas are ripped to reduce run-off.			
	8. Roof catchments will be used to collect the storm water for some substations uses			40,000
	9. Construction of water pans to collect storm water for substations use, tree planting and landscaping.			10,000 per unit
9. Visual and aesthetic impacts				
Visual and aesthetic impacts	**1.**Extensive public consultation during project planning	KETRACO and community	Planning phase	50,000
	2. Structures at the site should be designed in such a way that they will improve the beauty of the surroundings.			
	3. Restore site area through backfilling, landscaping and planting of trees, shrubs and grass on the open spaces to re-introduce visual barriers,		Continuous	50,000
	4. Design and implement an appropriate landscaping programme		Quarter one	20,000
10. Increase in social vices				
Increase in social vices including HIV/AIDS	**1**. Periodic sensitization forums for employees on ethics, morals; general good behaviour and the need for the project to co-exist with the neighbours	Contractor	Entire construction period	50,000

Potential Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Guidance and counselling on HIV/AIDS and other STDs to employees	KETRACO and contractor		10,000
	3. Provision of condoms			10,000
	4. Contractor to have a strong policy on sexual harassment and abuse of office guided by proponent's policy on the same	Contractor	Quarter one	0
11. Cultural Heritage and Archaeological Finds				
Cultural Heritage and Archaeological Finds	**1.** Upon discovery of a heritage site or an Archaeological find, the construction site will be stopped, the site if possible will be restricted using tapes or local materials, and relevant authorities including local administration officers and the museums of Kenya informed for further instructions.	Contractor and KETRACO	Entire construction period	0
12. Land take – Resettlement and loss of use				
Resettlement and loss of use	**1.** Conduct a detailed and elaborate RAP	KETRACO	Continuous	To be determined
	2. Conduct consultation meetings with Project Affected Persons			
	3. Ensure timely compensation for loss of property and land use.			
	4. Ensure adherence to country legal legislations and World Bank Safeguard Policy 4.12 on Involuntary Resettlement			

8.2: ESMP FOR THE OPERATION PHASE

Table 8.2: ESMP for the operation phase of the proposed project

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Abate Air Pollution				
Generation of exhaust emission	**1.** Vehicle idling time shall be minimised	KETRACO	Entire implementation time	0
	2. Regular servicing of engines and machine parts to reduce exhaust emission generation			
2. Minimization of solid and liquid waste generation and ensuring more efficient waste management				
Solid waste generation	**1.** Use of an integrated solid waste management system i.e. the 3 R's: 1. Reduction at source 2. Reuse 3. Recycle	KETRACO	Continuous	0
	2. Provide solid waste handling facilities such as rubbish bags and skips		One-off	20,000
	3. Ensure that wastes generated are efficiently managed through recycling, reuse and proper disposal procedures.		Continuous	0
	4. A private licensed company to be contracted to collect and dispose solid waste on regular intervals			50,000 /year
	5. Place in strategic places signs against littering and dumping of wastes			10,000 /year
	6. Audits on waste generation and			

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	development of Waste Reduction Action Plans (WRAP)			To be determined
Liquid waste generation	**1.** Conduct regular checks for sewage pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies	KETRACO	Continuous	20,000 / annum
	2. Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated			
	3. Audits on liquid waste generation and development of liquid Waste Reduction Action Plans			
Release of sewage into the environment	**1.** Provide adequate and safe means of handling sewage generated at the substations	KETRACO	One-off	40,000
	2. Conduct regular inspections for sewage pipe blockages or damages and fix appropriately		Continuous	0
	3. Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated			0
3. Minimize Oil Spills				
Oil spills Hazards	**1**. Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of vehicles	KETRACO	Continuous	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. In case of an oil spill, immediate clean up measures will be instituted			
	3. The substations should be designed with spill prevention and detection systems to protect the environment especially where the transformers will be located.		One-off	Part of construction cost
	4. Design appropriate protection devices against accidental discharge of transformer oil substances.			
	5. The substations design should provide adequate storage areas for the transformer oil			
	6. Drains should be routed through an oil/water separator		One-off	Part of construction cost
	7. Frequent inspection and maintenance of the transformers should be done to minimize spilling		Continuous	0
	8. A written substations response plan should be prepared and retained on the site and the workers should be trained to follow specific procedures in the event of a spill.		One-off	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	9. The substations operator should ensure the proper containment or collection and disposal for the waste oil or used oil			0
	10. All waste oils from maintenance of transformers and other associated equipment should be segregated and disposed properly by a reputable/registered waste handler in accordance with the waste disposal plan		Continuous	20,000/year
	11. Storage and liquid impoundment areas for fuels, raw and in-process material solvents, wastes and finished products should be designed with secondary containment to prevent spills and the contamination of soil, ground and surface water		One-off	Project construction cost
4. Avifauna mortality				
Avifauna mortalities	**1.** To minimize collisions, undertake wire marking to alert birds to the presence of power lines, allowing them time to avoid the collision	KETRACO	One-off	Part of construction cost
	2. Build raptors platforms for bird roosting and nesting			
5. Minimize occupational health and safety risks				

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
Impacts on workers' and community health and safety	Implement all necessary measures to ensure health and safety of the workers and the general public during operation of the proposed project as stipulated in the Occupational Safety and Health Act, 2007	KETRACO	Continuous	50,000/month
6. Minimize Electrocution Incidents				
Electrocution from live power lines or electric equipment	**1.** Put in place a maintenance system to ensure physical integrity of project equipment is maintained	KETRACO	Planning stage	0
	2 Access to the substations should only be by authorization and trained personnel		Continuous	
	3. Erect a perimeter fence to deny unauthorized people access the substations			
	4.. Clear warning signs to be placed on strategic places			
	5. Conduct periodic awareness and sensitization campaigns for the neighbouring communities		Continuous	20,000/session
7. Electrostatic and magnetic forces				
Perceived danger of Electrostatic and Magnetic force	**1.** Conduct education and awareness campaigns to dispel fear among community on the effects of electrostatic and magnetic forces	KETRACO	Continuous	20,000 / annum

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
8. Increase in social vices				
Increase in social vices including HIV/AIDS	**1**. Periodic sensitization forums for employees on ethics, morals; general good behaviour and the need for the project to co-exist with the neighbours	KETRACO	Continuous	30,000/year
	2. Guidance and counselling on HIV/AIDS and other STDs to employees			
	3. Provision of condoms			
	4. enforcement of KETRACO's policy on sexual harassment and abuse of office			

8.3: ESMP FOR DECOMMISSIONING PHASE

Table 8.3: ESMP for decommissioning phase of the proposed project

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
1. Reduction of Noise and vibrations				
Increased noise and vibration	**1.** Install portable barriers to shield compressors and other small stationary equipment where necessary.	KETRACO and Contractor	Continuous	To be determined
	2. Demolish mainly during the day. The time that most of the neighbours are out working.			
	3. Provide appropriate PPE to workers			
	4. Co-ordinate with relevant agencies and neighbouring communities regarding all demolition activities			
2.Abatement of air pollution				
Generation of dust	**1.** Watering all active demolition areas as and when necessary to lay dust.		Continuous	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.	KETRACO and Contractor		
	3. Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at demolition sites.		One-off	10,000
	4. Provide appropriate PPE to all workers		Continuous	Dust coats and dust masks@5000 per employee
Generation of exhaust emission	**1.** Vehicle idling time shall be minimised	KETRACO and Contractor	Continuous	0
	2. Regular servicing of engines and machine parts to reduce exhaust emission generation			
3. Waste management				
Demolition waste	**1.** Use of an integrated solid waste management system i.e. through a hierarchy of options: 1.Source reduction 2.Reusing 3. Recycling 4.Incineration 5. Sanitary land filling.	KETRACO and Contractor	Continuous	0
	2. All machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible or they be taken to a licensed waste disposal site	KETRACO and Contractor	One-off	0

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	3. Dispose waste more responsibly by contracting a registered waste handler who will dispose the waste at designated sites or landfills only and in accordance with the existing laws.	KETRACO and Contractor	Continuous	Cost borne by the contractor
4. Oil spills				
Oil spills Hazards	**1**. Install oil trapping equipment in areas where there is a likelihood of oil spillage e.g. during maintenance of construction facility and vehicles.	KETRACO and Contractor	Continuous	0
	2. In case of an oil spill, immediate clean up measures will be instituted			
	3. Close surveillance of the fuel and cooling oil store			
5. Impacts on workers' and community health and safety				
Health and Safety for workers' and community members	**1**. Ensure strict compliance with the Occupational Safety and Health Act (OSHA) 2007	KETRACO DOHSS and Contractor	Continuous	To be determined
	2. Prohibit access by unauthorized personnel into the demolition site			
	3. Place warning signs where necessary			
6. Rehabilitation of project site				
Vegetation disturbance	**1.** Implement an appropriate re-vegetation programme to restore the site to its original status	KETRACO and community	One-off	50,000

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Ksh)
	2. Consider use of indigenous plant species in re-vegetation			
	3. Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent residential area and the development.			

CHAPTER 9: ENVIRONMENTAL MONITORING PLAN (EMoP)

9.1: ENVIRONMENTAL MONITORING PLAN

Table 9.1: Environmental Monitoring Plan for the proposed project

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
1. Noise and vibration impacts	Daily observation; monthly noise level analysis		Daily observation; monthly noise level analysis	Noise level analysis; quarterly reports on log of vehicle and machine servicing; trees planted; number of (noise) licences given; PPE provided; and sensitization meetings held	KETRACO and Contractor
2. Impacts on air pollution	Daily dust observation; monthly air quality analysis	Monthly air quality analysis	Daily dust observation; monthly air quality analysis	Daily dust observation; quarterly air sampling and lab analysis; quarterly reports on PPE provided; log of vehicle and machine servicing; sensitization meetings held; frequency of sprinkling water	KETRACO and Contractor

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
3. Solid and liquid waste generation	Monthly	Monthly	Monthly	Reports on waste management plans developed; amounts of waste generated; facility provided for handling and storage of waste; methods employed for waste disposal; training meetings held, Waste water quality analysis; Reports on liquid waste management plans developed; number of inspections held to identify leaking or blocked pipes	KETRACO and Contractor
4. Oil spills	Daily	Monthly	Daily	Reports of oil trapping equipment installed; number of oil spill incidents and corrective measures taken	KETRACO and Contractor
5. Destruction of existing vegetation and habitats	Daily			Reports on site zoning program; community initiatives held on tree planting; landscaping programme on re-vegetation implemented	KETRACO and Contractor
6. Disturbance of faunal species	Monthly			Reports on wildlife sighted, meetings with KWS and conservancy owners, bush clearing	KETRACO and Contractor

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
7. Avifauna mortalities		Quarterly		Reports on wire marking and raptor platforms build; incidents of bird strikes	KETRACO and Contractor
8. Health and Safety issues	Daily	Monthly	Daily	Quarterly reports on health and safety plans; SHE training programs; records of any incident, accident; investigation and corrective actions; PPE provided; progress of perimeter wall construction; warnings posted;	KETRACO and Contractor
9. Soil erosion	Daily			Reports on storm water management and soil erosion control plans developed; amounts of run-off and roof water harvested; water harvesting and storage facilities installed	KETRACO and Contractor
10. Visual and aesthetic impacts	Quarterly			Reports on public consultation held; landscaping programme designed and implemented	KETRACO and Contractor

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
11. Electrocution incidences		Quarterly		Reports on maintenance system developed; electrocution accidents occurrence and corrective measures taken; visitors and employees access to the substations log; progress on construction of the perimeter wall; warning signs posted; sensitization workshops held	KETRACO and Contractor
12. Perceived danger of Electrostatic and Magnetic force		Quarterly		Reports on education and awareness campaigns held	KETRACO and Contractor
13. Increase in social vices	Monthly	Monthly		Reports on sensitization forums held; sessions held on guidance and counselling on HIV/AIDS and other STDs; number of condoms issued	KETRACO and Contractor
14. Cultural Heritage and Archaeological Finds	Monthly			Reports on heritage areas and archaeological finds found	KETRACO
15. Land take - Resettlement and Loss of use	Monthly			Reports on RAP implementation including compensation for land, structures and crop/trees damage	KETRACO

Monitoring scope	Frequency			Methodology	Responsible entity
	Construction	Implementation	Decommissioning		
16. Rehabilitation of project site			Monthly	Reports on re-vegetation programme developed and implemented; number and species of trees planted	KETRACO and Contractor

CHAPTER 10: RECOMMENDATIONS AND CONCLUSION

10.1: INTRODUCTION

An Environmental Management Plan (EMP) for the project has been developed to ensure sustainability of the site activities from construction through operation to decommissioning. The plan provides a general outlay of the activities, associated impacts, and mitigation action plans. Implementation timeframes and responsibilities are defined, and where practicable, the cost estimates for recommended measures are also provided.

A monitoring plan has also been developed and highlights some of the environmental performance indicators that should be monitored. Monitoring creates possibilities to call to attention changes and problems in environmental quality. It involves the continuous or periodic review of operational and maintenance activities to determine the effectiveness of recommended mitigation measures. Consequently, trends in environmental degradation or improvement can be established, and previously unforeseen impacts can be identified or pre-empted.

It is strongly recommended that a concerted effort is made by the site management in particular, to implement the Environmental Management and Monitoring Plan provided herein. Following the commissioning of the 132Kv transmission line and substations, statutory Environmental and Safety Audits must be carried out in compliance with the national legal requirements, and the environmental performance of the site operations should be evaluated against the recommended measures and targets laid out in this report.

It is quite evident from this study that the construction and operation of the proposed transmission line project will bring positive effects in the project area including improved supply of electricity, cleaner environment, creation of employment opportunities, gains in the local and national economy, provision of market for supply of building materials, Informal sectors benefits, Increase in revenue, Improvement in the quality of life for the workers and community members, and Improved security.

Considering the proposed location, construction, management, mitigation and monitoring plan that will be put in place, the project is considered important, strategic and beneficial and given that no immitigable negative impacts were encountered and that no community objection was received, the project may be allowed to proceed.

10.2: RECOMMENDATIONS

Following the impact analysis presented in the previous sections, the following recommendations were made

- The proposed project to be implemented in compliance with the relevant legislation and planning requirements
- The proponent to ensure implementation of the mitigation measures provided in the ESMP
- The proponent to conduct and implement a detailed and elaborate Resettlement Action Plan
- The proponent to monitor implementation of the ESMP using the developed ESMoP
- The proponent to conduct annual Environmental Audits and submit to NEMA
- NEMA to consider, approve and grant an Environmental Impact Assessment License to the proponent

10.3: CONCLUSION

From the foregoing, it is noted that;

- no immitigable negative impacts were encountered
- No objection from the community was received
- Identified potential negative impacts can be mitigated
- Benefits to the community, region, and the country at large are immense

The ESIA team, therefore, recommends to NEMA to consider, approve and grant an **Environmental Impact Assessment License** to the proponent and the proponent to implement the project with strict adherence to the proposed ESMP

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