KENYA ELECTRICITY GENERATING COMPANY LTD.

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT STUDY REPORT

FOR

THE PROPOSED 132 kV OVERHEAD ELECTRICITY TRANSMISSION LINE TO SUPPLY POWER TO THE KENGEN INDUSTRIAL PARK AT OLKARIA IN NAIVASHA SUB-COUNTY, NAKURU COUNTY

JUNE, 2018

Proponent: Kenya Electricity Generating Company Limited (KenGen).

Assignment: Environmental and Social Impact Assessment Study for the Proposed 132 kV Overhead Electricity Transmission line to the KenGen Industrial Park.

Report Title: Environmental and Social Impact Assessment Study Report for the Proposed 132 kV Overhead Electricity Transmission Line to Supply Power to the KenGen Industrial Park at Olkaria in Naivasha Sub-County, Nakuru County.

ESIA TEAM MEMBERS:

Name	Qualifications	NEMA Reg. No.
Philip Juma Barasa	BSc. Environmental Science and MSc. Geothermal Energy Technology.	Lead Expert No.1857
Douglas Gichangi	BSc. Environmental Conservation and Natural Resource Management.	Associate Expert No. 8118
Gideon Kaile Lolim	BA. Community Development and Post Graduate Diploma in Education.	Not Registered
Rolex A. Rang'ang'ah	BSc. Environmental Studies.	Not Registered
Johannes Onjala Ochome	BSc. Electrical & Electronics Engineering and Post Graduate Diploma in Geothermal Energy Utilization.	Not Registered
Andrew Mbaji	BSc. Electrical and Electronics Engineering.	Not Registered
David M. Kahoro	BSc. Environmental & Biosystems Engineering.	Associate Expert No. 7983

Declaration by the Lead EIA/Audit Expert

I, **Philip Juma Barasa**, the Lead EIA/Audit Expert, hereby confirm that this report represents the findings of the ESIA study conducted for the proposed 132 kV overhead electricity transmission line to the KenGen Industrial Park at Olkaria in Naivasha Subcounty, Nakuru County.

Name and Address of the Lead Expert
Philip Juma Barasa
P.O Box 785-20117
NAIVASHA

Tel: +254 724 455 061

Signed: _____ 29-06-2018.

EIA/EA Lead Expert **Date**

NEMA Reg. No. 1857

Name and Address of Proponent

Kenya Electricity Generating Company Ltd (KenGen)
Stima Plaza, Kolobot Road, Parklands
PO Box 47936-00100
NAIROBI

Tel: + 254-20-3666000

Email: jwere@kengen.co.ke

Signed: _____ 29/6/2018

For: KenGen **Date**

Environment & CDM Manager

Designation

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ACRONYMS

°C	Degrees Celsius
µm	Micrometres
AC	Alternating Current
ACS	Aluminum Clad Steel
ACSR	Aluminum conductor, steel reinforced
ASTM	American Society for Testing and Materials
API	Application Program Interface
ASME	The American Society of Mechanical Engineers
CCITT	Consultative Committee for International Telegraphy and Telephony
CDCF	Community Development Carbon Fund
CO_2	Carbon Dioxide
CSR	Corporate Social Responsibility
CT	Current Transformer
DBH	Diameter at Breast Height
dB (A)	Decibels A-weighted
DCC	Deputy County Commissioner
DCS	Distributed Control System
DLMS	Device Language Message Specification
E	East
EA	Environmental Audit
ECD	Early Childhood Development
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EMCA	Environmental Management and Coordination Act
EMF	Electromagnetic Field
EMS	Environmental Management Systems
EPA	Environmental Protection Agency
ERC	Energy Regulatory Commission
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FDI	Foreign Direct Investment
FRP	Fibre Reinforced Plastic
g/m^2	Grams per Meters Square
GDC	Geothermal Development Company

GDP	Gross Domestic Product
GH_z	Gigahertz
GoK	Government of Kenya
GPS	Global Positioning System
H	Height
Ha	Hectares
H_2S	Hydrogen Sulphide Gas
HGNP	Hell's Gate National Park
HIV	Human Immunodeficiency Virus
HMI	Human Machine Interface
HV	High Voltage
IAEA	International Atomic Energy Agency
IBA	Important Bird Area
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	Industrial Park
IPP	Independent Power Producer
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
KCAA	Kenya Civil Aviation Authority
KEBS	Kenya Bureau of Standards
KenGen	Kenya Electricity Generating Company
KERRA	Kenya Rural Roads Authority
KETRACO	Kenya Electricity Transmission Company
KFS	Kenya Forest Service
KIP	KenGen Industrial Park
Km	Kilometres
KPLC	Kenya Power and Lighting Company
KV	Kilovolts
KWS	Kenya Wildlife Service
LANAWRUA	Lake Naivasha Water Resource Users Association
LCPDP	Least Cost Power Development Plan
LNRA	Lake Naivasha Riparian Association

m	Metres
m/s	Meters per second
masl	Metres above sea level
mg/m^3	Milligrams per meters cubed
MoU	Memorandum of Understanding
MWe	Megawatt electric
Mwh	Megawatt Hour
N	North
NCG	Non-condensable Gases
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organization
OLTC	On-Load Tap Changer
OPGW	Optical Ground Wire
OW	Olkaria Well
OWS	Oserengoni Wildlife Conservancy
PAPs	Project Affected Persons
PLC	Primary Locked Circuit
PM	Particulate matter in air
PM_{10}	Particulate matter of particle sizes 10 micrometres and below
$PM_{2.5}$	Particulate matter of particle sizes 2.5 micrometres and below
ppm	Parts per million
Prod	Production
QMS	Quality Management Systems
R	Re-injection
RAP Land	Resettlement Action Plan land
S	South
SCADA	Supervisory Control and Data Acquisition
SCC	Stakeholder Coordination Committee
SEA	Strategic Environmental Assessment
SO_2	Sulphur dioxide
SPM	Suspended Particulate Matter
STDs	Sexually Transmitted Diseases
SUDS	Sustainable Drainage Systems
ToR	Terms of Reference
UNEP	United Nations Environment Programme

UNFCCC	United Nations Framework Convention on Climate Change
Uw/Wt	Unit Weight per Weight
VU	Vulnerable
W	West
WRA	Water Resources Authority

EXECUTIVE SUMMARY

The manufacturing sector is one of the key pillars of the Kenya Vision 2030. The Vision aims to encourage a "robust, diverse and competitive" manufacturing sector. One of the big four agenda, aimed at accelerating economic growth in Kenya, is the manufacturing industry. Electricity is an important input in the manufacturing processes and hence the Government of Kenya has made tremendous efforts in improving electricity generation in the country. However, even if power is available, poor transmission and distribution infrastructure leads to erratic power supply and outages in the country. Further, the quality of electricity supplied is also a major concern for high voltage and bulk consumers. In order to encourage affordable, reliable, quality and sustainable electricity for manufacturing industry in Kenya, the government has recognized the need to allow generators of electricity to sell wat they generate to bulk electricity consumers.

Kenya Electricity Generating Company Limited (KenGen) generates more than 65% of electricity consumed in Kenya. The Company owns thirty-two (32) power generating plants with a combined installed capacity of 1,630 MWe from generation modes comprising hydro (50%), thermal (15%), geothermal (33%) and wind (2%) technologies. Geothermal energy is considered a renewable energy resource that does not emit greenhouse gases into the atmosphere. The energy is reliable and less affected by vagaries of weather. KenGen currently generates 531.1 MWe of geothermal energy from Olkaria Geothermal Field and 2.4 MWe from Eburru Geothermal Field. The Company owns and operates four geothermal power plants at Olkaria namely 45MWe Olkaria I (Units 1, 2,3) commissioned between 1981 and 1985, 105 MWe Olkaria II (Units 1,2,3) units 1 & 2 commissioned in 2003 and unit 3 commissioned in 2010, 150MWe Olkaria IV commissioned in 2014 and 150MWe Olkaria I AU 4 & 5 commissioned in 2015. In addition, KenGen is generates 81.1MWe from the Olkaria Field by employing well head generating technology.

KenGen is in the process of establishing an Industrial Park at the Olkaria Geothermal Field in Naivasha Sub-county, Nakuru County. This initiative is in line with the Government of Kenya's Industrial Transformation Programme whose focus is on food and beverage (agro-processing), textiles, paper and packaging, apparels, warehousing and trading. The proposed KenGen Industrial Park (KIP) therefore aims at taking advantage of competitively priced geothermal steam and electricity as key economic drivers of industrialization. KenGen intends to distribute and sell part of the geothermal power generated at Olkaria to the manufacturing industries

that will be located within the proposed Industrial Park. In so doing, the manufacturing industries will be attracted to Olkaria thereby reducing energy transmission losses.

Against the above background, KenGen requires to apply, to the Energy Regulatory Commission (ERC), for a license to generate and supply bulk electricity to the industrial locators. However, the application for the license has to be accompanied by the Environmental and Social Impact Assessment (ESIA) study report and license issued by National Environment Management Authority (NEMA). This ESIA study report has been prepared for the proposed 132 kV overhead power transmission line project that will supply bulk electricity to the KIP. The scope of the proposed project will comprise of the following:

i) Substation extension works at the well pad OW-914 substation. This shall include introduction of a 220 kV bus bar, construction of a complete bay for termination of the proposed 132 kV and a new 220/132 kV transformer bay. Additional components shall include; circuit breakers, current transformers and voltage transformers complete with other related switching equipment.

ii) Approximately 20-30 transmission line metallic towers together with 3 phase conductors complete with associated insulation materials as well as an Optical Ground Wire (OPGW) for communication. The towers are to be spaced approximately 250 m – 350 m apart depending on the terrain of the specific areas along the proposed line route.

iii) 132 kV substation to be located near the proposed Industrial Park site for purpose of transforming voltages from 132 kV to 11 kV or 33 kV depending on consumers' requirements. A 132/11 kV or 132/33 kV transformer complete with associated circuit breakers, current transformers, voltage transformers, isolators, surge arrestors among other substation high voltage equipment shall be installed. It shall also include a control room building which shall host the switchgear room and the control and communication equipment.

iv) 11kV or 33kV distribution lines depending on requirements of tenants at the industrial park. These low voltage distribution lines shall be constructed within the industrial park site and terminated at the premises within the park.

The proposed overhead power transmission line project will traverse outside Hell's Gate National Park at the Olkaria domes area in Hell's Gate location, Naivasha sub-county, Nakuru County. The piece of land is owned by KenGen. Land conflict due to acquisition of right of way is hence not envisaged. The length of the proposed power transmission route will be

approximately 7 km from Olkaria wellhead OW-914 to the industrial park site. The proposed project is among the projects listed under the second schedule of Environmental Management and Coordination Act (EMCA), CAP 387. The ESIA study was carried out in accordance with the Environmental (Impact Assessment and Audit) Regulations, 2003. The terms of reference for the study were submitted to NEMA on 15th May, 2018 and upon review, they were approved on 17th May, 2018. The methodology employed in carrying out the ESIA study comprised of the following:

i. Environmental scoping to generate the ToR
ii. Desk review
iii. Field visit and data collection including ecological assessment
iv. Three public barazas
v. Key stakeholders meeting with various professionals and
vi. Data analysis and presentation.

The findings of the ESIA study indicate that the proposed project has the potential of generating positive and negative impacts. The positive impacts include: Provision of employment opportunities, improved supply of reliable and cheaper electricity, promotion of green energy, reduced transmission losses and enhancement of the tax base. The potential negative impacts will be associated with vegetation clearing, handling of hazardous materials, waste management, dust, influx of workers to the proposed project site, gaseous emissions, working at height and contact with energized conductors. The potential negative impacts will include; contamination of soil and surface water, spread of communicable diseases, soil erosion, loss of animal habitat, mortalities of avifauna, injuries, adverse health of workers, public nuisance, climate change and loss of life and/or properties.

All the potential negative impacts can be adequately mitigated thus the project should be considered for approval by NEMA. However, upon approval, the project proponent will need to implement the Environmental and Social Management Plan during the construction and operation phases of the proposed project in order to promote environmentally sustainable development. The ESMP should form part of the selected contractor's obligation as specified under the contract for construction, testing and commissioning of the proposed transmission line project.

CHAPTER 1

1 INTRODUCTION

1.1 Project Background

Kenya Electricity Generating Company Limited (KenGen) is the leading electric power generation company in Kenya. The Company generates about 75 percent of electricity capacity installed in the country. The Company utilizes various sources to generate electricity ranging from hydro, geothermal, thermal and wind. Hydro is the leading source, with an installed capacity of 819.9 MWe, which is 51 per cent of the Company's installed capacity. Geothermal is currently at 533.8 MWe (of which 81.1 MWe is from the innovative wellheads technology) contributing to about 32 per cent of the total installed capacity. The total installed thermal and wind capacity is 253.5 MWe and 25.5 MWe respectively.

Amid the rapid growth of Kenya's economy and Foreign Direct Investment (FDI) in-flows, KenGen has set out to develop an Industrial Park (IP) on a piece of land measuring approximately 453 Ha at Olkaria Geothermal Field in Naivasha Sub-County, Nakuru County. The proposed industrial park will serve as an effective instrument to attract FDIs and to generate employment opportunities. It would thus contribute to community and regional growth and ultimately sustained growth of the national economy as a whole. This development heavily relies on the availability of quality, efficient and reliable electricity supply so as to make business sense to the industrial locators. KenGen intends to sell part of the geothermal power generated at Olkaria to the manufacturing industries that will be located within the proposed Industrial Park. It is against this background that KenGen is proposing to install a 132 kV overhead electricity transmission line to supply power to the Industrial Park site from the existing wellhead substation at well pad OW-914.

1.2 Project Proponent

The project proponent is Kenya Electricity Generating Company Ltd (KenGen) and the registered office and contact addresses are:

Stima Plaza, Phase III,
Kolobot Road, Parklands
P.O. Box 47936 – 00100 Nairobi, Kenya
Tel : +254 20 3666000
Mobile : 0711036000/0732116000/203666000
Web : www.kengen.co.ke
E-mail : jwere@kengen.co.ke

1.3 Project Location

The proposed transmission line project will be located at Olkaria Geothermal Field, Hell's Gate location in Naivasha sub-county, Nakuru County. The transmission line route will start with a terminal tower near the OW-914 wellhead project site and it shall traverse to the proposed industrial park site in the Olkaria domes area. The piece of land for the proposed transmission line route is registered under the name KenGen as land reference number 8396/12. The length of the transmission line will be approximately 7 km. The selected transmission line route lies outside Hell's Gate National Park. The Olkaria RAPland, where the Olkaria IV Projected Affected Persons, were resettled lies to the south of the proposed transmission line route.

1.4 Nature of the Proposed Project and its Objectives

The proposed project will involve construction of a single circuit, 132 kV overhead electricity transmission line to supply power to the proposed KenGen Industrial Park from the existing wellhead substation at well pad OW-914. The objectives of the proposed project is to facilitate supply of bulk power to the KenGen Industrial Park thereby ensuring provision of affordable, reliable, quality and sustainable electricity for the industrial locators.

1.5 Justification of the Proposed Project

Electricity is an important input in the manufacturing processes. In recognition of this fact, the Government of Kenya has made tremendous efforts in improving electricity generation in the country. However, even if power is available, poor transmission and distribution infrastructure leads to erratic power supply and outages in the country. Further, the quality of electricity supplied is also a major concern for high voltage and bulk consumers. This is due to fluctuation in power and power outages which decreases productivity (Kenya Association of Manufacturers, 2018). The manufacturing sector is one of the key pillars of the Kenya Vision 2030, which aims to encourage a "robust, diverse and competitive" manufacturing sector (UNEP, 2015). In order to encourage affordable, reliable, quality and sustainable electricity for manufacturing industry in Kenya, there is need to allow generators of electricity to sell what they produce to bulk electricity consumers. The proposed power transmission project will provide an opportunity for KenGen to supply bulk electricity to manufacturing firms which will be located within KenGen Industrial Park thus enhancing the quality and reliability of electricity.

1.6 Objectives of the Environmental Social Impact Assessment (ESIA) Study

The overall objective of carrying out the ESIA study was to ensure that the anticipated environmental and/or social concerns are integrated in the activities encompassing the proposed project hence contributing to sustainable development. The specific objectives of conducting the ESIA study with respect to the proposed 132 kV power transmission line project were to:

i. Identify the anticipated environmental impacts of the project and the scale of the impacts;
ii. Identify and analyze alternatives to the proposed project;
iii. Propose adequate mitigation measures, for the significant negative impacts, to be taken during and after implementation of the proposed project;
iv. Carry out public consultations and
v. Develop an Environmental and Social Management Plan (ESMP) with mechanisms for monitoring and evaluating compliance and environmental performance of the proposed project.

1.7 Screening of the Proposed Project

Pursuant to section 58 of the Environmental Management and Coordination Act (EMCA) CAP. 387, proponents are required to carry out ESIA studies for projects listed under the second schedule. Item 10 of the second schedule requires ESIA study to be carried out for electric transmission lines above 66 kV. The proposed 132 kV electric transmission line project thus qualified for an ESIA study.

1.8 Terms of Reference (ToR) for the ESIA Study

The Lead ESIA Expert in conjunction with the management of KenGen prepared the ToR for conducting the ESIA study of the proposed 132 kV overhead power transmission project. The ToR were submitted to NEMA on 15th May, 2018 and upon review, they were approved on 17th May, 2018. The detailed ToR together with the confirmation for approval are attached in appendix 1.

The TORs were structured in a way that the ESIA team was in a position to provide the following information in the final ESIA study report.

a) The proposed location of the project;
b) A concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project; the objectives of the project;

c) The technology, procedures and processes to be used in the implementation of the project;
d) The materials to be used in the construction and implementation of the project;
e) The products, by-products and waste generated by the project;
f) A description of the potentially affected environment;
g) The environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;
h) Alternative technologies and processes available and reasons for preferring the chosen technology and processes;
i) Analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies;
j) An Environmental Management Plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures;
k) Provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out activities or major industrial and other development projects;
l) The measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies;
m) An identification of gaps in knowledge and uncertainties which were encountered in compiling the information;
n) An economic and social analysis of the project;
o) An indication of whether the environment of any other state is likely to be affected and the available alternatives and mitigating measures; and
p) Such other matters that the ESIA team felt were of great importance and which may be required by NEMA.

1.9 Structure of the ESIA Study Report

The ESIA study report comprises of a non-technical summary of the proposed project and the ESIA findings. The following are the chapters that form the body of the report.

Chapter 1: Introduction: This chapter provides project background, location, purpose of the study, project objectives, scope, and justification of the project, terms of reference, approach and methodology.

Chapter 2: Project Components and Process Activities: This chapter describes the proposed project in terms of inputs and outputs, cost, design and implementation strategies.

Chapter 3: Description of the Project Environment: The chapter examines the biophysical and socio-economic baseline environment of the proposed project location and the surrounding areas. The salient features include; climate, air quality, noise levels, topography, soils geology, flora, fauna, administrative set up, demography, land use, source of livelihood, education and health profiles among others.

Chapter 4: Legal and Regulatory Framework: This chapter examines the national and international legal and regulatory framework applicable to this project and the institution framework that governs these laws.

Chapter 5: Analysis of Project Alternatives: This chapter provides information on the various alternatives considered for the proposed project in terms of location, technology and design.

Chapter 6: Public Consultations and Disclosure: This chapter describes the public consultation approach and the outcome of the stakeholder forums held.

Chapter 7: Potential Environmental and Socio-economic Impacts and Mitigation Measures: The chapter analysis the anticipated positive and negative impacts associated with the proposed project. It further provides mitigation measures for the anticipated negative impacts.

Chapter 8: Environmental & Social Management and Monitoring Plan: This chapter provides the Environmental and Social Management Plan (ESMP) and the Environmental and Social Monitoring Plan arising from the negative impacts associated with the proposed project.

Chapter 9: Conclusion and Recommendations: The chapter provides information on the conclusions and recommendations based on the findings of the ESIA study.

References: All literature materials and secondary data used for this study have been acknowledged in the references

Appendices: The appendices contain relevant supporting documents.

1.10 ESIA TEAM MEMBERS

The ESIA study was conducted by a multidisciplinary team of professionals listed below.

i.	Philip Barasa	Environmental Scientist/Geothermist
ii.	Douglas Gichangi	Ecologist
iii.	Gideon Kaile Lolim	Social Expert
iv.	Johannes Onjala Ochome	Electrical & Electronics Engineer
v.	Andrew Mbaji	Electrical Engineer

vi.	Rolex A. Rang'ang'ah	Environmental Scientist
vii.	David M. Kahoro	Environmental & Biosystems Engineer

1.11 Approach and Methodology

1.11.1 General Approach

The ESIA study was carried out through desktop studies, field visits and stakeholder engagement forums.

1.11.2 Methodology

The ESIA study was conducted in accordance with the provisions of the Environment (Impact Assessment and Audit) Regulations, 2003. The methodology employed to collect, analyse and present the findings was as detailed below.

i. **Environmental scoping:** This was the initial step that helped the ESIA team to narrow down to the most critical issues requiring attention during the study. The process entailed field visit and meetings with the management of KenGen and other relevant stakeholder. The output of this stage was the ToRs that were developed and approved by NEMA.

ii. **Desk review:** This involved indoor review of the documented baseline information on the project area, project design documents and relevant legislations and guidelines among others.

iii. **Field visit and data collection:** This involved collection of primary data from the area covered by the proposed power line route. The information comprised of; flora, fauna, noise levels and the quality of air, water, soil and vegetation. Interviews were conducted with relevant line ministries to collect information on the socio-economic profile. Ecological assessment was carried out using the belt transect sampling technique. Hand held Global Positioning System (GPS) devices, were used for navigation to and from the centre point. The terrain, habitat condition, natural and man-made features were physically observed and described. Flora and fauna species were identified by the ecologist with the help of suitable reference sources. Digital cameras were used to take photos of the major features and species for desktop identification at a later stage. Vegetation structure and density was estimated based on percentage of canopy cover and Diameter at Breast Height (DBH).

iv. **Public barazas:** Three public barazas were held i.e at RAPland, where the Olkaria IV Project Affected Persons were resettled, on17th May 2018, Kamere Trading Centre on

17th May 2018 and Olomayiana Kubwa village on 18th May 2018. All public barazas were chaired by the area Assistant Chief, Olkaria sub-location.

v. **Key stakeholders consultative meeting:** This meeting was held on 24th May, 2018 at the KenGen Olkaria Social Hall. It was a technical workshop comprising of various professionals drawn from the line ministries, regulators, Non-governmental organizations, Community Based Organizations, energy sector players, private companies and NEMA. The meeting was chaired by the Deputy County Commissioner, Naivasha sub-county.

vi. **Data analysis and presentation:** Data was analysed using scientifically proven methods with the help of the various applicable softwares. Presentation of the synthesized information was in form of graphs, maps, tables and wind roses.

vii. **Compilation of the ESIA study report**: The report was compiled in line with the Environmental Impact (Assessment/Audit) Regulations of 2003. Each ESIA team member was handling a specific section of the ESIA study report as per the allocation of tasks in the attached ToRs.

CHAPTER 2

2 PROJECT COMPONENTS, SPECIFICATIONS AND ACTIVITIES

The project components, specifications and activities are detailed below.

2.1 Project Components

The proposed project will comprise of the following:

2.1.1 Bulk Power Supply Transmission Line

This will be an approximately 7 km long, single circuit, 132 kV overhead electricity transmission line which will traverse from wellhead substation located at Olkaria well pad OW-914 to the KenGen Industrial Park site. Approximately 20 - 30 transmission line towers are expected to be constructed along the proposed transmission line route. The towers are to be spaced about 250m – 350m apart depending on the terrain of the specific areas along the proposed line route. The 132 kV transmission line towers shall be hot deep galvanized and shall have a minimum height of approximately 30 m (dependent on specific designs and tower types). The transmission line will incorporate 3 phase conductors complete with associated insulation materials as well as an OPGW for communication. The lowest energized conductors on the towers shall be at an elevation of approximately 20 m above ground (dependent on specific designs and tower types). Also excavations for the transmission tower foundations as well as bush clearing along the proposed transmission line way leave shall be undertaken in such a way that minimizes effects of cutting down trees and soil erosion, i.e. by construction of gabions where necessary to protect the line towers and the disturbed ground areas upon excavation and backfilling.

2.1.2 Substations Equipped with the Necessary Facilities and Equipment

The proposed project will comprise of 2 substations as described below.

i) Substation extension works at the OW-914 substation: this shall include introduction of a 220 kV busbar, construction of a complete bay for termination of the proposed 132 kV line and a new 220/132kV transformer bay. Circuit breakers, current transformers and voltage transformers complete with other related switching equipment will also be provided.

ii) 132 kV substation to be located near the proposed industrial park site for purpose of transforming voltages from 132 kV to 11 kV or 33 kV depending on the industrial park locator's requirements. The design will incorporate a 132/11 kV or 132/33 kV transformer complete with associated circuit breakers, current

transformers, voltage transformers, isolators, surge arrestors among other substation high voltage equipment.

iii) A control room building that will host the switchgear room and the control and communication equipment will also be provided. The proposed substations will be enclosed with a chain link fence incorporating an access gate to avoid intrusion by animals (both domestic and wild) and unauthorised access to the facility.

2.1.3 Distribution Lines to be Connected to the Industrial Locators

The proposed distribution lines will be located within the industrial park site to facilitate connection of the industrial locators. The distribution lines will be rated at 11 kV or 33 kV depending on requirements of the industrial locators. These low voltage distribution lines shall be constructed within the industrial park site and terminated at the various premises. A typical transmission line project comprises of the components shown in figure 1

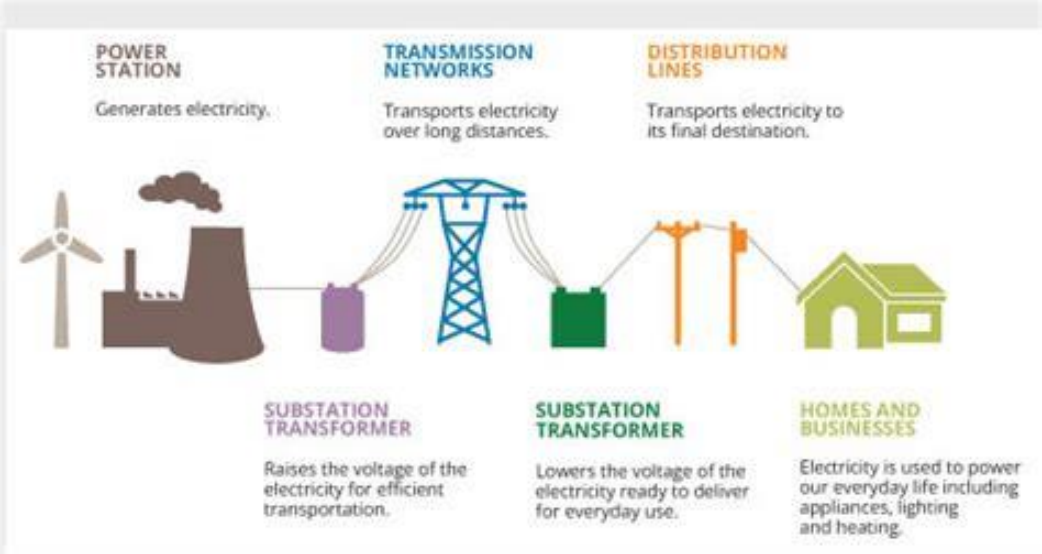


Figure 1: Typical Transmission Line Components

2.2 Implementation Schedule

The proposed project will be implemented under Engineering Procurement and Construction contract. The substations and the transmission line works are expected to be implemented within 24 months upon successfully award of the tender to the selected contractor.

2.3 Transmission Line Design

2.3.1 Way Leave 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. Figure 2 shows a way-leave corridor.

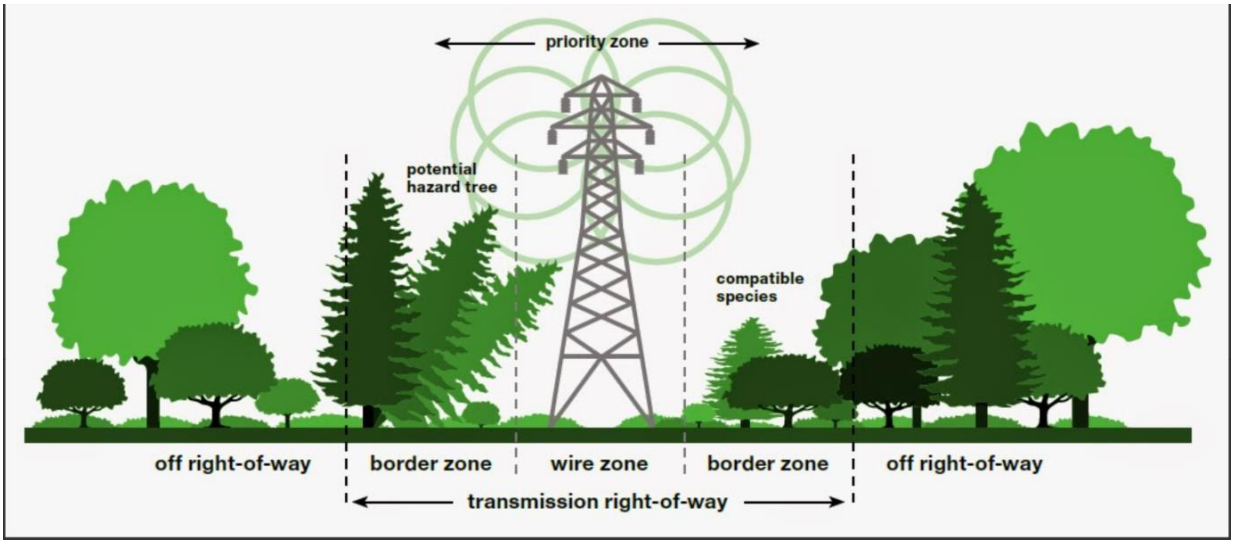


Figure 2: Typical way-leave corridor for transmission lines

The corridor under the high voltage transmission power lines provides for the safety of the human beings and animals besides permitting access for the routine maintenance work. The width of the corridor is usually 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 the proposed transmission line will be 40 m.

2.3.2 Air Space Protection

Where it is likely that the power line is potentially risky to aviation and avifauna safety, because of its height and location, appropriate safety measures must be considered. Some of these measures include use of suitable markers and proper design of the structures in line with best industrial practices and/or as recommended by the Kenya Civil Aviation Authority (KCAA). The 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 zones, or safety zone has to be evaluated and approved by KCAA to utilize property near airports and airstrips.

2.3.3 Conductor Vertical Clearances

The following are the minimum vertical clearances to be ensured from the line conductors at maximum sag (inclusive of 0.3 m included in sag calculations to accommodate conductor creep) to ground level or objects and crossings as described in table 1.

Table 1: The Minimum Vertical Clearances for the Line Conductors

Description	Minimum vertical Clearances in Metres
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

2.3.4 Design Factors of Safety

The design factors for steel lattice towers, which apply for 132 kV lines, are shown in table 2.

Table 2: Design factors for steel lattice towers for 132 kV lines

Description of the Components	Design Factor
Conductors, earth wire and optical fibre earth wire at final maximum working tension based on ultimate nominal breaking load.	3.00
Conductors, earth wire and optical fibre earth wire at still air everyday temperature final tension based on ultimate nominal breaking load.	5.00
Tension clamps and mid-span joints based on conductors, earth wire and optical fibre earth wire ultimate nominal breaking load.	0.95
Insulators and Fittings (based on failing load). • Under normal working conditions • Under broken string Condition	 3.00 3.00
Steel Lattice Towers	

Description of the Components	Design Factor
Steel towers under normal working conditions	2.00
Steel towers under broken wire conditions	1.50
Steel towers under maintenance conditions	2.00
Cascade Collapse for suspension towers	1.00
Foundations	
Foundations under normal working conditions	2.50
Foundations under broken wire conditions	1.75
Foundation under maintenance conditions	2.00
Factors against overturning/uprooting	1.20

2.3.5 Tower Layout

2.3.5.1 Possible Tower Configurations

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

i. Conventional overhead line (Steel lattice towers with individual foundations). This design is cost effective (regarding investment cost) and easy to construct in the sense that no heavy equipment is required. However, the design requires large space (easement and permanent land take) and creates visual impact especially in urban areas.

ii. Compact overhead line (Self-supported steel lattice towers with monoblock foundations for suspension towers.) This design is economical and easy to construct. The main disadvantage is the fact that it requires slightly higher cost and for heavier suspension towers, access to crane is required.

iii. Tubular steel pylons / Pre-stressed concrete poles. This design has a smaller base thus reducing the land take and visual impact. However, it is considerably costly than the steel lattice towers and requires use of heavy equipment.

2.3.5.2 Tower Type Family Recommendation

Taking into account the cost and space availability, 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 3 m from the ground, step-bolts on two diagonally opposite legs starting above the anti-climbing to the top, name plate and phase plates. 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.

2.3.5.3 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:

i. phase to phase distance
ii. phase to earth wire distance in regards of the location of the earth wire to ensure an optimum against lightning strikes
iii. attachment height to ground of the suspension and tension string
iv. phase to structure clearance (which has to be followed by the strings as well as the jumpers of the tension towers).

2.3.5.4 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

$$H = h1 + h2 + h3 + h4$$

2.3.6 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.). The typical spans are as detailed below:

2.3.6.1 Basic Span

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.

2.3.6.2 Maximum Span

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 especially distances between conductor and earth wire

2.3.6.3 Wind Span

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.

2.3.6.4 Weight Span

This is the horizontal distance between the low point of sag in back span and the low point of sag in the head span. It is used in calculating the vertical load that the conductor imposes on the supporting structure. Or is the horizontal distance between the points where the tangents to the curve of the two adjacent spans are horizontal.

2.3.7 Selection of Conductors

The phase conductors used are all of ACSR type, namely with Code Names LYNX, CONDOR and HAWK. The proposed project will make use of the LYNX conductor types as shown in table 3.

Table 3: Phase Conductors used in Transmission Lines

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

2.3.8 Selection of Shield Wires

Conventional Earth Wire –Type ACS will be used. The earth wire fulfils two functions:

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

Since 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

transmission lines are aluminium-clad steel conductors. They are standardised according to IEC 61089, EN 50182, Table F21 or ASTM B416. The standard earth wire to be used will be of type ACS.

2.3.9 Optical Ground Wire (OPGW) Shield Wire

Currently, the fibre optic cable links are the foundation of communications systems. This is because they have the advantage of large capacity, high speed, and long distance transmission. At the same time they are neither influenced by electromagnetic fields nor show any cross-talk, which are very important aspects for consideration in the installation of high voltage (HV) lines. The most common method for this is to install an 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 fibres.

The fibres OPGW shall follow the specifications and recommendations indicated in table 4.

Table 4: The Fibre OPGW Specifications

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
IEC 61597	Overhead electrical conductors – Calculation methods for stranded bare conductors
ITU G.652	Characteristics of a single-mode optical fibre
IEC 60104	Aluminium-magnesium-silicon alloy wire for overhead line conductors
IEC 60304	Fibres and binders colours
IEC 60949	Calculation of thermally permissible short-circuit currents, taking into account non-adiabatic heating effects.

2.3.10 Foundation Design

The foundations shall be of pad and chimney reinforced concrete type. Piles may be employed in bad and buoyant terrain. The foundations capacity shall be determined through soil investigation. The safety factors shall be as per "Design Factors of Safety" as follows:

- 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 typical soils likely to be found in the project area have been divided into five distinct groups listed in table 5.

Table 5: Typical soil types in the project area

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.

2.3.11 Tower Footing Resistance

A lightning strike to towers contributes to the 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. In case it occurs in the direct vicinity of the switchgear, a high over-voltage characterized with high rates of change may arise. Linking the last towers to the switch gear earthing system, as a remedial measure, is a suitable method of significantly reducing the tower footing resistance as well as 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 the tower structure shall be made as dictated 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. Standard values for the nominal footing resistance of steel lattice towers are as detailed in table 6.

Table 6: Standard value for the nominal footing resistance

Voltage (kV)	Footing Resistance Ω
132	10
220	10
275	10
400	10

The proposed project will make 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 and buried or driven at

the base of the tower leg foundation. In order to avoid vandalism of the earthing material, it is proposed 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 of 11.5 mm diameter. The earth conductor at the terminal towers shall be connected to the substation earthing grid. Plate 1 shows the tower structures.

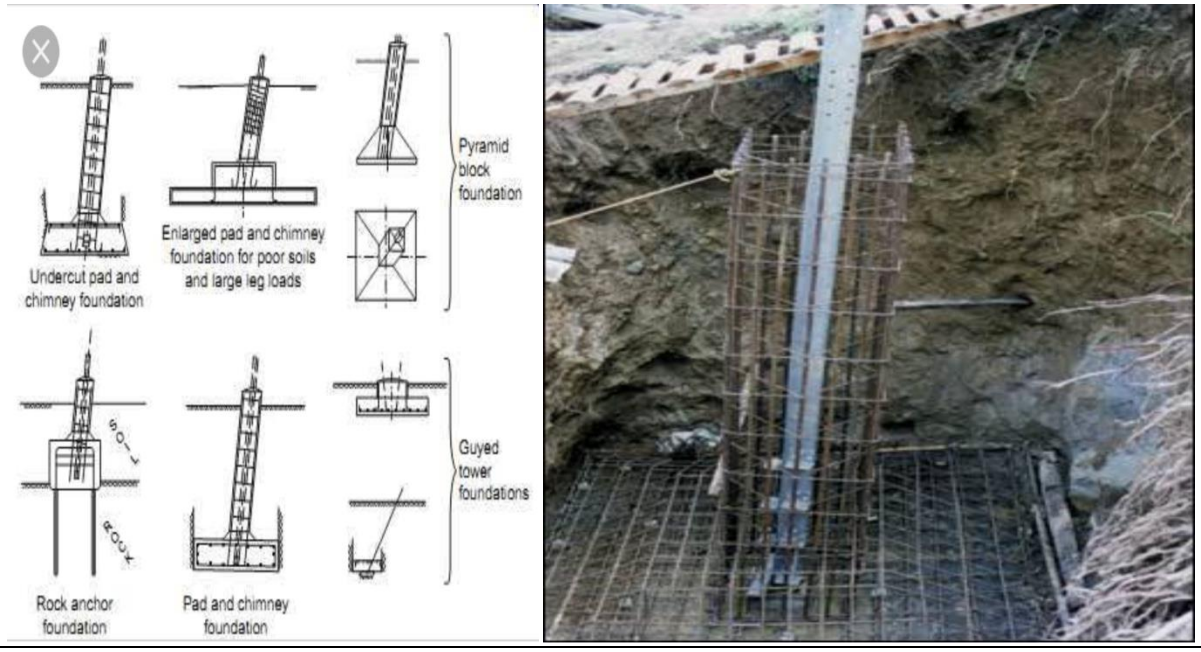


Plate 1: Tower structures

2.3.12 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.

2.4 Substation Design

This section provides information on the substation design.

2.4.1 Introduction

Figure 3 shows an image of a substation.

Figure 3: Substation image courtesy of Google

The design of the substations shall consider:

i. the most economical means of achieving the full development requirements;
ii. the stage-by-stage developments of the substations. In some cases, this may involve preferred built of full diameters, co-ordinating the full diameter built with the demand forecast and generation expansion plan;
iii. any reactive compensation requirements;
iv. the future inclusion of distribution level substations;
v. the co-ordination of overhead line entries, avoiding circuit cross-overs where possible;
vi. the required insulation with stand 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 international standards in regard to equipment and operation. The new substations shall be designed as conventional outdoor air insulated 132 kV with a substation control building housing, control and protection panels, communication and auxiliary equipment.

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

The layout shall consider the incoming overhead transmission lines and provision of easy access to the equipment and extension possibilities. The control building shall be located in a way that will permit a clear view on the outdoor equipment and the access to the area. The whole substation area shall be fenced to promote safety. 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 recommended for use by KenGen is shown in table 7.

Table 7: The standard layout recommendation for substations by KenGen

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.

2.4.2 Space Requirements

The Kenya Power and Lighting Company Ltd (KPLC`s) guidelines on minimum substation land sizes are as detailed in table 8.

Table 8: KPLC guidelines on minimum substation land sizes

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

2.4.3 Common Requirements for Substations

The common requirements for the substations are provided below.

2.4.3.1 Power Transformers

Figure 4 shows an electric power transformer.

Figure 4: Power transformer image courtesy of MGB Electrique

The transformers shall be of the conservator type, fitted with external coolers and an on-load tap and shall comply with IEC 60076. Considering that the average maximum ambient temperature in any one day is 30 °C, 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 °C.

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

2.4.3.2 Circuit Breakers

Figure 5 shows the circuit breaker of a single pole circuit.

Figure 5: Circuit breaker Image of a single pole circuit

The circuit breakers shall comply with IEC 60056 and they shall be of:

- Single-pressure, sulphur hexafluoride (SF6) type with self-contained power-operated spring-charged operating mechanism.
- Three-pole outdoor type, for the 132 kV 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 the 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.

2.4.3.3 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.

2.4.3.4 Operational Interlocking

This is associated with normal system operation and switching and is 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.

2.4.3.5 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.

2.4.3.6 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. 132 kV 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.

2.4.3.7 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. freeze 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.

2.4.3.8 Measuring Transformers

The output of the 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. Other features will include.

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

2.4.3.9 Current Transformers

Figure 6 indicates the current transformers.

Figure 6: Image of current transformers

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.

2.4.3.10 Voltage Transformers

Figure 7 shows the voltage transformer.

Figure 7: Capacitor Voltage Transformers With and Without Wave Trap. Courtesy of KPLC

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).

2.4.3.11 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.

2.5 Labour, Materials and Equipment

Labour, materials and equipment for the proposed 132 kV power transmission line are provided below.

2.5.1 Labour

The proposed project will require labour during planning, design, construction, operation and maintenance. The construction workforce will consist of unskilled labourers, craftsmen, engineers, supervisory personnel, support personnel, and construction management personnel who will perform the construction tasks. During construction phase, which will last for two years, approximately 50 to 100 locals per day will benefit from the proposed project. KenGen will utilize internal capacity during operation phase. However, during maintenance, the Company may decide to contract the works. In such circumstances, unskilled labour will be sourced from within.

2.5.2 Construction Equipment

Construction of the proposed 132 kV power transmission line and substations would require vehicles, steel haul trucks, dump trucks, tractors, trailers, tensioner, sagging dozer, cranes, excavators, bulldozers, motor graders, water boozers, static wire reel trailer, hole diggers, boom truck, drum pullers, loaders, concrete mixers, fork lifts, compactors, air compressors, and vibrating rollers.

2.6 Project Activities

The project activities will involve the following (Idaho Power Company, 2011).

2.6.1 Soil Boring

At the discretion of the Project Engineer, soil borings will be completed along the route to determine depth to bedrock and the engineering properties of the soil. Based on the soil properties, foundation designs will be completed for transmission line towers and other structures. Borings would be made with truck or track-mounted equipment. Access to the transmission line route will be primarily overland travel with possible crushing of vegetation under the vehicle; clearing/cutting of vegetation; temporary road building; road cuts or a combination of these four types.

2.6.2 Identification and Preparation of Staging Areas

Construction of the project will begin with the establishment of staging areas, or laydown yards. The staging areas will serve as field offices; reporting locations for workers; parking

space for vehicles and equipment; and sites for material storage, fabrication assembly, concrete mixers, and stations for equipment maintenance. Staging areas will be determined by KenGen in liaison with the selected contractor. In some areas, the staging area may need to be scraped by a bulldozer and a temporary layer of rock or aggregate laid to provide an all-weather surface. Unless otherwise directed by KenGen, the rock will be removed from the staging area upon completion of construction and the area will be restored. The staging areas will be located in previously disturbed sites or in areas of minimal vegetative cover where possible.

2.6.3 Site Preparation

Individual structure sites will be cleared to install the transmission line support structures and facilitate access for future transmission line and structure maintenance. In addition, the cleared area will provide a safe working space for placing equipment, vehicles, and materials. Clearing individual structure sites will be done using a bulldozer to blade the required area. The work area will be cleared of vegetation only to the extent necessary. After line construction, areas not needed for normal transmission line maintenance, including fire and personnel safety clearance areas, will be graded to blend as near as possible with the natural contours, then re-vegetated as required. Additional equipment may be required if solid rock is encountered at a structure location. Rock hauling or hammering may be required to remove the rock. Excess rock that is too large in size or volume to be spread at the individual structure sites will be hauled away and disposed of at location specified by KenGen.

2.6.4 Installation of Structure Foundations

Each 132 kV support structure will require the installation of foundations. First, four holes will be excavated for each structure. The holes will be drilled using truck or track-mounted augers of various sizes depending on the diameter and depth requirements of the hole to be drilled. Where possible the holes would also be drilled manually using hand tools. Each foundation will extend approximately 1 to 2 feet above the ground level.

Reinforced-steel anchor bolt cages will be installed after excavation and prior to structure installation. These cages are designed to strengthen the structural integrity of the foundations and will be assembled at the nearest project laydown yard and delivered to the structure site via flatbed trucks. These cages will be inserted in the holes prior to pouring concrete. The excavated holes containing the reinforcing anchor bolt cages will be filled with concrete. Mixing of concrete will be done next to each respective site.

2.6.5 Erection of the Support Structures

The steel support structures will be assembled on site. Steel members for each structure will be delivered to the site by flatbed truck. Assembly will be facilitated on site by a truck-mounted crane. Subsequent to assembly, the structures will be lifted onto foundations using a large crane designed for erecting towers. Where possible, the crane will move along the right of way from structure to structure site erecting the towers.

2.6.6 Installation of String Conductors, Shield Wire and Fibre OPGW

Conductor, shield wire, and OPGW will be placed on the transmission line support structures through a process called stringing. The first step to wire stringing will be to install insulators (if not already installed on the structures during ground assembly) and stringing sheaves. Stringing sheaves are rollers that are temporarily attached to the lower portion of the insulators at each transmission line support structure to allow conductors to be pulled along the line.

Additionally, temporary clearance structures (also called guard structures) will be erected where required prior to stringing any transmission lines. The temporary clearance structures are typically vertical wood poles with cross arms and are erected at road crossings or crossings with other energized electric and communication lines to prevent contact during stringing activities. Bucket trucks may also be used to provide temporary clearance. Bucket trucks are trucks fitted with a hinged arm ending in an enclosed platform called a bucket, which can be raised to let the worker in the bucket service portions of the transmission structure as well as the insulators and conductors without climbing the structure.

Once the stringing sheaves and temporary clearance structures are in place, the initial stringing operation will commence with the pulling of a lightweight “sock” line through the sheaves along the same path the transmission line will follow. Pulling the lines may be accomplished by attaching them to a specialized wire stringing vehicle. Following the initial pulling of the wire into the sheaves, the wire will then be tensioned to achieve the correct sag between support structures. Equipment at sites required for pulling and tensioning activities will include tractors and trailers with spooled reels that hold the conductors and trucks with the tensioning equipment. Depending on topography, minor grading may be required at some sites to create level pads for equipment. Finally, the tension and sag of conductors and wires will be fine-tuned, stringing sheaves will be removed, and the conductors will be permanently attached to the insulators at the support structures.

2.6.7 Clean-up and Site Restoration

Construction sites, staging areas, material storage yards, pulling and tensioning yards, and access roads will be kept in an orderly condition throughout the construction period. Solid waste will be removed from the sites and disposed of in an approved manner through NEMA licensed waste handlers. Open burning of construction waste will not be allowed. Disturbed areas not required for access roads and maintenance areas around structures will be restored and re-vegetated, as required by KenGen. All practical means will be made to restore the land, outside the minimum areas needed for safe operation, to its original contour and to restore natural drainage patterns along the Right of way (ROW).

2.6.8 Operations and Maintenance

Operation and maintenance activities will include transmission line patrols, climbing inspections, tower and wire maintenance, insulator washing in selected areas as needed, and access roads repairs. KenGen will keep necessary work areas around structures clear of vegetation and will limit the height of vegetation along the ROW. Periodic inspection and maintenance of each of the substations and communications facilities is also a key part of operating and maintaining the electrical system.

2.7 Decommissioning

The proposed transmission line will have a projected operational life of at least 50 years or longer. At the end of the useful life of the Project or if the project will no longer be required, the transmission line will be removed from service. At such time, conductors, insulators, and hardware will be dismantled and removed from the Right of Way (ROW). Structures and foundations will be removed to below ground surface. Decommissioning and restoration on lands shall be consistent with the terms and conditions specified by NEMA upon submission, review and approval of the decommissioning plan.

Following abandonment and removal of the transmission line structures and equipment from the ROW, any areas disturbed during line dismantle will be restored and rehabilitated. If a substation is no longer required, the substation structures and equipment will be dismantled and removed from the site. The station structures will be disassembled and either re-used at another station or sold for scrap. Major equipment such as breakers, transformers, and reactors will be removed, refurbished, and stored for use at another facility. Foundations will be either abandoned in-place or cut off below ground level and buried. Service roads will be abandoned following removal of the structures and lines and may be abandoned while the

lines are in-service if they are determined to no longer be necessary. When a service road has been identified as no longer necessary, the road will be restored back to the original state of land through landscaping and planting of vegetation. Prior to landscaping, the affected areas will be cleared of foreign materials, such as garbage, paper, and other materials.

2.8 Project Budget

The estimated cost of the proposed power transmission line project is approximately, US Dollars six million, one hundred and sixty four thousand (US$ 6,164,000).

3 DESCRIPTION OF THE PROJECT ENVIRONMENT

3.1 Bio-physical Environment of the Proposed Project Area

3.1.1 Location of the Proposed Project

The proposed 132 kV power transmission line will be located on part of Land Reference No. 8396/12. The piece of land measures approximately 1895 Ha and is registered under KenGen as shown in appendix 2. Administratively, the proposed project is located in Olkaria Sub-location, Hell's Gate location in Naivasha Sub-County, Nakuru County. Naivasha Sub-County has three divisions namely: Naivasha, Mai-Mahiu and Kongoni. The proposed project is in Kongoni division.

3.1.2 Land Uses

The main land uses in the neighbourhood of the proposed power transmission line project consists of livestock ranching, horticultural farming, tourism, wildlife conservation, human settlement and geothermal resource development. Kedong and Akiira ranches are located to the south and southeast of the proposed project site respectively. Olkaria OW-914 wellhead and Olkaria IV geothermal power plants are located to the west and southwest respectively. Geothermal wells OW-917 and OW-922 are located close to the proposed power transmission line route as shown in figure 8.

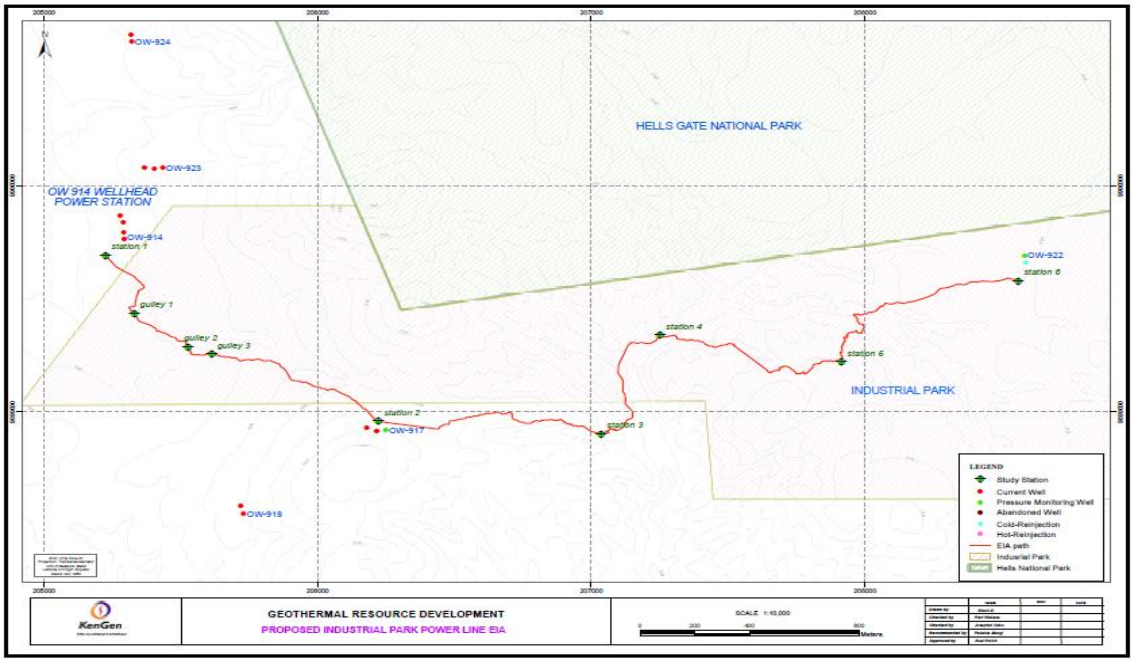


Figure 8: Proposed power transmission line route (in red.)

In August 2014, KenGen resettled Project Affected Persons (PAPs) to pave way for the construction of Olkaria IV geothermal power station. The land on which the PAPs were resettled, the Olkaria RAPland, lies to the south of the proposed power transmission line route. The PAPs are pastoralists hence their main economic activity is livestock rearing. Hell's Gate National Park lies close to the proposed project site in the northern direction. The concession area for Akiira Geothermal Company Limited, an Independent Power producer, is located to the south east of the proposed transmission line route. Generally, the proposed project site is dominated by geothermal development and wildlife conservation activities.

3.1.3 Population Profile

According to the 2009 census, the population of Naivasha area and its environs was as indicated in table 9

Table 9: Population Distribution by administrative Units in Naivasha, August 2009

Sub-Location	Male	Female	Total Population 2009	Households	Area/Square	Density
Hells Gate	32,565	32,081	64646	22147	436.7	148
Olkaria	13011	12426	25437	9194	345.5	74
Malewa	4432	4267	8299	2845	152.9	57
Kongoni	2054	2050	4104	1209	86.3	48
Maiella	4416	4804	9220	2124	41.9	220
Moi Ndabi	2936	2840	5776	1564	167.9	34
Ndabibi	4527	3871	8398	2361	131.7	64

Source: Republic of Kenya, 2009 Kenya Population and Housing Census

The neighborhood of the Olkaria Geothermal Field, where the proposed project is located, is scarcely populated. The population currently comprise of the Maasai community, residents of Kamere and employees of KenGen, neighboring flower farms, KWS and project contractors. According to the 2012 census, carried out during preparation of RAP for Olkaria IV PAPs, the total number of PAPs' households was 335 as indicated in table 10.

Table 10: total number of Olkaria IV PAP households

Settlement/Village	Category of PAPs	No. of Households	
		Sub-Total	Total
Cultural Centre	Resident land and asset owners	46	104
	Non-resident landlords	7	
	Land owners with no assets (also non-resident)	27	
	Tenants	24	
	Land tenants	0	
Oloonongot	Resident land and asset owners	46	81
	Nonresident landlords	0	
	Land owners with no assets (also non-residents)	17	
	Tenants	8	
	Land tenants	0	
	Teachers	10	
Oloosinyat	Resident land and asset owners	21	54
	Nonresident landlords	0	
	Land owners with no assets (also non-residents)	9	
	Tenants	16	
	Land tenants	8	
Olomayiana Ndogo	Resident land and asset owners	51	96
	Non-resident landlords	5	
	Land owners with no assets (also non-residents)	12	
	Land tenants	6	
Total Number of Households			335

Source: GIBB Africa (2012)

The population projection for Naivasha sub-county is shown in table 11.

Table 11: Population Distribution and Projection by Administrative units in Naivasha sub county

Location	Population census Yr, 2009	Population projection Total Yr, 2016
Hells gate	64,646	80,000
Olkaria	12,426	20,000
Mirera	39,208	45,000
Lakeview	20,0082	24,000
Malewa	8,699	14,,000
Maiella	13,024	19,000
Karati	13,216	17,000
Naivasha East	27,825	34,000
Kongoni	27,495	36,540
TOTAL	316,333	241,540

Source: Deputy county commissioner, Naivasha Sub-county

3.1.4 Income Sources

Large-scale horticultural and floricultural farms around Lake Naivasha employ a large number of Kenyans. Geothermal power generation is another contributor to employment opportunities especially for the local communities. Geothermal power generation is undertaken by KenGen, Oserian Development Company Limited and Orpower IV Inc. KenGen is currently constructing Olkaria V (158 MWe) geothermal project. The construction phase of the project has contributed immensely towards the provision of economic and employment opportunities to the local communities. The socio-economic activities among the Olkaria IV PAPs are listed in table 12.

Table 12: The socio-economic activities among the Olkaria IV PAPs

Economic Activity	Income Stream
Livestock rearing	• Sale of livestock • Sale of livestock produce
Tourism at the Maasai Cultural Centre	• Tour guide services by guides • Sale of handmade beaded jewelry by women • Entrance fee into the cultural Centre to experience Maasai way of living • Overnight hosting of tourists in the Manyattas
Quarrying of pumice stones	• Selling of pumice stones
Trade in goods	• Conducted by women who sell Lessos, ghee, milk and beads
Employment	• Employment mostly as security guards in the neighboring companies • Employment by KenGen and contractors on permanent and temporary basis for both skilled and unskilled jobs.

Source: GIBB Africa (June 2012)

3.1.5 Education Profile

KenGen constructed a Nursery and a Primary school to cater for its employees and the local community. Currently these two schools have a total of 480 pupils. More than half of these population is drawn from the local community. The company bus transports the pupils from the local communities to and from the schools within an area covering a distance of 15 km.

KenGen, under its Corporate Social Responsibility programme launched in 2005, has continued to offer scholarship opportunities to the top 3 bright and needy students in secondary and university institutions respectively. The target group of students is from the neighboring communities. Over 81 students from Olkaria have benefited from the scholarship programme.

KenGen, Orpower4 and Oserian have further contributed in the construction of classrooms, pit latrines and rain water harvesting infrastructure in some schools located in the neighborhood of Olkaria Geothermal Field. Olkaria Primary School which was constructed by KenGen for the PAPs, has the Early Childhood Development (ECD) and Primary School sections. Table 13 shows the total number of primary and secondary schools in Naivasha sub-county.

Table 13: Number of primary and secondary schools in Naivasha

Sub-county Education Zones	Public Primary & Secondary schools	Student Enrolment		Total Student Enrolment
		Boys	Girls	
Central Zone	15	8,038	7,111	15,149
Longonot zone	16	3,455	3,385	6,840
Maraigushu zone	20	4,611	4,436	9,692
Maiella Zone	21	7,964	7,769	15,733
TOTAL	**72**	**24,068**	**22,701**	**47,414**

There are three public secondary schools close to the project site. The schools are:

- St. Antony Girls Secondary School at Kwa Muhia
- Moi -Ndabi secondary School in Maiella which has a population of 116 students; and
- Mirera Secondary School in Karagita which has a population of 925 students.

The nearest public secondary school is located about 35 Kms from the proposed project site. The most accessible secondary schools within the project area that are privately owned are:

- Sher Moi Academy which has a student population of 168, and
- Oserian Secondary School with a student population of 165

3.1.6 Health Profile

According to records spanning for 3 years from the Ministry of Health (Naivasha Sub-county Hospital and Mvuke Dispensary), the highest prevalent diseases are respiratory diseases. This is due to the fact that cold and flu are common and are classified as respiratory diseases. The respiratory diseases are followed by diarrhea, malaria, diabetes and hypertension with less cases reported. The top 6 prevalence diseases at RAPland and Mvuke dispensaries in Olkaria are indicated in table 14.

Table 14: Disease prevalence in Olkaria (RAP Land and Mvuke dispensaries)

Diseases recorded	2015		2016		2017	
	RAP Land	Mvuke	RAP Land	Mvuke	RAP Land	Mvuke
Respiratory diseases	616	1394	733	1201	342	1151
Diarrhoeal	68	115	60	60	55	55
Malaria	17	59	32	62	0	39
Diabetes	0	13	0	12	0	23
Hypertension	0	17	0	13	31	16
Soft Tissue injuries	19	23	15	17	0	23

The government health facilities in the neighbourhood of the proposed project are Maiella Health Centre and RAPland Dispensary. The two health facilities do not adequately cater for the health needs of the community members. Most of the time, essential drugs are not available. For this reason, the community members are forced to seek medical attention from private health facilities located at Kamere, Kwa Muhia and DCK shopping centres. In addition, some community member prefer to seek medical assistance from the Naivasha Sub-county Hospital which is located about 43 km away.

3.1.7 Cultural Profile

The Maasai community is dominated by the following cultural activities; circumcision, naming ceremonies, weddings, burials, religious ceremonies and sacred rituals. The cultural activities are accompanied by traditional songs and dances. The Maasai cultural centre is located close to Olkaria I geothermal power plant, about 10 km away from the proposed project site. The centre has been set aside by the Olkaria IV PAPs for showcasing the Maasai culture and traditions hence earning income. There are no known or gazetted archaeological, historical or cultural sites near the proposed power transmission line route.

3.1.8 Climate

The project area has a semi–arid type of climate. The Olkaria domes area is located at the floor of the Rift Valley and hence experiences higher temperatures than the adjacent highlands. Naivasha sub-county lies 1,829 m above sea level. The daily recorded minimum temperatures range from 11.4 °C to 16.6 °C whereas the maximum temperatures range from 25.4 °C to 35.5 °C. The average temperature for the area is 18.4 °C. February is the warmest month, and June/July the coolest. Night time temperatures are occasionally frosty, and mid-afternoon temperatures very hot. Winds are generally South-easterly, except in February to April, when they tend to have a noticeable North-easterly component.

Relative humidity averages 69.6%. Rainfall in the proposed project area is generally low, recording an average of 634 mm. The monthly distribution of rainfall is mainly governed by the movement of Inter-Tropical Convergence Zone (ITCZ). This results in a bimodal pattern of rainfall distribution with long rains occurring in March, April and May while the short rains are received in the months of October, November and December. Data collected in Olkaria by KenGen at X-2 using an automatic weather station and manual rain gauges for rainfall has been analysed. The weather station is located about 15 km away from the proposed project site.

3.1.8.1 Olkaria Wind Rose

The wind rose indicates the general seasonal and annual flow of winds. Air pollutants tend to be dispersed downwind away from the source. A summary of wind speed, wind direction & frequency at Olkaria (X-2) is illustrated in figure 9.

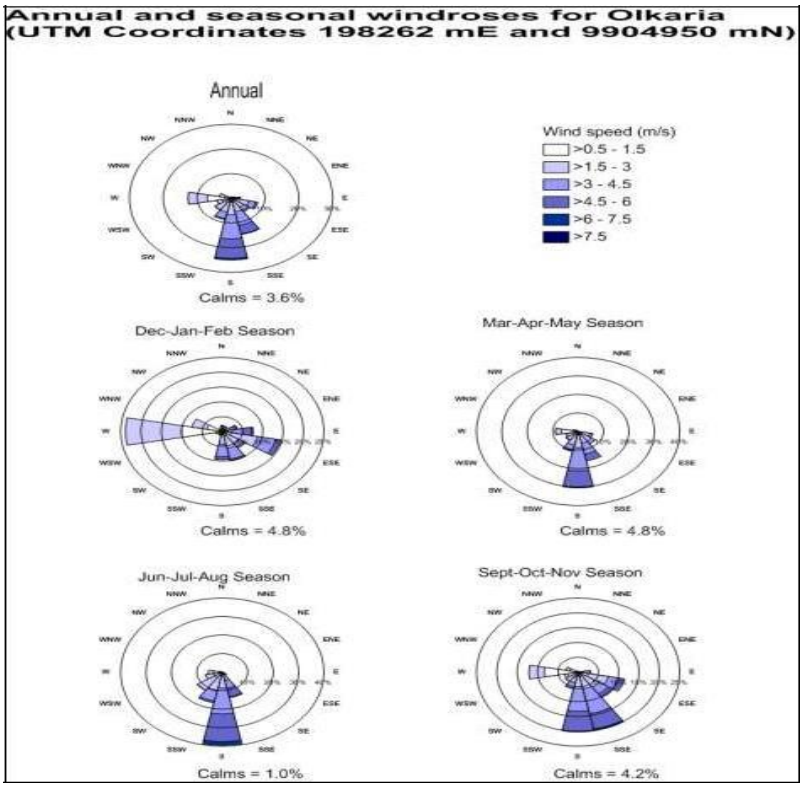


Figure 9: A summary of wind speed, wind direction & frequency at Olkaria (X-2)

The following observations can be made from the annual wind rose:

- The predominant wind direction at Olkaria over the year is from the South. After the southerlies, the south easterly and westerly winds follow. The maximum recorded wind speed is 7.0 m/s.
- For the Dec-Jan-Feb season, light winds from the west prevailed.
- For the Mar-Apr-May season, southerlies dominated.
- For the Jun-Jul-Aug season, southerlies dominated.
- For the Sept-Oct-Nov season, winds blowing from the South and South South-East dominated.

Air pollutants associated with the proposed project activities are mainly going to be blown towards North from the respective reference points.

3.1.9 Air Quality

Gas emission from the existing KenGen Olkaria power stations predominantly consists of carbon dioxide (95.1%) and hydrogen sulphide (4.4%). The other gases which include hydrogen, methane, nitrogen and oxygen form 0.5% (uw/wt) of the total non-condensable gas

fraction. Total geo-gas forms about 2% of geothermal effluent (Sinclair Knight and partners, 1994). This is discharged to the atmosphere.

Monitoring of hydrogen sulphide concentrations has been on-going in and around Olkaria power stations since 1997. All average measurements are reportedly below threshold limits. The proposed 132 kV power transmission project is not envisaged to generate hydrogen sulphide gas. However, the workforce may be exposed to hydrogen sulphide from the nearby wells and power plants during construction and operation phase of the proposed project. Hydrogen sulphide gas poses the most significant negative impact on air quality due to its toxic natures. At Olkaria Geothermal Field, KenGen monitors the gas on daily basis using portable gas analysers. This creates awareness and informs where mitigation measures are necessary.

Some of the safety measures that have been put in place by KenGen include use of self-containerized air breathing apparatus and installation of safety signage at potentially high emission points. Particulate Matter (PM) concentration in air is also monitored at power plant sites during construction and operation phases. The soils in Olkaria are loose volcanic ash type and hence are vulnerable to erosion especially when disturbed through machine excavations, vehicular movements and vegetation clearing. Baseline data on air quality was collected at seven reference points located along the proposed power transmission line. The standards for emissions of hydrogen sulphide gas and particulate matter in air are indicated shown in tables 15 and 16.

Table 15: Safety and environmental standards for H_2S gas emission in air

WHO and EMCA (Air quality Regulations, 2014) limits for H_2S gas	
Location	**Recommended Levels**
Limit beyond occupier's facility boundary	0.1 ppm
Occupational limit for workers area	10.0 ppm
Continuous emission limit for workplaces	1.0 ppm

Table 16: Safety and environmental standards for particulate matter in air

EMCA (Air Quality Regulations, 2014) limits for particulate matter		
Particle sizes in µm	**Industrial area**	**Residential, Rural & Others**
PM-2.5	75	75
PM-10	150	150
SPM	500	200

3.1.9.1 Hydrogen Sulphide Gas

The proposed 132 kV power distribution project is not envisaged to emit hydrogen sulphide gas in the air. However, emission from nearby power plants may be significant. Hydrogen sulphide gas is most significant air quality parameter in geothermal operations. There are human health and environmental effects associated with release of hydrogen sulphide gas in air.

(a) Properties of hydrogen sulphide

Hydrogen sulphide is a colourless flammable gas, which is denser than air and liquefies at -60 °C. It is soluble in both polar (water) and non-polar (organic) solvents. It is a very reactive gas and hence oxidizes rapidly in air and solution. It reacts readily with most metals leading to corrosion. Considering its density, hydrogen sulphide gas settles at the lowest points e.g. in gullies and valleys. This can allow build-up of dangerous concentrations of hydrogen sulphide gas. Within power plant areas, high concentrations of hydrogen sulphide may occur in cellars that are part of the well head or sump (Sinclair Knight and partners, 1994). Hydrogen sulphide is a noxious and potentially poisonous gas with odour of rotten eggs. Natural occurrences of hydrogen sulphide are estimated to contribute 90% of global emissions while the remaining 10% is emitted from industrial wastes.

Air quality criteria, has been formulated by regulatory bodies in other countries to maintain acceptable environmental quality. Non-condensable gases from high temperature geothermal power plants contain 5% hydrogen sulphide gas and 95% carbon dioxide. When they are ejected into the atmosphere, these gases are at higher temperature than ambient air. Hot non-condensable fumes are lighter than normal air, and this helps the gases to mix rapidly with ambient air. Therefore hydrogen sulphide emitted from the gas ejectors does not preferentially settle out from the plume any more than other gases in air. The only time hydrogen sulphide settles down more preferentially than other gases in the air, is in enclosed area, where there is no wind.

(b) Health Effects of Hydrogen Sulphide

The toxic effects of hydrogen sulphide gas on humans and animals vary according to dosage as shown in table 17.

Table 17: Effects of H_2S on Health (Sinclair Knight and Partners' 1994)

Concentrations (ppm)	Effects
Below 1	Offensive odour
1- 10	Occupational exposure limit. Breathing apparatus required.
10-20	Ceiling of occupation exposure limit. Worker must wear breathing apparatus.
20-100	Loss of sense of smell in 2 - 15 minutes. May burn throat and chest. Causes headache and nausea, coughing and skin irritation.
100-200	Sense of smell lost rapidly, burns eyes, and throat.
200-500	Loss of reasoning and balance. Respiratory disturbance in 2 - 5 minutes. Prompt resuscitation.
500-700	Immediate unconsciousness with one sniff. Causes seizures, loss of control of bowel and bladder. Breathing will stop and death will result if no resuscitation is done.

The toxic effects of hydrogen sulphide have been classified into three categories, acute, sub-acute and chronic. Acute intoxication refers to effects of a single exposure to a massive dose of hydrogen sulphide of the order of 1000 ppm and above. At this concentration, hydrogen sulphide exerts an effect on the whole nervous system by inhibiting the enzyme cytochrome oxidase, which is involved in the aerobic metabolic pathway (Sinclair Knight and partners, 1994). The WHO recommended exposure limit for staff working 8 hours per day for 5 days in a week is 10 ppm. The effects of hydrogen sulphide on vegetation are not well documented largely because, in contrast to animals, there appear to be a wide variation in response across species (Sinclair and Knight, 1994).

Sulphide taken up by plants is primarily metabolized to sulphate; or incorporated into plant proteins and as in the case of sulphur dioxide, low concentrations may have growth stimulation or fertilizing effect. At higher concentrations, hydrogen sulphide can cause leaf lesions, defoliation and reduced growth, with young plants being the most susceptible. The effects of hydrogen sulphide on aquatic animals have been evaluated by Axtmann (1971), who recommended that concentrations in water of less than 0.006 ppm were safe. Oxidation of H_2S in the atmosphere results in the formation of SO_2, which forms acid precipitation in the presence of moisture. Acid rain is defined as precipitation with the pH values of less than 5.8. Acid rain could contribute to change in soil pH and acidification of surface waters e.g. lakes leading to reduction in phytoplankton biomass and fish stocks. KenGen has been monitoring hydrogen sulphide concentrations within Olkaria Geothermal Field since 1997.

(c) Hydrogen Sulphide Monitoring Sites

The objective of these monitoring programs is to monitor occupational health exposures rather than environmental conditions. The data may provide some guidance as to the maximum levels that are likely to arise in the environment close to the power stations and give some "spot" samples of condition in more remote areas such as Olkaria staff quarters, Kamere and Olkaria Rapland residential areas. The observations relate to average concentrations over a few minutes and are all made during the day. The facilities including existing wellhead units, power stations and geothermal wells along the proposed power transmission line are routinely monitored and results shared for awareness. Contractors and other new workers are sensitized on hydrogen sulphide gas among other potential hazards.

(d) Effects on Materials

Hydrogen sulphide is corrosive to metals including copper, silver and even gold. It also reacts with lead-based paints to produce discolouration. Apart from aesthetic considerations, this corrosion of metals can cause problems in electronic equipment when connecting wires are affected. Permissible H_2S concentrations in the workplace assuming 8-hour shifts, 5-day weeks are provided in table 18.

Table 18: Permissible H_2S concentrations in the workplace assuming 8-hour shifts, 5-day weeks

Effect	Ppm for 8-hr shift	mg/m³ for 8-hr shift
Lowest reported odour threshold	0.00047	0.00066
5% detection limit 50% detection limit 95% detection limit	0.0013 0.0046 0.0230	0.002 0.007 0.035
Offensive odour	0.003-0.005	0.004-0.007
Threshold limit value a	10	14
Threshold of serious eye injury	50-100	20-140
Olfactory paralysis	150-250	210-350
Pulmonary oedema, threat to life	300-500	420-700
Strong nervous system stimulation	500-1000	700-1400
Immediate collapse with respiratory failure	1000-2000	1400-2800

Source: The Sub-committee on Hydrogen Sulphide gas, 1979 and including data from Nagy, 1991

The concentration of H_2S resulting in sub-acute intoxication syndromes is shown in table 19.

Table 19: Concentration of H_2S resulting in sub-acute intoxication syndromes

Species	Sub-Acute Syndrome mg/m³ (ppm)	Acute Syndrome mg/m³., (ppm)
Canaries	80- 321 (50-200)	321 (200)
White rats	80- 884 (50-550)	804 (500)
Dogs	80-1045 (50-650)	964 (600)
Guinea pigs	161-1205 (100-750)	1205 (750)
Goats	160-1446 (100-900)	1446 (900)
Humans	161- 964 (100-600)	964-1607 (600-1000)a*

*Immediately fatal

Source: Hydrogen Sulphide", Sub-committee on Hydrogen Sulphide, 1979 and WHO, 1987).

Baseline data on hydrogen sulphide gas, along the proposed 132 kV power transmission route, indicated low concentration levels in the surrounding air. A total of seven sampling points were considered along the proposed power line route. The measured levels were below the odour nuisance threshold level of 0.0046 ppm as indicated in the table 20.

Table 20: Concentration levels of hydrogen sulphide gas at the proposed project site

Sampling points along the power distribution line	Average H_2S gas levels in ppm
P-1	0.002
P-2	0.003
P-3	0.002
P-4	0.003
P-5	0.003
P-6	0.003
P-7	0.003

3.1.9.2 Particulate Matter

Areas along the proposed power transmission line route have a relatively extensive vegetation cover which is over 50% consisting of mixed shrubs, bushes, acacia trees and grass. The well pad walls have been rehabilitated through grass planting. This has reduced particulate matter in the air. Less soil is prone to wind erosion with extensive surface cover. Suspended particulate matter was found to be highest in comparison to other particle sizes. Fine inhalable

particles, 10 micrometres and below, can penetrate the respiratory system deep to alveoli leading to rising cases of asthma diagnoses, cancerous growths in the lungs and cardiovascular diseases. Suspended particulate matter consists of course or large particles in the air approximately less than 100 micrometres. The smaller the particle size, the higher the health risks. All the levels of particulate matter in air were far below the standards as indicated in table 21.

Table 21: Particulate matter levels in air along the proposed transmission line route

	Particulate matter levels in micrograms per cubic meters µg/M³			
	1.0 µm	2.5 µm	10 µm	TSP µm
	2	2	2	2
	2	2	2	2
	2	2	2	1
	3	4	6	2
	5	3	8	2
	8	8	10	10
	2	2	2	3
Maximum	**8**	**8**	**10**	**10**
Average	**3**	**3**	**5**	**3**

3.1.9.3 Carbon dioxide

Carbon dioxide and methane are greenhouse gases that have global climate impacts. Apart from being a greenhouse gas, carbon dioxide combines with moisture in the air to form carbonic acid, which is a weak acid. Depending on the amount of the acid formed, pH values of rainwater may be lowered. Normal precipitation has pH values between 5.6 and 5.65 due to the presence of carbon dioxide in the atmosphere. Long exposure of high concentration of carbon dioxide has serious impact on human beings. Studies have shown that exposure of various concentrations of carbon dioxide have effects on human breathing (Kubo et al, 1999) as shown in table 22.

Table 22: Effects of Carbon dioxide on Human Health

Concentrations (ppm)	Effects
10,000-20,000	Long term exposure to such levels can cause increased calcium depositions in the body tissues and may cause mild stress and behavioural change.
50,000	Shortness of breath, dizziness, mental confusion, headache and possible loss of consciousness.
100,000	Normally, one losses consciousness and eventually death if no action is taken

Source: Kubo et al, 1999

3.1.9.4 Noise Levels

Baseline data on noise emission indicated relatively low levels. The sources of noise were other geothermal activities such as well testing works, operations of nearby power plant at Olkaria IV, drilling at OW-R14 (temporary emission) and wellhead power plants at OW-914. All the levels were below the occupational noise limit of 85.0 dB (A) as indicated in table 23.

Table 23: Average noise levels at the proposed project site

Measurement points along the power line route	Noise levels in dB(A)
P-1	60.7
P-2	57.8
P-3	49.5
P-4	43.6
P-5	38.6
P-6	35.1
P-7	42.3
Maximum	**60.7**
Average	**46.8**

3.1.10 Lake Naivasha Basin

The proposed power transmission line route lies to the south of Lake Naivasha, about 15 km away. Lake Naivasha was declared Kenya's second Ramsar Site in 1995. It is a unique freshwater lake in the Rift Valley Province of Kenya, 100 km Northwest of Nairobi (Harper *et al.*, 1990). It lies on the floor of the Eastern Rift Valley at a mean altitude of 1890 m a. s. l, Latitude 00 45' to 00 56' South and Longitude 360 22' to 360 54' East (LNRA, 1999). Lake Naivasha is the largest water mass in the area and comprises of four lakes: Lake Naivasha (145 km^2), Crescent Island (2.1 km^2), Oloiden (5.5 km^2) and Sonachi (0.6 km^2). The Lakes have

surface and underground hydrological flow connection. The deepest part of the lake is 18 m at Crescent Island, but this depends on the lake level. At times depending on the Lake level, Oloiden is disconnected from the main lake. Oloiden is smaller than Crescent and located at the south end of the main lake. The main lake is shallow (max. 8m). Sonachi lies south western end of the Lake Naivasha, but has independent waters from the main Lake.

Two perennial rivers, Malewa and Gilgil, drain their waters into Lake Naivasha. They share discharge at 80% and 20%, respectively. The Karati River that drains east of the Lake is ephemeral, flowing into the lake for approximately two months in a year. There is little runoff from the south of the lake. Flows from Mau Hills and Eburru, which are to the west, infiltrate the ground before reaching the Lake. The rates of evaporation from the Lake exceed rainfall. Often, the Lake experiences fluctuation in levels. The Lake has no surface outlet. Its water level follows the long cycles of wet and dry periods with an amplitude of about 12 m over the last one century. According to Harper et al (1990), the lake level fluctuations have not been found to show any direct relationship with local rainfall, except that periods of exceptionally high rainfall when the level rises.

Annual evaporation always exceeds rainfall (Ase *et al.*, 1986). However, Vincent et al, (1979) suggested that the lake's level rise is an indicator of the long term pattern of high altitude climate, particularly the penetration of equatorial westerlies and the influence on land above 2500 masl. Evidence of this hypothesis came from the monthly correlation of lake level changes with precipitation data from high altitude meteorological stations (at 2700m), and the correlation of lake level with the altitude of the snow of the Lewis Glacier on Mt Kenya.

3.1.10.1 Hydrogeology of Lake Naivasha

Ground water is recharged laterally from the high rift flanks and axially along the floor southward. The rift planks, the grid faulting and tectono-volcanic axis along the rift floor control the hydrogeology and the rift valley. The grid faulting acts as a channel for ground water or they provide barriers to lateral flow. Thus faulting causes the groundwater to flow from escarpments to the centre and then follow longer flow paths reaching greater depths, and aligning their flow to Lake Naivasha. Water table is deeper towards the south (Lagat, 2003). Though the rocks, particularly lacustrine sediments are very porous (Thompson and Dodson, 1963), the water table is deep between 100-266 m. The region is water scarce and the available water could be saline when found (Randel and Johnson, 1991).

3.1.10.2 Lake Naivasha Water Levels

The lake levels trend from year 2010 to 2018 indicates continued rise in water levels. There has been accelerated geothermal expansion over the same period. Recently, the lake levels have shown a sharp increase from the month of February 2018 to the month of May 2018 due to high rainfall amounts. The latest average lake level reading taken for the month of May 2018 was 1888.997 meters above sea level (masl). This is above the set level of 1885.3 masl by WRA for lake water abstraction up to permit amount. The lake level continues to vary significantly with variations in weather conditions but not geothermal project activities. More water from the lake is lost through evaporation compared to abstraction uptake. The long term trend shows declining amounts water in the lake. However, the recent water levels are some of the highest in history due to heavy rainfall received during the long rain season (March-May) of 2018. These variations are shown in Figures 10 and 11.

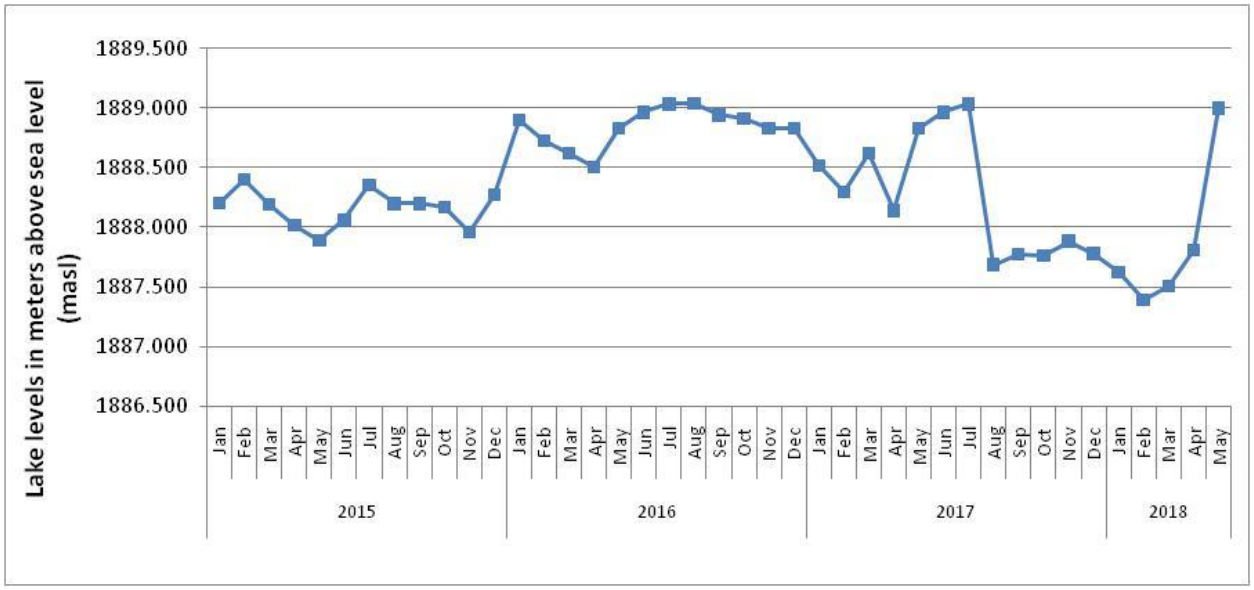


Figure 10: Short term monthly lake level variation from Jan 2015 to May 2018

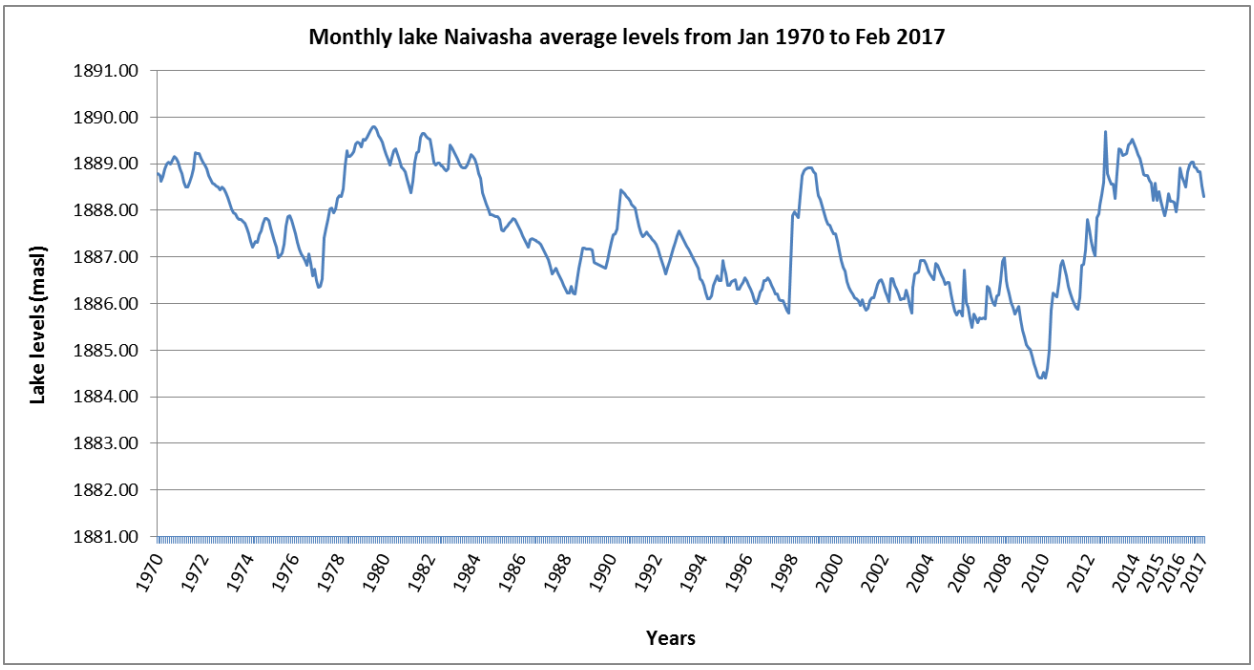


Figure 11: Long term monthly lake level variations from January 1970 to February 2017

3.1.10.3 Lake Naivasha Water Quality

KenGen took samples from Lake Naivasha at spot near Oserian Beach for chemical analysis. This was part of the established quarterly monitoring program. Most of the parameters were below the maximum recommended limits. Calcium levels were found to exceed the recommended standard for discharge into the environment while Zinc and Sulphate levels were nearing the set maximum limits. The chemical analysis followed the recommended water quality testing. The concentrations of elements posing serious health hazards including chromium, arsenic, cadmium, mercury and lead were below the allowable limits. Details of the chemical analysis are indicated in table 24. Laboratory analysis was conducted from 15 March 2018 to 23 March 2018.

Table 24: Water Quality Result for Lake Naivasha

PARAMETER	Methods	Results	[1]Standard (Max. Limits)
Anions			
pH	AQTP 002	7.76	**6.0 - 9.0**
Chlorides, Total as Cl^-, in ppm	AQTP 096	53.09	**250**
Florides as F^-, in ppm	AQTP 095	1.25	**1.5**
Sulphates as SO_4^{2-}, in ppm	AOAC 34.019	0.82	**2**
Cations			
Calcium as Ca, in ppm	AQTP 061	5.69	**2**

Chromium, mg/l	AOAC 2.048	<0.01	2
Manganese as Mn, in ppm	AQTP 058	<0.01	10
Iron as Fe, in ppm	AQTP 055	<0.01	10
Copper as Cu, in ppm	AQTP 050	0.25	1.0
Zinc as Zn, in ppm	AQTP 052	0.46	0.5
Arsenic as As, in ppm	AQTP 081	< 0.01	0.02
Cadmium as Cd, in ppm	AQTP 088	< 0.01	0.01
Mercury as Hg, in ppm	AQTP 083	< 0.01	Not detected
Lead as Pb, mg/l	AQTP 067	<0.01	0.01

KEY

< -Less than; below detection level of 0.001 mg/l;

Standard values quoted from Environmental Management & Coordination (Water Quality) Regulations 2006, Third Schedule

'Standards for Discharge of Effluent into the Environment'

• No Reference values quoted for these parameters

AQTP - agriQ-Quest Laboratories Test Procedure adopted from ISO and APHA Methods

3.1.10.4 Water Abstraction from Lake Naivasha

KenGen is permitted to abstract a total of 8,000m^3/day from Lake Naivasha for use at the Olkaria Geothermal Field. This water is utilized in for drilling purposes and topping up of cooling tower basins on a need basis. Brine is also utilized to substitute drilling water and re-injection as part brine management and to replenish the reservoir. The use of brine in drilling has reduced the amount of raw water abstracted for drilling as shown in the figure 12. Figures 13 and 14 show water abstraction and brine pumping for the period July 2015 to May 2018.

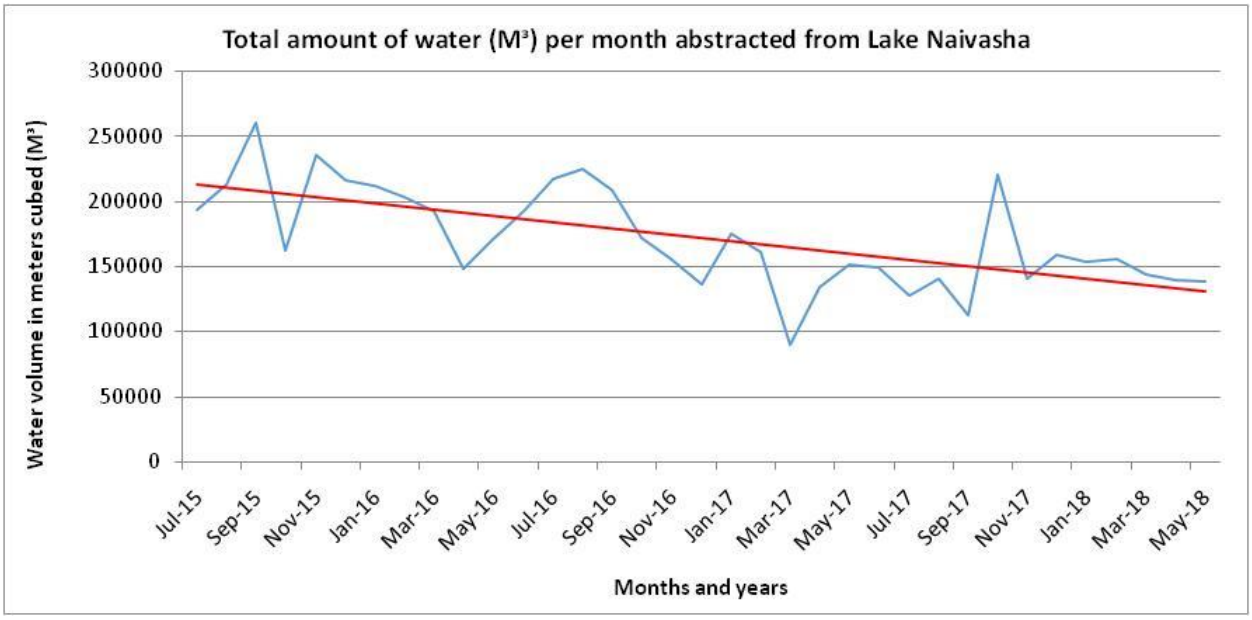


Figure 12: Water abstraction for Olkaria Business Area

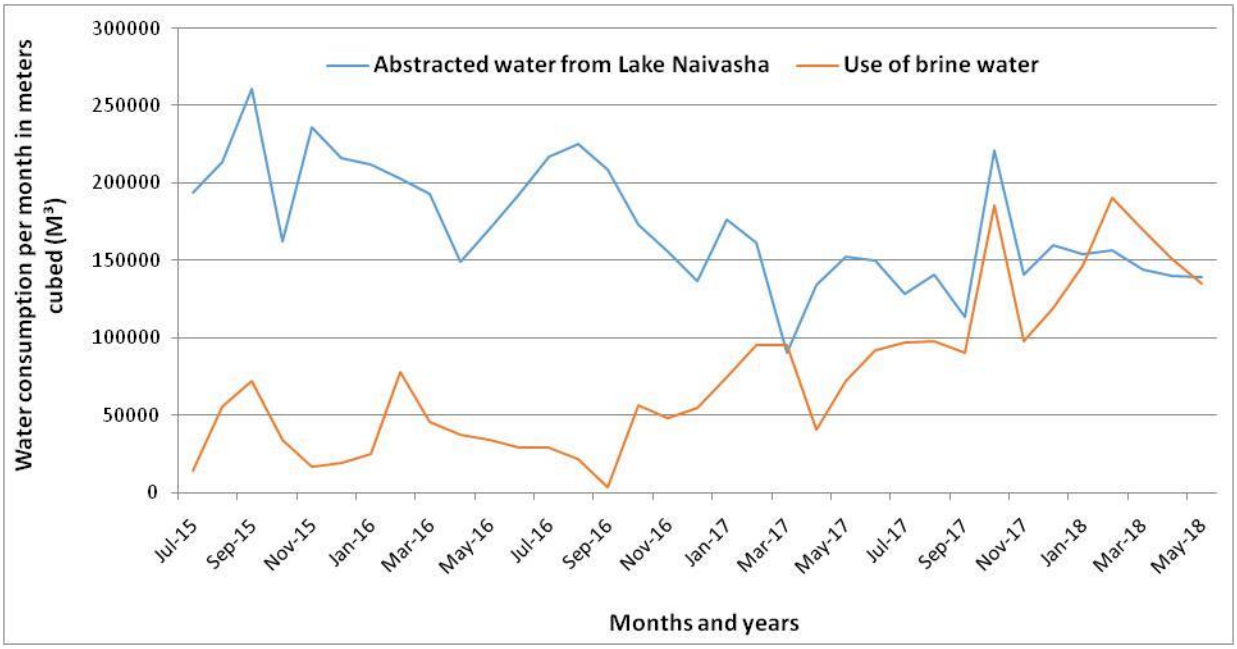


Figure 13: Consumption of raw water and brine for drilling

3.1.11 Liquid & Solid Waste Generation and Management

At Olkaria Geothermal Field, just like in any other factory set up, different waste streams are generated as a result of power generation and geothermal resource development activities. Solid waste and effluent management practices depend on the type of waste stream involved. In order to ensure that the various waste streams are disposed of in accordance with Environmental Management and Coordination (Waste Management) Regulations 2006, a functional waste Management system is in place. Solid waste management approaches includes source reduction, waste segregation, temporary disposal in waste bins, transportation, recycling, incineration and final disposal at designated sites. Liquid waste includes used oil, untreated sewage, brine and waste sanitary water. The different waste management practices at Olkaria are summarised in table 25.

Table 25: Solid and Liquid waste Management practices at Olkaria

Solid and Liquid Waste Management Practices at Olkaria Business Area		
Waste Type	**Waste Management Practices**	**Disposal Method**
Scrap Metal	Accumulated at well OW-3 temporary storage area.	Sold to licensed scrap metal dealers
Hazardous Waste(oil filters and oily rags)	Accumulated at Motor Vehicle and Rig Workshop	Incineration through NEMA licensed hazardous waste handlers.
Medical Waste	Accumulated at Mvuke Dispensary then transported to Naivasha Sub-county hospital for final disposal.	Incineration
Office waste and household waste	Collected on weekly basis	Transported by NEMA licensed waste transporters for final disposal at the Naivasha dumping site.
Construction Debris	Accumulated at construction sites	Used as backfilling material.
Brine	Accumulated in settling ponds	Re-injected back into the reservoir.
Used oil	Accumulated in drums and kept at the designated area at the Mitsubishi yard.	Sold to NEMA licensed used oil recyclers.
Untreated sewage and sanitary waste water.	Discharged to septic tanks	Exhausted and transported to the Naivasha Sewage treatment plant.

3.1.12 Topography

The project area including Lake Naivasha and environs, is situated at the floor of the Great Rift Valley. The Lake Naivasha basin covers an area of 3,400 km^2 and the lake itself stands at around 1,885 meters above sea level (masl). The lake basin is bound to the west by Mau Escarpment (3,080 masl), and to the south and south east by the Olkaria and Longonot

mountains. To the East of the lake basin is Kinangop Plateau. The Nyandarua (Aberdare) Range (3,900 masl) lies to the north and north east and Eburru volcanic pile flanks the western side of lake basin. The general topography of the study area is characterized by a wide range of features associated with volcanic activity. They include craters, remnants of pre-existing craters, fault scarps, fissures and steam jets. The proposed power transmission line route traverses an area characterized by volcanic features that consist of steep sided domes formed from pyroclastic rock and lava flows.

The domes enclose an approximately circular depression that has been cut by the Ol Njorowa Gorge, which was formed by out flowing water from Lake Naivasha. Within this complex, there are several small valleys that drain the upper slopes and discharge runoff and sediments to the foot slope and the plains below. To the north of Olkaria, the topographical features are dominated by depressions of four tower bodies including the Crescent Island, the main Lake, Lake Oloiden and Crater Lakes. The area along the proposed power transmission line route is characterized by rugged terrain with deep gullies and alternating ridges running NS as shown in figure 15. The ridges are highly eroded with scanty vegetation. The dominant soil is unconsolidated volcanic ashes and intercalation of rocks in areas of high erosion. Valleys that have active erosion are bear with rock exposed in steep areas and deposits in low areas. Some gullies are dormant and have since regenerated and colonized by vegetation as shown in plate 2. Erosion was also observed in the areas with anthropogenic activities such as geothermal wells.

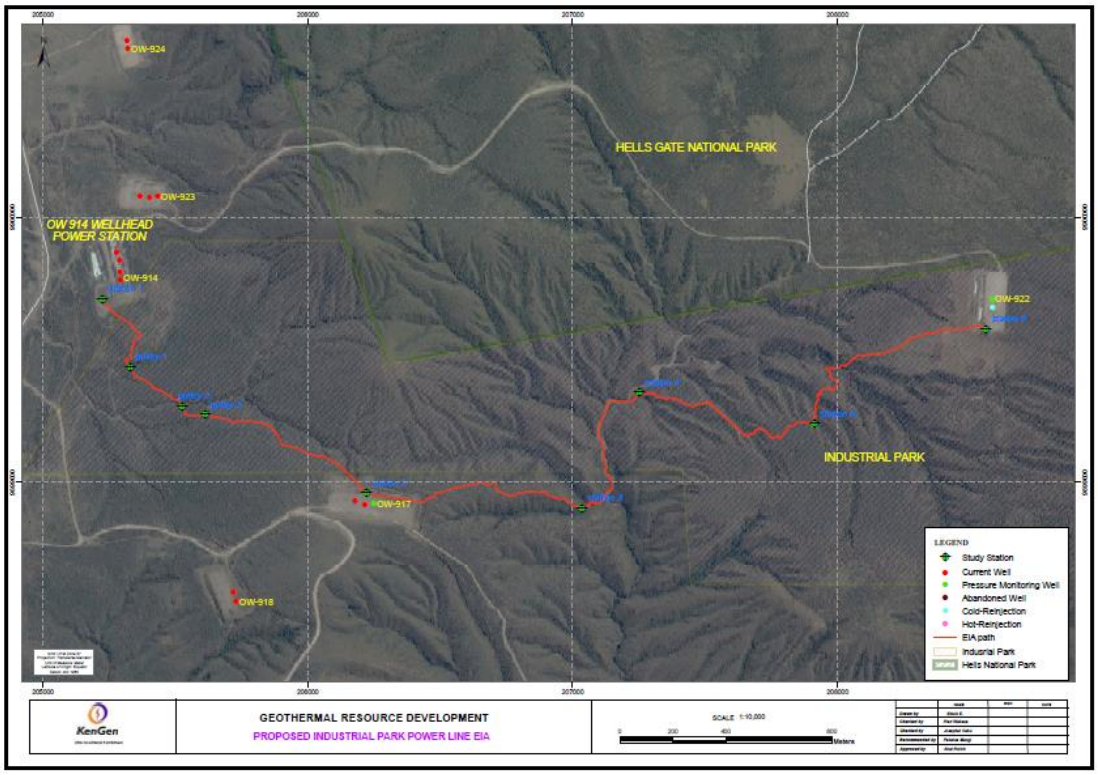


Figure 14: Google Earth map showing topography of the project site

Plate 2: Regenerated gulley

3.1.13 Geology

The surface geology of the Naivasha and Olkaria area is dominated by comenditic lavas, pumice fall and pyroclastic. A large fraction of the pumice fall and pyroclastic deposits is hypothesized to have originated from Longonot and Suswa volcanoes, lying immediately 20 km east and 40 km south of Olkaria Volcanic Complex, respectively (Omenda, 1998). Most of the

comenditic rhyolite extrusions of the present area are confined to an irregular area which curves around the south-western shores of Lake Naivasha. Other rhyolite craters and plugs are scattered along a line roughly parallel with the Ol-Njorowa Gorge (Clarke et al., 1990). The rhyolites are younger than the comendites and may represent a later phase of volcanism involving a common parent magma. Much of the pumice in the area is probably of normal rhyolitic composition, and it is known that some of the most recent phases of volcanicity have been pumice ejection. On the western banks of Lake Naivasha a few small lava flows are composed of much more compact bluish grey, slightly vesicular basalt with fairly abundant but small plagioclase phenocrysts. Texturally-similar basalt forms an isolated outcrop in the Kinangop escarpment, Pardoe and Schuster's farm (Clarke et al., 1990).

3.1.14 Soils

Soil types in Olkaria and surrounding the area can broadly be classified into two distinct types namely lacustrine (lake sediments) and volcanic, both of which are quaternary deposits. The former are a product of the high stands of Lake Naivasha, about 9 thousand years while pyroclastic ashes and tuffs, are the main constituents of volcanic soils caused by the heaviest accumulations of the ejected ashes derived from Olkaria and the surrounding volcanic complexes (Thompson and Dodson, 1963).

3.1.15 Flora

The existing vegetation along the proposed power transmission route and its surroundings is generally characterized by grasses, herbs, shrubs, scrubs and a few trees. Young scanty *Tarchonanthus camphoratus* dominated the surveyed area. Other species of shrubs and trees included: Acacia *drepanolobium, Rhus natalensis* and *cussonia holistii.* Invasive plant species had colonized disturbed and degraded areas, gulley floors, well pads, access roads and eroded areas. These included *Solanum incunum, Datura stramonium, Hypoestes Forskaolii* and *Sida tenuicarpa.* Other plant species observed are shown in table 26 and plate 3.

Table 26: vegetation species observed at the site

Scientific Name	Common Name
Trees & shrubs	
Acacia drepanolobium	Whistling thorn
Acacia xanthophloea	Yellow barked acacia
Tarchonanthus camphorates	Camphor bush
Rhus natalensis	Desert date
Rumex usambarensis	

Cussonia holistii	Cabbage tree
Erica arborea	Tree heath
Lippia kituiensis	
Scrubs, Ferns and Herbs	
Achyranthes aspera	Devil's horse whip
Asparagus flagellaris.	-
Asplenium stuhlmanii	-
Galinsoga parviflora	Macdonald eye
Oxygonum sinuatum	Star stalk
Commelina benghalensis	Wandering jew
Solanum nigrum	African nightshade
Kalanchoe densiflora	-
Fuerstia Africana	-
Grasses	
Elymus repens	Couch grass
Themeda triandra	Red oat grass
Fimbristylis exilis	Geothermal grass
Cymbopogon citratus	Lemon grass
Cynodon dactylon	Star grass
Penissetum cradostenum	Kikuyu grass
Invasive species	
Sida tenuicarpa,	-
Ocimum gratissimum	Basil plant
Nicotiana glauca	Wild Tobacco
Conyza bonariensis	Horseweed
Solanum incanum	Sodom apple
Psiadia panctulata	-
Hypoestes forskaolii	-
Datura stramonium	Jimsonweed
Rucinus communis	Castor oil
Filicia muricata	-
Nicotiana glauca	Wild tobacco

(a)

(b)

Plate 3: a) Rumex usambarensis and (b) Acacia drepanolobium

3.1.16 Fauna

Direct and indirect methods were used to identify the presence of fauna species utilizing the area surrounding the proposed power transmission line route. These included live sighting, dropping, pellets, tracks, foot prints, vocalization, burrows, dens etc. The project area is outside but in close proximity to Hell's Gate National Park thereby acting as a wildlife dispersal area as shown in figure 15. There are scanty wild animals due to the rugged terrain and habitat degradation. No animals were encouered during the study period. However, there were idicators of minimal utilization as indicated in table 27 and plate 4.

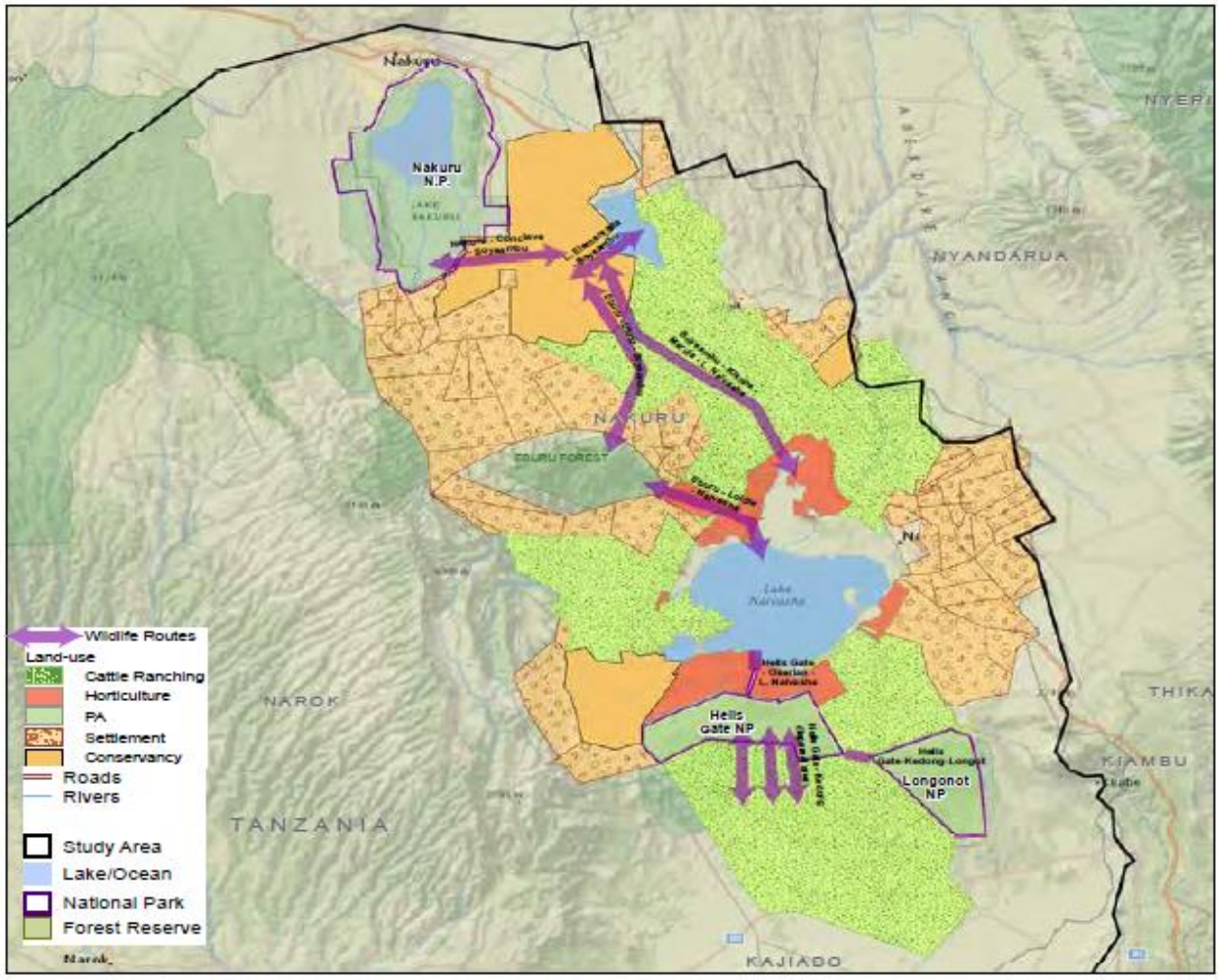


Figure 15: Existing and proposed wildlife movement corridors

Source: **Wildlife Migratory Corridors and Dispersal Areas: Kenya Rangelands and Coastal Terrestrial Ecosystems**

Table 27: Animal species identified

Species	Common Name	Evidence
Mammals		
Phacochoerus africanus	Warthog	Burrows
Equas burchellii	Common Zebra	Droppings
Crocuta crocuta	Hyena	Droppings, track
Orycteropus afer	Aardvak	Burrows
Madoqua kirkii	Dikdik	Droppings

(a) (b)

Plate 4: (a) Photo showing a warthog burrow and (b) hyena droppings

3.1.16.1 Avifauna

The proposed power transmission line project route runs outside but in close proximity to the south-eastern boundary of Hell's Gate National Park (HGNP). HGNP is known to harbor Kenya's only nationally protected nesting colony of Critically Endangered Rüppell's Vultures (Gyps *rüeppellii*) that typically contains 19 nests per year on a cliff face (Barasa et al, 2015). The Critically Endangered White-backed Vulture (*Gyps africanus*) which is critically endangered and the Near Threatened Grey-crested Helmetshrike (*Prionops poliolophus*) as per the IUCN red list of threatened species are found in HGNP. There are over 100 other bird species recorded inside the park; many thousands of swifts roost and nest in cracks on the cliffs (Barasa et al, 2015). The Park is listed by Nature Kenya as Important Bird Area (IBA) due to its variety of bird species of conservation concern.

3.1.16.2 Herpetofauna

Herpetofauna (reptiles and amphibians) play a key ecological role in regulating population of other species through predatory and herbivory. A total of 30 herpetofauna species were documented from this area during baseline ecological survey conducted by GIBB Africa in

2014. These include 15 snake species of which three were confirmed to occur at the site and include the African Rock Python known to occur within the gorges and valley bushlands. The presence of the only two tortoise species known from this area was confirmed and three lizard species out of six known from the area were recorded. Herpetofauna is highly sensitive to habitat modification especially fresh water dwelling frogs, while surface run-off is major threat to the breeding especially for snake and tortoises, (Gibbs, 2014).

3.1.16.3 Invertebrates

A total of 30 species of invertebrate within six order and 18 families were recorded at the project site during the field survey by Gibbs, 2014. Invertebrates play very key role in the ecosystem especially maintaining vegetation cover through plant pollination. Majority are indeed very sensitive to habitat modification, making them good indicators of environmental degradation which may lead to their disappearance from an area hence loss of the ecosystem functions they mechanistically mediate.

3.1.16.4 Wildlife Census Analysis

Wildlife census for the period between 2012 and 2016 were reviewed to establish status and infer species trend. Considering population of the main wildlife species within Naivasha area, it is clear that apart from wildebeest whose population is increasing, the general trend of mammals' trend is downward amongst Zebra, Buffalo, Impala and Eland species as shown in figure 16.

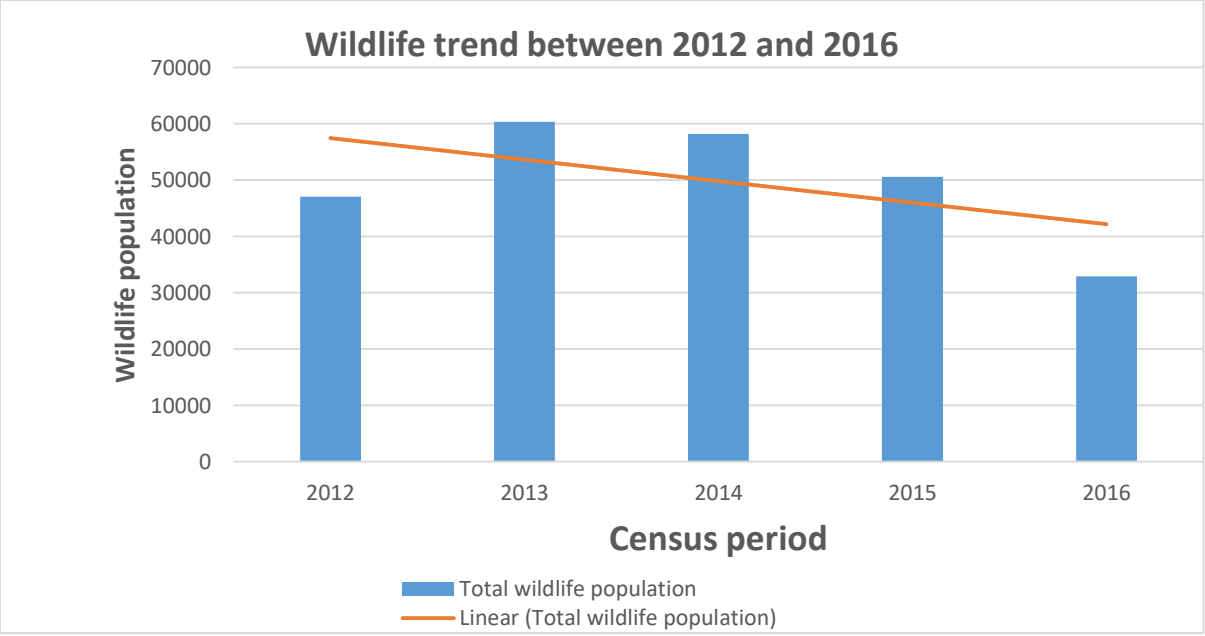
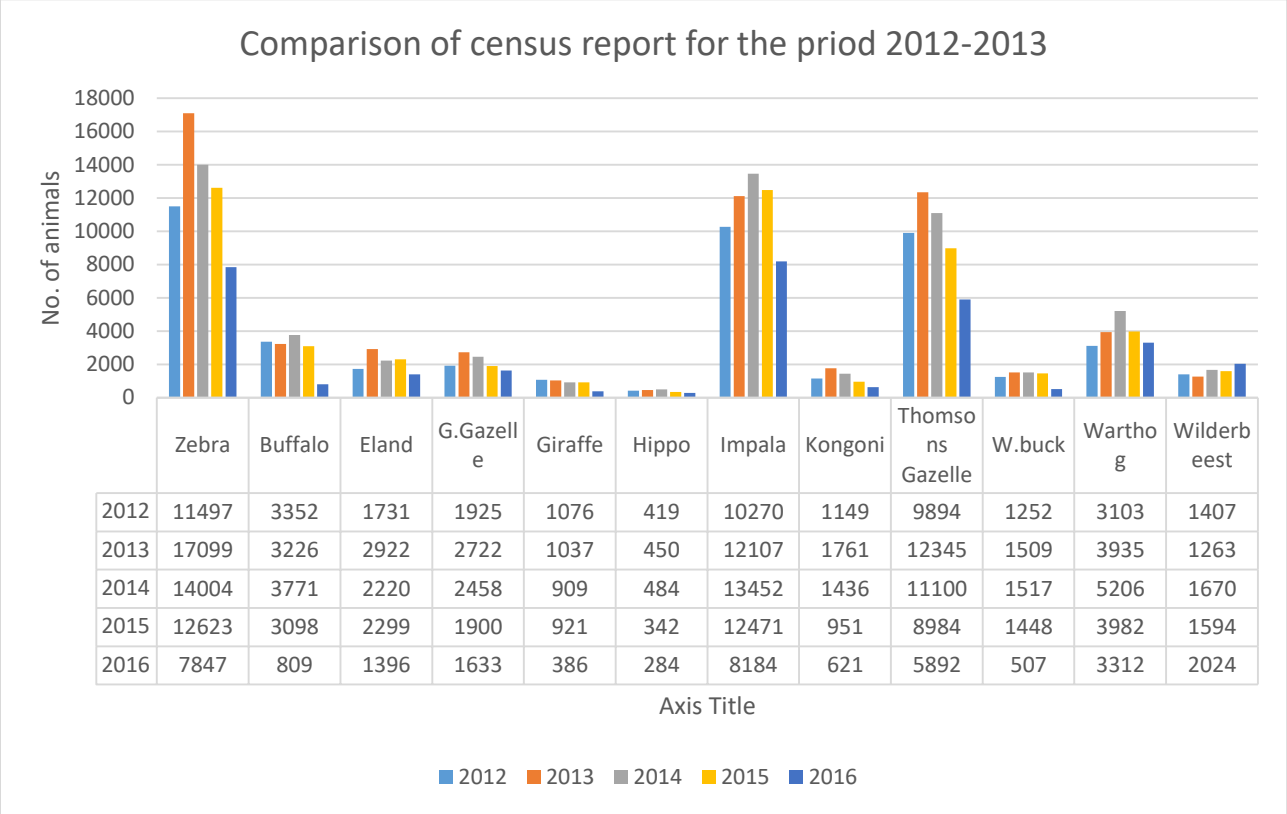


Figure 16: Wildlife trend in Naivasha area

Data source: Naivasha area 2016 wet-season mammal census Report

Among the common herbivores in Hell's Gate and Mt. Longonot ecosystem, zebra recorded the highest abundance (11,497) while the hippopotamus was least abundant (419). Hippopotamus are rare to sight during the day since they are partially aquatic.

There are high number of animals outside protected areas (HGNP and Mt. Longonot) and for the case of Hells Gate National Park, the animals seem to be moving from the park to Kedong and Oserengoni (Oserian) Wildlife Conservancy (OWC) following the rapid geothermal development activities, (Atai, 2016).



	Zebra	Buffalo	Eland	G.Gazelle	Giraffe	Hippo	Impala	Kongoni	Thomsons Gazelle	W.buck	Wartho g	Wilderbeest
2012	11497	3352	1731	1925	1076	419	10270	1149	9894	1252	3103	1407
2013	17099	3226	2922	2722	1037	450	12107	1761	12345	1509	3935	1263
2014	14004	3771	2220	2458	909	484	13452	1436	11100	1517	5206	1670
2015	12623	3098	2299	1900	921	342	12471	951	8984	1448	3982	1594
2016	7847	809	1396	1633	386	284	8184	621	5892	507	3312	2024

Figure 17: Wildlife census findings for the period between 2012 & 2016

Data source: Naivasha area 2016 wet-season mammal census Report

The proposed project transmission line route will be located outside HGNP and it is therefore expected that the impact will equally reduce. Figure 18 shows Hell's Gate and Mt. Longonot zonation map.

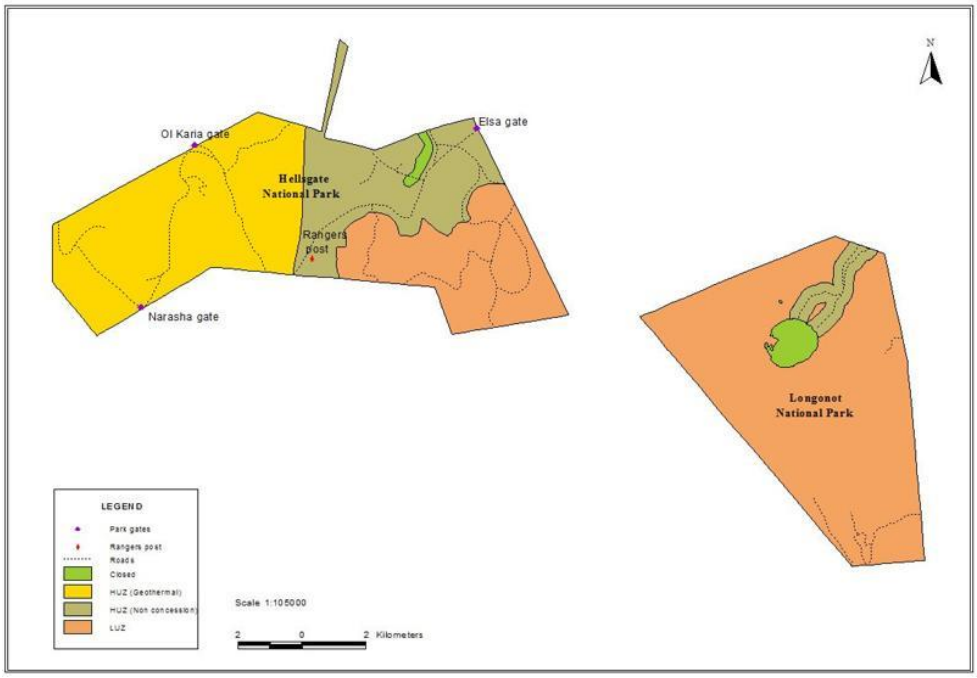


Figure 18: Hell's Gate and Mt. Longonot ecosystem zonation

Source: KWS, Hell's Gate & Mt. Longonot ecosystem management plan, 2010-2015).

3.1.17 Ecosystem Conservation and Catchment Restoration Programmes

3.1.17.1 Social Afforestation

Kenya recognises the importance of forests and natural resources. It is against this background that the Kenyan Constitution, 2010 sets a minimum of 10% national tree cover target. KenGen has been raising seedlings from four of its tree nurseries located at Olkaria, Karagita, Naivasha GK Prison and Eburru to promote social afforestation. The afforestation programme aims at raising, issuing and planting tree seedling within Lake Naivasha catchment and all over the country towards achieving the national set target. Tree planting is also undertaken to rehabilitate the catchment areas. From the financial year 2001-2002 to Financial Year 2017-2018, a total of 2,118,570 tree seedlings have been issued out from various tree nurseries within geothermal business area as shown in figure 19. The company has an annual target of raising 150,000 tree seedlings.

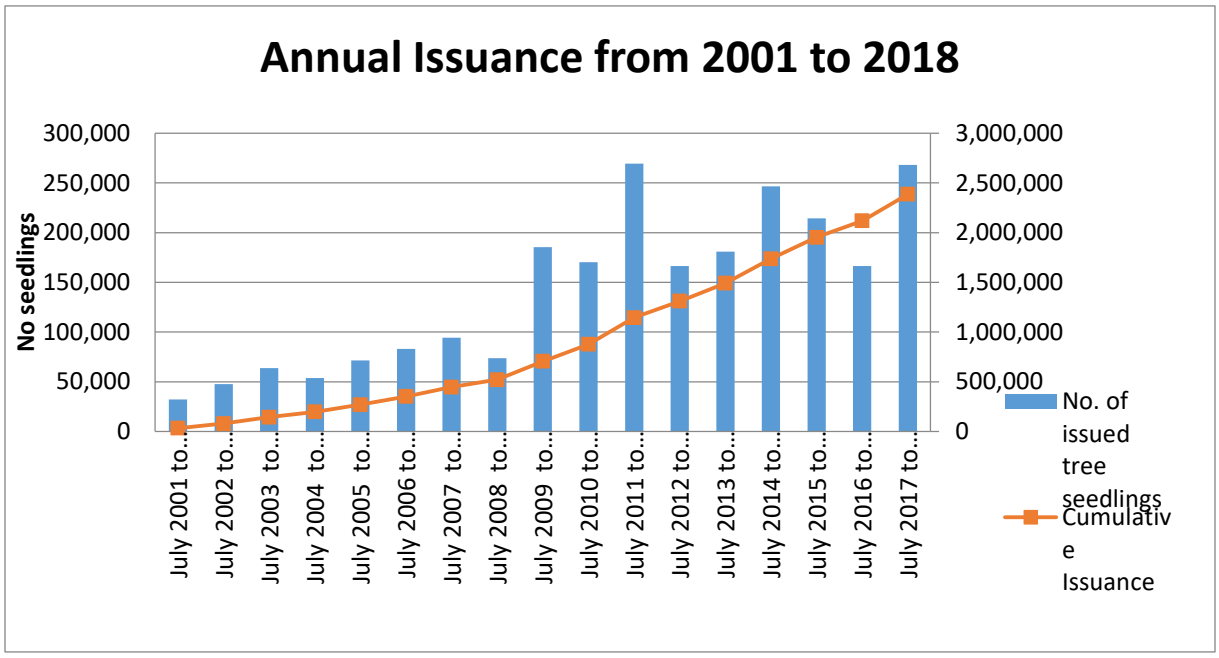
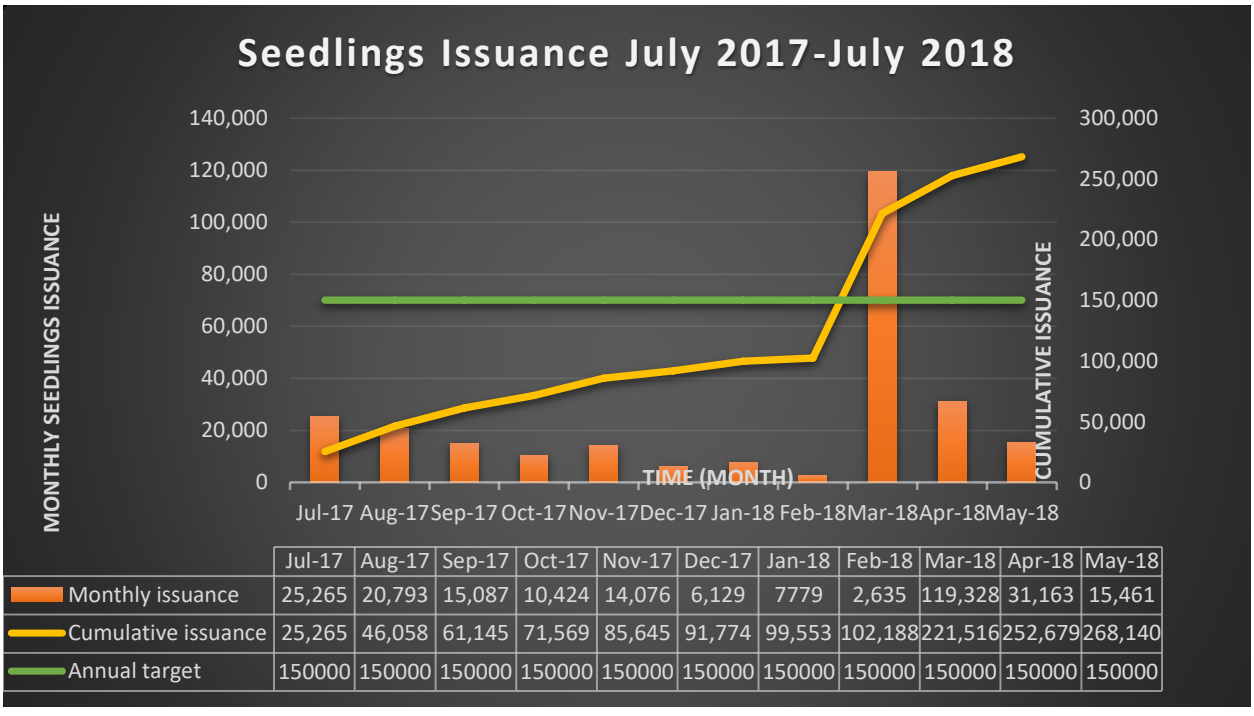


Figure 19: Issued tree seedlings (From 2001 to 2018 financial years)

The amount of tree seedlings issued out per month is directly proportional to the amount of precipitation received. The peak tree seedlings issuance was in the month of December 2015 when the country was receiving El nino rainfall while the lowest issuance was in January 2017 during the dry period as shown in Figure 20.



	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18
Monthly issuance	25,265	20,793	15,087	10,424	14,076	6,129	7779	2,635	119,328	31,163	15,461
Cumulative issuance	25,265	46,058	61,145	71,569	85,645	91,774	99,553	102,188	221,516	252,679	268,140
Annual target	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000	150000

Figure 20: Total monthly tree seedlings issuance for the period July 2017-May 2018

Survival rate monitoring for the issued seedlings is also undertake biannually. The average survival rate of the issued seedlings has been over 70% as shown in figure 21.

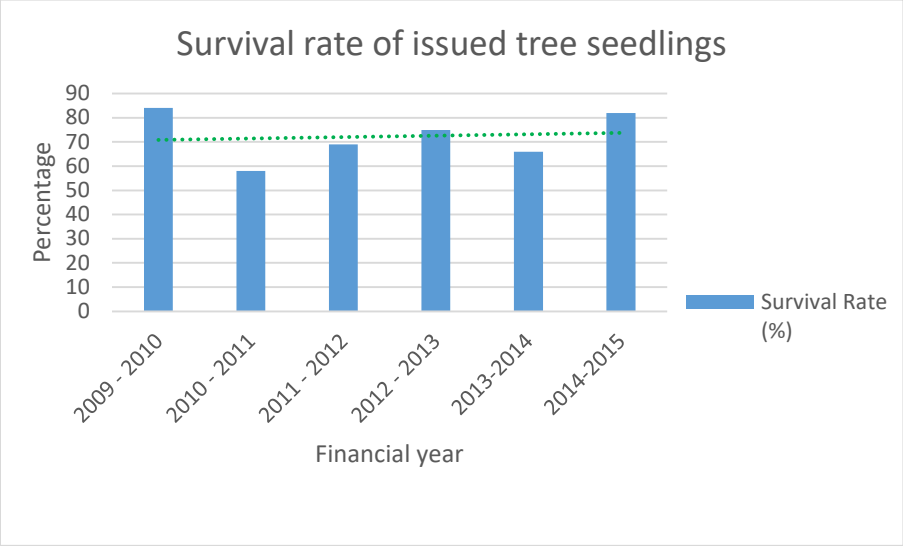


Figure 21: Issued tree seedlings survival rate by Financial Year

3.1.18 Threats to Biodiversity Conservation

(i) Habitat loss and fragmentation

High population numbers in Naivasha area is outside protected areas i.e. HGNP and Mt. Longmont National park. This situation has forced private land owners and ranchers to fence. The government protected areas are not fenced and wild animals move freely within and outside these sites. However increased fencing within the area has affected wildlife conservation and the earlier presumed habitats and wildlife dispersal corridors are under cultivation or highly fragmented (Atai, 2016).

(ii) Alien and invasive species

Proliferation of invasive species is a menace within and outside Hell's Gate National park. Invasive species threatens natural habitats since they out compete native species and alter the host biophysical environments. *Nicotiana glauca, Solanum incanum* and *Datura stramonium* are the major invasive species of plant. The species tend to colonize disturbed areas such as roads, well pads, construction sites and overgrazed habitats. *Tarchonanthus camporatus* is a crucial habitat for the buffalos and other browsers but it's invasive on grasslands.

(iii) Livestock incursion

The neighbouring communities to Hell's Gate and Mt. Longonot National parks, mainly the Maasai, primarily practice pastoralism as source of livelihood. This type of livestock husbandry

is hardly regulated and leads to overstocking. Demand for forage and water especially during the drought, force herders to go out of their range to graze within the park. This eventually leads to competition with wildlife for resource and could even lead to spread of zoonotic diseases.

(iv) Vegetation Clearing and charcoal burning

Vegetation clearing is common in the park especially in isolated areas such as valleys. Trees and shrubs are cut down to provide a source of building materials and for charcoal burning. The vice is perpetrated by poachers and illegal herders.

(v) Wildfires

Wild fires are common inside and outside the park due to open fires and the semiarid nature of Olkaria. The wildfire result from illegal charcoal burning, illegal settlements, arson and electrical faults. Wildfires are sometimes used as a means of pasture and pest management, (I.U.C.N, 2008).

CHAPTER 4

4 LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

4.1 General Overview

In Kenya there are several Acts of Parliament and a Constitution that govern environmental management and conservation of natural resources. The Environmental Management and Co-ordination Act (EMCA), CAP 387 is the umbrella legal framework that governs environmental management in Kenya. EMCA, 199) provided for the establishment of National Environment Management Authority (NEMA), which became operational in July 2002, with the statutory mandate to co-ordinate all environmental activities in the country. The Act has undergone several reviews to align it with the provisions of the Constitution of Kenya, 2010. The current revised version is EMCA, CAP 387. Kenya has also developed the National Environment Policy, 2013 which was also formulated in line with the Constitution of Kenya, 2010. This Policy proposes a broad range of measures and actions responding to key environmental issues and challenges. It seeks to provide the framework for an integrated approach to planning and sustainable management of natural resources in the country. It recognizes the various vulnerable ecosystems and proposes various policy measures not only to mainstream sound environmental management practices in all sectors of society throughout the country but also recommends strong institutional and governance measures to support the achievement of the desired objectives and goal .

Among the measures proposed include:

i. Promotion of environmental education and public awareness at all levels.
ii. Sound waste management approaches.
iii. Safe handling of chemicals.
iv. Management of ecosystems and sustainable use of natural resources. These include promoting sustainable use of fresh water and wetland resources and the conservation of river and lake ecosystems through development and implementation of river basin management plans.
v. Promoting greater environmental responsibility and development and diffusion of environmentally friendly technologies and
vi. Promotion of a clean and healthy environment through prevention of pollution and spread of HIV/AIDS.

Kenya is also a signatory to various international environmental laws including; the Ramsar Convention, The Vienna Convention, Convention on Biological Diversity, the Montreal Protocol, United Nations Framework Convention on Climate Change, the Kyoto Protocol and

the Paris Agreement. The applicable legislative and regulatory framework that will impact on the proposed the 132 kV overhead electricity transmission line project are discussed below.

4.2 Kenya's Legislative and Regulatory Framework

4.2.1 The Constitution of Kenya, 2010

The Constitution is the supreme Law of the Republic of Kenya and binds all persons and all State organs at both levels of government. Article 42 provides that every person has the right to a clean and healthy environment, which includes the right to have -

(a) The environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in Article 69 and

(b) Obligations relating to the environment fulfilled under Article 70.

Article 69 (1) stipulates that the state shall -

a) Ensure sustainable exploitation, utilisation, 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.

Article 69 (2) provides that 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. According to Article 70 (1), if a person alleges that a right to a clean and healthy environment recognized and protected under Article 42 has been, is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter. Article 70 (2) stipulates that on application, under clause (1), the court may make any order to,

a) Prevent, stop or discontinue any act or omission that is harmful to the environment;

b) Compel any public officer to take measures to prevent or discontinue any act or omission that is harmful to the environment; or

c) Provide compensation for any victim of a violation of the right to a clean and healthy environment.

Article 70 (3) does not require an applicant to demonstrate that any person has incurred loss or suffered injury.

KenGen will be required to put in place necessary measures to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources throughout construction and implementation phase of the proposed 132 kV overhead electricity transmission line project to supply power to the KenGen Industrial \Park. Public participation during the ESIA study for the proposed project should also be undertaken in order to give the public an opportunity to participate in decision making process. Already, the EIA team has conducted three public barazas and a key stakeholder's workshop with regards to this ESIA study. The proponent, in collaboration with NEMA, will also ensure publishing of a public notice in the Kenya Gazette and one of the local newspapers inviting the public to provide further comments on the final ESIA study report.

4.2.2 The Environmental Management and Coordination Act (EMCA), Cap 387

This is an Act of Parliament which establishes appropriate legal and institutional framework for the overall environmental management in Kenya. The Sessional Paper No. 6 of 1999 titled *Environment and Development* gave forth to the Environmental Management and Coordination Act (EMCA) No. 8 of 1999 as Kenya's first framework environmental law.

The Act has undergone several reviews to align it with the provisions of the Constitution of Kenya, 2010. The current revised version is EMCA, CAP 387. Some of the provisions of the Act that are applicable to the proposed 132 kV overhead electricity transmission line project to supply power to the proposed KenGen industrial park are:

Section 3 stipulates that -

(1) Every person in Kenya is entitled to a clean and healthy environment in accordance with the Constitution and relevant laws and has the duty to safeguard and enhance the environment.

(2) The entitlement to a clean and healthy environment under subsection (1) includes the access by any person in Kenya to the various public elements or segments of the environment for recreational, educational, health, spiritual and cultural purposes.

(3) Every person shall cooperate with state organs to protect and conserve the environment and to ensure the ecological sustainable development and use of natural resources.

(4) If a person alleges that the right to a clean and healthy environment has been, is being or is likely to be denied, violated, infringed or threatened, in relation to him, then without prejudice to any other action with respect to the same matter which is lawfully available, that person may on his behalf or on behalf of a group or class of persons, members of an association or in the public interest -

(a) Prevent, stop or discontinue any act or omission deleterious to the environment;

(b) Compel any public officer to take measures to prevent or discontinue any act or omission deleterious to the environment;

(c) Require that any on-going activity be subjected to an environmental audit in accordance with the provisions of this Act;

(d) Compel the persons responsible for the environmental degradation to restore the degraded environment as far as practicable to its immediate condition prior to the damage; and provide compensation for any victims of pollution and the cost of beneficial uses lost as a result of an act of pollution and other losses that are connected with or incidental to the foregoing.

Subject to Section 29 of the Act, every Governor shall by notice in the Gazette, constitute a County Environment Committee of the respective County. Section 57 (1) requires that all Policies, Plans and Programmes for implementation be subject to Strategic Environmental Assessment (SEA). According to section 58, the proponent of any project specified in the second schedule is required to undertake Environmental Impact Assessment (EIA) study and submit the EIA study report to NEMA prior to being issued with the license. The second schedule of the Act provides a list of projects that are required to undergo EIA studies.

Section 68 provides that –

(1) The Authority or its designated agents shall be responsible for carrying out environmental audit of all activities that are likely to have significant effect on the environment. An environmental inspector appointed under this Act may enter any land or premises for the purposes of determining how far the activities carried out on that land or premises conform to the statements made in the environmental impact assessment study report issued in respect of that land or those premises under section 58(2).

(2) The owner of the premises or the operator of a project for which an EIA study report has been made shall keep accurate records and make annual reports to the Authority describing how far the project conforms to the statements made in the EIA study report submitted under section 58(2).

According to section 129 (1) any person who is aggrieved by:-

a) The grant of a licence or permit or a refusal to grant a licence or permit, or the transfer of a licence or permit, under this Act or regulations made thereunder.
b) The imposition of any condition, limitation or restriction on his licence under this Act or regulations made thereunder;
c) The revocation, suspension or variation of his licence under this Act or regulations made thereunder;
d) The amount of money which he is required to pay as a fee under this Act or regulations made thereunder;
e) The imposition against him of an environmental restoration order or environmental improvement order by the Authority under this Act or regulations made thereunder; may within sixty days after the occurrence of the event against which he is dissatisfied, appeal to the National Environment Tribunal in such manner as may be prescribed by the Tribunal

Pursuant to section 145 (1) when an offence against this Act, is committed by a body corporate, the body corporate and every director or office of the body corporate who had knowledge of the commission of the offence and who did not exercise due diligence, efficiency and economy to ensure compliance with this Act, shall be guilty of an offence. The institutions under EMCA, CAP 387 are provided in table 28.

Table 28: Institutions under EMCA, Cap. 387

Index	Institution	Functions
i.	NEMA	Undertake general supervision and co-ordination over all matters relating to the environment and implementation of all policies relating to the environment on behalf of the Government of Kenya.
ii.	County Environment Committees (CEC)	Ensure proper management of the environment within the county for which it is appointed and Develops a County Strategic Environmental Action Plan after every five years.
iii.	National Environmental Department (A committee of NEMA)	to investigate— (i) any allegations or complaints against any person or against NEMA in relation

Index	Institution	Functions
		to the condition of the environment in Kenya or (ii) any suspected case of environmental degradation so as to facilitate preparation of a report for presentation to the Council of County Governors.
iv.	National Environment Tribunal (NET)	Receive written appeals from any aggrieved party or a referral directed to it by NEMA on any matter relating to the Act, inquire into the matter and make an award, give directions, make orders or decisions as may be deemed necessary.

KenGen will be required to exercise due diligence when implementing the proposed 132 kV overhead electricity transmission line project to ensure protection of the environment and safety of workers and the surrounding community. However, construction phase of the proposed 132 kV overhead electricity transmission line project should be preceded with acquisition of the EIA license which shall set out mandatory conditions to be fulfilled in line with sustainable development goals. This ESIA study report has been prepared to fulfil this requirement. During construction phase, the selected contractor shall be required to implement the Environmental and Social Management Plan contained in this ESIA study report so as to ensure environmentally sustainable development.

4.2.3 The Environmental Management and Co-ordination (Waste Management) Regulations, 2006

These Regulations were published in the Kenya Gazette Supplement No. 69, Legislative Supplement No. 37, and Legal Notice No. 121 of 29 September, 2006. The regulations provide details on management (handling, storage, transportation, treatment and disposal) of various waste streams including:

- domestic waste
- industrial waste,
- hazardous and toxic waste
- pesticides and toxic substances
- biomedical wastes and

- radioactive waste

Regulation No. 4 (1) makes it an offence for any person to dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators in order to minimize the amount of waste generated and they include:

i. Improvement of production process through-
   - Conserving raw materials and energy
   - Eliminating the use of toxic raw materials and wastes
   - Reducing toxic emissions and wastes

ii. Monitoring the product cycle from beginning to end by-
   - Identifying and eliminating potential negative impacts of the product
   - Enabling the recovery and re-use of the product where possible, and
   - Reclamation and recycling and

iii. Incorporating environmental concerns in the design and disposal of a product

Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal. Regulation 14 (1) requires every trade or industrial undertaking to install at its premises anti-pollution equipment for the treatment of waste emanating from such trade or industrial undertaking. Regulation 15 prohibits any industry from discharging or disposing of any untreated waste in any state into the environment.

Regulation 17 (1) makes it an offence for any person to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA. Regulation 40 requires all waste transporters to obtain a license from NEMA for the transportation of waste.

KenGen will be required to ensure sound management of all solid waste generated throughout the implementation period of the proposed 132 kV overhead electricity transmission line. The measures to be put in place include provision of solid waste containers for onsite use, segregation of waste at the source, ensuring final disposal of solid waste at designated sites, contracting NEMA licensed waste transporter and maintaining waste tracking records on site.

4.2.4 The Environmental Management and Co-ordination (Water Quality) Regulation, 2006

These regulations were published in the Kenya Gazette Supplement No. 68, Legislative Supplement No. 36, and Legal Notice No. 120 of 29 September, 2006. The regulations provides

for sustainable management of water resources including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells and other water sources). It is an offence under Regulation No. 4 (2), for any person to 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.

Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious or obstructing matter, radio-active waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards for effluent discharge into the environment.

During construction phase of the proposed 132 kV overhead electricity transmission line and associated substations, the contractor and KenGen will refrain from any actions, which may directly or indirectly cause water pollution. Such actions include handling and storage of hazardous materials.

4.2.5 The Environmental Management and Co-ordination (Air Quality) Regulations, 2014

Regulation 3 stipulates that the objective of these Regulations is to provide for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air.

According to Regulation 5 (l) 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.

Regulation 15 provides that no person, owner or operator of a facility shall cause or allow the emission of air pollutants in excess of the limits stipulated under the Third Schedule.

Regulation 20 (l) prohibits any person, operator or owner of any facility to cause or allow fugitive emissions to cause the ambient air quality at its property boundary to exceed the limits prescribed under the First Schedule.

Regulation 25 (l) provides that No person shall cause or allow the emission of visible air pollutants from a stationary vehicle in excess of the limits set out under the prescribed Standard. According to Regulation 30 (l) the occupier or operator of premises shall ensure that exposure of indoor air pollutants does not exceed the exposure limits stipulated under the Factories and Other Places of Work (Hazardous Substances) Rules or under any other relevant law.

Regulation 33 prohibits any person operating construction equipment or handling construction material to allow emission of particulate matter so as to exceed the limits set out in the First schedule.
Regulation 34 stipulates that No person shall cause or allow emission of particulate matter during the demolition of structures, buildings, or parts of buildings in such a manner as to exceed the limits set out in the First Schedule.

According Regulation 35, No person shall cause or allow stockpiling or other storage material in a manner likely to cause ambient air quality levels set out under the First Schedule to be exceeded.

KenGen and the selected contractor will be required to implement appropriate safety measures to prevent air pollution during construction and operation phase of the proposed 132 kV overhead electricity transmission line project.

4.2.6 The Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009

These regulations were published as legal Notice No. 61. The regulations provide information on the following:

i. Prohibition of excessive noise and vibration
ii. Provisions relating to noise from certain sources
iii. Provisions relating to licensing procedures for certain activities with a potential of emitting excessive noise and/or vibrations and
iv. Noise and excessive vibrations mapping

According to Regulation 3 (1), 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.
Regulation 4 prohibits any person to *(a)* make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or *(b)* cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 meters from any moving source.
Regulation 5 further makes it an offence for any person to make, continue or cause to be made or continued any noise in excess of the noise levels set in the First Schedule to these

Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property. Table 29.shows the first schedule.

Table 29: First schedule - Maximum Permissible Noise Levels

Zone		Sound Level Limits dB (A) (Leq, 14h)		Noise Rating Level (NR) (Leq,14h)	
		Day	Night	Day	Night
A	Silent Zone	40	35	30	25
B.	Places of worship	40	35	30	25
C.	Residential: Indoor	45	35	35	25
	Outdoor	50	35	40	25
D.	Mixed residential (with some commercial and places of entertainment)	55	35	50	25
E.	Commercial	60	35	55	25

Time Frame:

Day: 6.01 am - 8.00 pm (Leq, 14 h)

Night: 8.01 pm – 6.00 am (Leq, 10 h)

Regulation 12 (1) makes it an offence for any person to operate a motor vehicle which- *(a)* produces any loud and unusual sound; and *(b)* exceeds 84 dB(A) when accelerating. According to sub regulation 2 of this regulation, No person shall at any time sound the horn or other warning device of a vehicle except when necessary to prevent an accident or an incident. Regulation 13 (1) provides that except for the purposes specified in sub-regulation (2) there under, no person shall operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. Table 30 shows the second schedule.

Table 30: Second Schedule - Maximum Permissible Noise Levels for Construction Sites (Measurement taken within the facility)

Facility		*Maximum Noise Level Permitted (Leq) in dB(A)*	
		Day	Night
i.	Health facilities, educational institutions, homes for disabled etc.	60	35
ii.	Residential	60	35
iii.	Areas other than those prescribed in (i) and (ii)	75	65

Time Frame:

Day: 6.01 a.m. – 6.00 p.m. (Leq, 14 h)

Night: 6.01 p.m. – 6.00 a.m. (Leq, 14 h)

Regulation 19 (1) prohibits any person to carry out activities relating to fireworks, demolitions, firing ranges or specific heavy industry without a valid permit issued by the Authority.

According to sub-regulation 4, such permit shall be valid for a period not exceeding three months.

The contractor selected by KenGen shall be required to put in place necessary measures aimed at preventing noise pollution during the construction phase of the proposed project.

4.2.7 The Occupational Safety and Health 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 was published in the Kenya Gazette Supplement No. 111 (Acts No.15).

It received presidential assent on 22nd October, 2007 and became operational on 26 October, 2007. The key areas addressed by the Act include:

- General duties including duties of occupiers, self-employed persons and employees
- Enforcement of the act including powers of an occupational safety and health officer
- Registration of workplaces
- Health General Provisions including cleanliness, ventilation, lighting and sanitary conveniences
- Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle,

cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver

- Safety General Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas
- Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials
- Welfare general provisions including supply of drinking water, washing facilities, and first aid
- Offences, penalties and legal proceedings

Under section 6 of this Act, every occupier is obliged to ensure safety, health and welfare of all persons working in his workplace. The occupier shall achieve this objective by preparing and as often as may be appropriate, revising a written statement of his general policy with respect to the safety and health at work of his employees and the organization and arrangements for the time being in force for carrying out that policy (Section 7). He is also required to establish a safety and health committee at the workplace in a situation where the number of employees exceeds twenty (section 9) and to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a registered safety and health Advisor (Section 11). In addition, any accident, dangerous occurrence, or occupational poisoning which has occurred at the workplace needs to be reported to the occupational safety and health officer of the respective area by an employer or self-employed person (section 21).
According to section 44, potential occupiers are required to obtain a registration certificate from the Director for all premises intended for use as workplaces. Such places shall be maintained in a clean state during the operation phase (section 47).

In relation to fire safety, section 81 requires necessary precautions for dealing with fire incidents to be implemented including provision of means for extinguishing fire and means for escape, in case of fire, for the persons employed in any workplace or workroom. As far as disaster preparedness and emergency response program is concerned, section 82 (1) makes it a mandatory requirement for every occupier of a workplace to design evacuation procedures to be used during any emergency situation and to have them tested at regular intervals.
The employers' positive contribution towards the welfare of the employees include provision and maintenance of adequate supply of wholesome drinking water - section 91 and a first aid

box or cupboard of the prescribed standard – section 95 at suitable point (s) conveniently accessible to all employees.

The contractor to be selected by KenGen will be required to ensure adherence to the provisions of OSHA, 2007. Some of the measures to be put in place include; constituting a well-functioning health and safety committee, conducting statutory inspections of relevant equipment and providing applicable trainings, wholesome drinking water to employees, first aid boxes and firefighting equipment. Utmost care shall be taken during handling of energized conductors due to the high voltages anticipated.

4.2.8 The Factories and other Places of Work (Fire Risk Reduction) Rules, 2007

These Rules were published in the Kenya Gazette Supplement No. 46, Legislative Supplement No. 28, Legal Notice No. 59 of 4 May, 2007 being a supplementary legislation to the Factories and other places of work act, Cap 514 which was repealed. The Occupational Safety and Health Act 2007 (replacement of Cap 514) recommends the implementation of this subsidiary legislation. The rules provide for fire safety measures with specific focus on the following critical requirements:

- Safe handling and storage of flammable substances
- Provision of fire escape exits
- Formation of firefighting team
- Functions of a firefighting team
- Fire safety training
- Conducting fire drills
- Installation, maintenance, inspection and testing of fire equipment
- Documentation of a fire safety policy and
- Annual fire safety audits

These rule shall apply majorly where the activities being conducted are likely to ignite fire. The contractor and KenGen will be required to ensure implementation of the various measures stipulated under the fire rules during project construction and operation phases. Some of the measures to be implemented include; training of some staff on fire-fighting, provision of fire protection system comprising of portable fire extinguishers, hose reels, sprinklers, hydrants, smoke detectors, fire alarm and fire water tank, provision of safe storage for flammable materials, conducting fire audits, designating emergency assembling points and providing emergency exits as necessary.

4.2.9 The Factories and Other Places of Work (Hazardous Substances) Rules, 2007

These Rules were published in the Kenya Gazette Supplement No. 46, Legislative Supplement No. 28, Legal Notice No. 60 of 4 May, 2007 being a supplementary legislation to the Factories and other places of work Act, Cap 514 which was repealed. The rules provide for safety measures in handling of hazardous substances at work places including:

- Occupational exposure limits
- Control measures
- Maintenance of Material Safety Data Sheets
- Provision and use of personal protective equipment
- Sound disposal of hazardous materials
- Provision of training and information to employees and
- Air monitoring and measurement
- Medical examination and
- Duties of employees

KenGen and the selected contractor will be required to ensure compliance with the hazardous substances rules by;

- *Documenting safe working procedures on the use, handling and storage of hazardous materials*
- *Providing suitable personal protective equipment to employees including coveralls, helmets, safety boots, gloves*
- *Providing first aid boxes at strategic points*
- *Carrying out regular monitoring of the levels of hydrogen sulphide gas emissions and*
- *Maintaining at the point of use MSDS for the various materials in use.*

4.2.10 The Factories and Other Places of Work (Noise Prevention and Control) Rules, 2005 –Legal Notice No.25

According to Rule 5, where noise in a workplace exceeds the continuous equivalent of 85 dB (A), the occupier must develop and implement an effective noise control and hearing conservation programme which must be in writing and should address:

a) Noise measurement
b) Education & training
c) Engineering noise control
d) Hearing protection

e) Posting of notices in noisy areas

f) Annual programme review

Rule 8 provides that all noise measuring equipment should be regularly calibrated, maintained, inspected and operated according to manufacturer's instructions. Rule 10 (2) requires occupiers to carry out regular inspection and maintenance of machines and installations to ensure that noise emission is prevented or controlled. Rule 13 provides that where the noise level is above 90 dB (A), the employer shall:

i. Post a sign at the entrance to and in every room or conspicuous place, clearly and prominent marked "DANGER HEARING PROTECTION MUST BE WORN"
ii. Supply hearing protection to all persons required to enter such an area and
iii. Ensure that all workers and any other person entering this area wear hearing protectors

KenGen and the selected contractor will be required to implement the above mentioned provisions during construction phase of the proposed 132 kV overhead electricity transmission line project so as to mitigate against any negative impacts associated with noise emission.

4.2.11 The Factories (Building Operations and Works of Engineering Construction) Rules, 1984

Rule 7 requires every contractor who employs more than twenty persons to appoint a safety supervisor who should be experienced in the works being carried out at the site. Rule 48 (1) prohibits any timber or material with projecting nails to be placed or be allowed to remain in any place at a site where they are a source of danger to persons employed. Rule 55 (C) provides that properly maintained scaffolds or; where appropriate, ladders or other means of support which shall be sufficient and suitable for the purpose shall be provided, placed and kept in position for use where work cannot be safely done on or from the ground or from part of a building or other permanent structure.

Rule 109 (1) prohibits any crane, crab or winch to be used unless it has been tested and thoroughly examined by a competent person within the previous four years and no pulley block, gin wheel or sheer legs shall be used in the raising or lowering of a load weighing one tone or more unless it has been tested and thoroughly examined by a competent person.

Rule 132 provides that where a contractor has more than five persons in his employment on a site, he shall provide and keep clean and in good repair a sufficient number of suitable first aid boxes, which shall, while work is going on, be reasonably accessible to all positions on the site where persons in his employment are working.

KenGen and the appointed contractor will need to comply with the above mentioned measures throughout the construction and operation phase of the 132 kV overhead electricity transmission line project.

4.2.12 The Work Injury Benefits Act, 2007

This is an Act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. The act was published on 26 October, 2007.

The salient features addressed by the act include the following:

i. Obligations of employers
ii. Right to compensation
iii. Reporting of accidents
iv. Compensation
v. Occupational diseases
vi. Medical aid and
vii. Appeals

According to section 7 (1) of the act, every employer is required to obtain and maintain an insurance policy, with an insurer approved by the Minister in respect of any liability that the employer may incur under the act to any of his employees. In addition, every employer carrying on business in Kenya shall within the prescribed period and in the prescribed manner register with the Director - section 8 (1). Pursuant to section 10 (2) of the act, it is the duty of every employee to ensure his/her safety at the place of work and hence where an accident, not resulting in serious disablement or death, is caused by the deliberate and wilful misconduct of the employee, such an employee is not entitled to compensation. However, according to section 12 if an employee is injured in an occupational accident or contracts an occupational disease while the employee, with the consent of the employer, is engaged in any organized first aid, ambulance or rescue work, fire-fighting or other emergency service, the accident or disease is for the purposes of this Act, deemed to have arisen out of and in the course of the employee's employment. In a circumstance where an accident occurs in the course of employment, section 21 makes it a requirement for a written or verbal notice of such an accident to be given by or on behalf of the employee concerned to the employer who shall send a copy of the notice to the Director within twenty four hours of its occurrence in the case of a fatal accident. In line with section 22 (1), an accident that has occurred should be reported to the Director by the employer in the prescribed manner within seven days from the date of receiving a notice of the accident or having learned that an employee has been injured in an accident. Similarly, it is the responsibility of the employee to report to his/her employer the occurrence of an accident not

later than 12 months from the date of such an accident or else the right to benefits, in accordance with section 27 (1), shall lapse if the accident is not reported within such a period of time (12 months). According to section 46 (1), the employer shall be responsible for availing necessary means of transport where an employee is injured in an accident, which necessitates his conveyance to a hospital medical facility and from a hospital or medical facility to his residence.

KenGen and the selected contractor will ensure adherence to this act by observing the following measures;

- *Provision of an ambulance*
- *Maintaining an insurance policy cover for its employees*
- *Maintaining a record of accidents*
- *Carrying out proper accident investigations and*
- *Organizing for pre-employment and regular medical examinations for staff.*

4.2.13 The Wildlife Management and Conservation Act, No. 47 of 2013

This is an Act of Parliament to provide for the protection, conservation, sustainable use and management of wildlife in Kenya.

Section 26(1) stipulates that the provisions of this Act with respect to conservation, protection and management of the environment shall be in conformity with the provisions of the Environmental Management and Coordination Act, CAP 387.

Section 30 prohibits any activity which is likely to have adverse effects on the environment, including the seepage of toxic waste into streams, rivers, lakes and wetlands.

Pursuant to section 44 (1) every national park, marine protected area, wildlife conservancy and sanctuary shall be managed in accordance with a management plan that complies with the requirements prescribed by the Fifth Schedule.

Subject to section 45 (1) No person shall mine or quarry in a national park without the approval and consent of Kenya Wildlife Service (KWS). Where this is approved an EIA license shall be mandatory.

Section 89 (1) provides that any person who-

(a) discharges any hazardous substances or waste or oil into a designated wildlife area contrary to the provisions of this Act and any other written law;

(b) pollutes wildlife habitats and ecosystems;

(c) discharges any pollutant detrimental to wildlife into a designated wildlife conservation area contrary to the provisions of this Act or any other written law, commits an offence

and shall be liable upon conviction to a fine of not less than two million shillings or to imprisonment of not less than five years or to both such fine and imprisonment.

Section 93 stipulates that any person who –

(a) knowingly introduces an invasive species into a wildlife conservation area; or

(b) Fails to comply with the measures prescribed by the Cabinet Secretary set out under this Act, commits an offence and shall be liable upon conviction to a fine of not less than three hundred thousand shillings or to imprisonment of not less than one year or to both such fine and imprisonment.

According to section 111 (1) any authorized officer of or above the rank of assistant warden may erect a temporary barrier across any road or place and any person approaching the barrier shall, on being required by the officer so to do, stop and allow the officer to carry out search of his own person and of any vehicle as may appear to the officer to be necessary or expedient. The Sixth Schedule to the Act provides the nationally listed critically endangered, vulnerable, nearly threatened and protected species of fauna and flora. The proposed 132KV overhead electricity transmission line project is within wildlife dispersal area hence could potentially affect the migration of wildlife.

The proposed electricity transmission line route will traverse outside Hell's Gate National Park. However, due to ecosystem connectivity, KenGen and the selected contractor will be expected to put in place necessary measures to promote conservation of wildlife during the construction and operation phase of the proposed project.

4.2.14 The Forest Conservation and Management Act, 2016

This Act repealed the Forest Act, 2005.

The Act provides for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country. According to section 8 of the Act, the conservation, protection and management of all public forests is vested in the Kenya Forest Service (KFS). In addition, this section provides that KFS is also responsible for the management of the water catchment areas in relation to soil and water conservation, carbon sequestration and other environmental services in collaboration with relevant stakeholders. Section 21 of the Act stipulates that each county government shall promote afforestation in the county.

The proposed 132KV overhead electricity transmission line project will not be located in a gazetted forest. However, the selected contractor shall take necessary measures to rehabilitate disturbed sites by replanting trees and grass during construction phase of the proposed project

thereby promoting ecosystem conservation. Native species of vegetation will be used in the rehabilitation programme.

4.2.15 The Energy Act, 2006 (No. 12 of 2006)

The energy act came into assent on 30 December, 2006 and was published on 2 January, 2007. This is an Act of Parliament passed to amend and consolidates the law relating to energy, to provide for the establishment, powers and functions of the Energy Regulatory Commission and the Rural Electrification Authority and for connected purposes. The Energy Act, amongst other issues, deals with all matters relating to all forms of energy including the generation, transmission, distribution, supply and use of electrical energy as well as the legal basis for establishing the systems associated with these purposes.

The Energy Act, 2006, also established the Energy Regulatory Commission (ERC) whose mandate is to regulate all functions and players in the Energy sector. One of the duties of the ERC is to ensure compliance with Environmental, Health and Safety Standards in the Energy Sector, as empowered by Section 98 of the Energy Act, 2006. In this respect, the following environmental issues will be considered before approval is granted:

- The need to protect and manage the environment, and conserve natural resources;
- The ability to operate in a manner designated to protect the health and safety of the project employees; the local and other potentially affected communities.

Section 27 and 28 under this Act requires that an application be made before the transmission and supply of bulk energy. Licensing and authorization to generate and transmit electrical power must be supported by an Environmental Impact Assessment (EIA) Report approved by NEMA.

KenGen has already initiated the process of applying for a license to transmit bulk electricity to the KenGen Industrial Park. However, in order for the application process to be completed, ERC recommended KenGen to submit together with the application, an EIA license for the proposed 132 kV overhead power transmission project. This ESIA report will serve to fulfil this purpose.

4.2.16 Geothermal Resources Act No. 12 of 1982

Section 7 (1) of this Act requires KenGen to be in possession of a geothermal resources licence over part of the entire geothermal resources area and to comply with the terms and conditions of the license.

Section 14 provides that the holder of such a licence may for the purposes of generating, transmitting or supplying electrical power-

(a) extract, take, use and apply geothermal resources on or under any land which is the subject of licence;

(b) erect, construct, provide and use such works and appliances as may be necessary for the purpose of generating electricity, and in connection with the transmission, use, supply and sale of electricity

Subject to section 8 (1) of the act, the licence confers upon KenGen the right-

(a) to enter upon the land being the subject of the licence to bore and to extract geothermal resources and to do all such things as are reasonably necessary for the conduct of those operations;

(b) in so far as it may be necessary for and in connection with the operations referred to in paragraph (a)-

i. to drill and construct all necessary boreholes;

ii. to erect, construct and maintain houses and buildings for his own use and for use by his employees;

iii. to erect, construct and maintain plant, machinery, buildings and other erections as may be necessary;

iv. to utilize the geothermal resources;

v. subject to the Water Act, to reclaim and utilize any water; and

vi. to construct and maintain roads and other means of communications and conveniences;

(c) to take and use or apply the geothermal resources for any purpose specified in the licence.

According to section 16, the holder of a license shall be liable for any loss, damage or injury to any person or property resulting from his works or operations, whether as a result of negligence or otherwise.

KenGen is in possession of a geothermal resources license for the Olkaria Geothermal Field. The company shall be required to adequately implement the ESMP for the proposed 132 kV overhead electricity transmission line project so as to ensure safety of workers, animals, visitors and the local residents throughout the life cycle of the proposed project.

4.2.17 The Geothermal Resources Regulation, 1990

Pursuant to regulation 13 of Geothermal Resources Regulation, 1990, all geothermal operations shall be conducted in a workman-like manner and comply with the following requirements

(a) as far as reasonably practicable -

i. prevent the unnecessary waste of or damage to geothermal or other energy and mineral resources;
ii. protect the quality of surface waters, air, and other natural resources, including wildlife, soil, vegetation and natural history;
iii. protect the quality of cultural resources, including archaeological, historical, scenic and recreational resources;
iv. accommodate other land users;
v. protect human and wildlife resources from unacceptable levels of noise;
vi. prevent injury to life; and
vii. prevent damage to property;

(b) sites selected for the construction of drilling sites, roads, sumps, steam transmission lines and other construction attendant to geothermal operations shall be evaluated for stability and in unstable earth conditions shall be avoided where they could affect the integrity of the facility;

(c) operations shall be conducted in a manner which minimizes erosion and disturbances to natural drainage;

(d) the licensee shall conduct all operations in such manner as to afford reasonable protection of fish, wildlife, and natural habitat.

Regulation 18 (1) provides that all licensees, which includes KenGen, shall maintain, at the site of works, and present on demand by any person authorized by the Minister -

a. a register of the progress of operations specifying all important matters relating to operations and, in particular, the characteristics of casing, the cementation effected, production tests and like matters as well as all occurrences and accidents,
b. geological and geophysical records and logs of all past and current bores;
c. a record of the physical and chemical characteristics of fluids emitted from past and current bores;
d. a register giving the names of all persons employed; and
e. such other matters as may be prescribed.

KenGen and the selected contractor will be required to comply with the above mentioned regulations throughout the construction and operation phase of the proposed 132 kV overhead electricity transmission line project. Due care shall be exercised to ensure protection and safety of wildlife, the local community and workers.

4.2.18 Occupiers Liability Act (CAP 34)

This is an Act that amend the law as to the liability of occupiers and others for injury or damage resulting to persons or goods lawfully on any land or other property from dangers due to the state of the property or to things done or omitted to be done there.

Section 3 (4) of the Act stipulates that in determining whether the occupier of premises has discharged the common duty of care to a visitor, regard is to be had to all the circumstances, so that (*e.g.*)

(a) where damage is caused to a visitor by a danger of which he had been warned by the occupier, the warning is not to be treated without more as absolving the occupier from liability, unless in all the circumstances it was enough to enable the visitor to be reasonably safe; and

(b) where damage is caused to a visitor by a danger due to the faulty execution of any work of construction, maintenance or repair by an independent contractor employed by the occupier, the occupier is not to be treated without more as answerable for the danger if in all the circumstances he had acted reasonably in entrusting the work to an independent contractor and had taken such steps (if any) as he reasonably ought in order to satisfy himself that the contractor was competent and that the work had been properly done.

KenGen will be required to exercise due care by ensuring that the selected contractor implements the ESMP for the proposed 132 kV overhead electricity transmission line project. Mandatory safety inductions of visitors and newly recruited workers shall be conducted prior to accessing the project site both during construction and operation phases.

4.2.19 The Public Health Act (Cap. 242)

Section 115 of the Act prohibits causing nuisance or other condition liable to be injurious or dangerous to health. Section 118 provides a list of nuisances which includes any noxious matter, or waste water, flowing or discharged from any premises, wherever situated, into any public street, or into the gutter or side channel of any watercourse, irrigation channel or bed thereof not approved for the reception of such discharge.

KenGen and the selected contractor shall take necessary measures to prevent public nuisance that may arise during the construction and/or operational phase of the proposed 132 kV overhead electricity transmission line project.

4.2.20 The Public Health (Drainage and Latrine) Rules

Rule 85 provides that every owner or occupier of every workshop, workplace or other premises where persons are employed shall provide proper and sufficient latrines for use by employees.

Rule 87 requires every contractor, builder or other person employing workmen for the demolition, construction, reconstruction or alteration of any building or other work in any way connected with building to provide in an approved position sufficient and convenient temporary latrines for use by such workmen.

Rule 91 provides that no person shall construct a latrine in connection with a building other than a water closet or a urinal, where any part of the site of such building is within 200 feet of a sewer belonging to the local authority (currently county government) which is at a suitable level, and where there is sufficient water supply.

KenGen and the selected contractor(s) will be required to provide portable toilets for use by the workers in the field during the construction phase of the proposed project.

4.2.21 The Water Act, 2016

This Act repealed the Water Act, 2002. The water act 2016 provides for the regulation, management and development of water resources, water and sewerage services; and for other connected purposes. Section 36 provides that a permit is required for any of the following purposes-

(a) any use of water from a water resource, except as provided by section 37;

(b) the drainage of any swamp or other land;

(c) the discharge of a pollutant into any water resource; and

(d) any other purpose, to be carried out in or in relation to a water resource, which is prescribed by Regulations made under this Act.

Section 143. (l) Stipulates that a person shall not, without authority conferred under this Act-

(a) wilfully obstruct, interfere with, divert or obstruct water from any watercourse or any water resource, or negligently allow any such obstruction, interference, diversion or abstraction; or (b) throw, convey, cause or permit to be thrown or conveyed, any rubbish, dirt, refuse, effluent, trade waste or other offensive matter or thing into or near to any water resource in such manner as to cause, or be likely to cause, pollution of the water resource.

KenGen and the selected contractor shall ensure implementation of appropriate measures to prevent potential contamination of surface water sources during the construction phase of the proposed 132 kV overhead electricity transmission line project.

4.2.22 Water Resources Management Rules, 2007, Legislative Supplement No.52

Rule 23 (1) stipulates that any person whose works or water use activity falls within Category A is required to notify the Authority, prior to construction or installation of works.

Rule 81 prohibits pollution of water by discharging or applying any poisonous, toxic, noxious or obstructing matter, radioactive waste or other pollutants into any water resource unless such discharge meets the permissible water quality standards recommended by the Authority.

Rule 88 provides that No person shall wilfully and deliberately allow any substance to spill out into any water resource or onto land where such spillage may or is likely to contaminate any body of surface or groundwater.

KenGen and the selected contractor shall be required to put in place necessary measures to prevent the potential of polluting surface water sources during the construction and operation phases of the proposed 132 kV overhead electricity transmission line project.

4.2.23 Climate Change Act, 2016

This is an Act to provide for a regulatory framework for enhanced response to climate change; to provide for mechanism and measures to achieve low carbon climate development.Section 3 stipulates in part, that the national and county governments shall promote low carbon technologies, improve efficiency and reduce emissions intensity by facilitating approaches and uptake of technologies that support low carbon, and climate resilient development. According to section 15 of the Act, each state department and national government public entity shall among others; integrate the climate change action plan into sectoral strategies, action plans and other implementation projections for the assigned legislative and policy functions and report on sectoral greenhouse gas emissions for the national inventory.

KenGen shall ensure that the selected contractor puts in place measures to reduce greenhouse gas emissions during construction phase of the proposed 132 kV overhead power transmission line.

4.2.24 The HIV and AIDS Prevention and Control Act (Cap 14 of 2006)

According to section 4 (1), the Government shall promote public awareness about the causes, modes of transmission, consequences, and means of prevention and control of HIV and AIDS through a comprehensive nationwide educational and information campaign conducted by the Government through its various Ministries, Departments, authorities and other agencies.

Pursuant to subsection (2), the educational and information campaign referred to in subsection (1) shall-

(a) employ scientifically proven approaches;

(b) focus on the family as the basic social unit;

(c) encourage testing of individuals; and

(d) be carried out in schools and other institutions of learning, all prisons, remand homes and other places of confinement, amongst the disciplined forces, at all places of work and in all communities throughout Kenya.

Subsection (3) provides that in conducting the educational and information campaign referred to in this section, the Government shall collaborate with relevant stakeholders to ensure the involvement and participation of individuals and groups infected and affected by HIV and AIDS, including persons with disabilities.

According to section 31 (1) No person shall be-

(a) denied access to any employment for which he is qualified; or

(b) Transferred, denied promotion or have his employment terminated, on the ground only of his actual, or suspected HIV status.

The selected contractor will be required to promote educational and information campaign and organize for Voluntary Counselling and Testing of workers during the construction phase of the proposed 132 kV overhead electricity transmission line project. In addition, the company shall ensure that the contractors do not discriminate workers on the basis of their HIV status.

4.2.25 Traffic Act, Cap 403

Section 16 of the Act requires every vehicle more than four years old from the recorded date of manufacture to be subjected to inspection by the motor vehicle inspection unit. Section 17A stipulates that no motor vehicle or trailer of a class prescribed for the purposes of section 17 (2) shall be used on a road unless an inspection certificate which is—

a) valid and in force at the time; and

b) Legible and in no way defaced or mutilated, is affixed to the vehicle or trailer.

According to section 20, no vehicle which is required to be licensed shall be used on a road unless the license, which shall be legible and in no way defaced, is carried on the vehicle in the prescribed manner.

Section 30 prohibits any person from driving a motor vehicle of any class on a road unless he is the holder of a valid driving license or a provisional license endorsed in respect of that class of vehicle.

Section 42 further prohibits any person to drive, or, being the owner or person in charge of a vehicle, cause or permit any other person to drive, a vehicle on a road at a speed greater than such speed as may be prescribed as the maximum speed for that class of vehicle.

Section 44 Any person who, when driving or attempting to drive, or when in charge of a motor vehicle on a road or other public place, is under the influence of drink or a drug to such an extent as to be incapable of having proper control of the vehicle, shall be guilty of an offence and liable to a fine not exceeding one hundred thousand shillings or to imprisonment for a term not exceeding two years or to both.

Section 45A takes it an offence for any person to drive on pavement, pedestrian walkway, etc. in order to avoid a buildup of traffic on a road, drive a motor vehicle on, or through, a pavement or a pedestrian walkway. Section 49 further prohibits any person to drive a motor vehicle on a road without due care and attention or without reasonable consideration for other persons using the road. Pursuant to section 52 of the Act, the driver of a vehicle shall at all times:

(a) obey any directions given, whether verbally or by signal, by a police officer in uniform, in the execution of his duty; and

(b) conform to the indications given by any traffic sign;

KenGen and the selected contractor will be required to observe the requirements of the Traffic Act during the construction and operation phase of the proposed power transmission project.

4.2.26 The Civil Aviation Act, 2013

This is an Act of Parliament to provide for the control, regulation and orderly development of civil aviation in Kenya; and for connected purposes and Safety of aircraft and persons on board.

Section 46 (1) of the Act stipulates that a person shall not willfully or negligently—

(a) Imperil the safety of an aircraft or any person on board, whether by interference with any member of the crew of the aircraft or by tampering with the aircraft or its equipment, or by disorderly conduct or by any other means;

(b) Cause or permit an aircraft to endanger any person or property;

(c) Interfere or tamper with an air navigation facility.

(2) A person who contravenes the provisions of subsection (1) commits an offence and shall be liable upon conviction to a fine not exceeding two million shillings.

KenGen will ensure that any safety measures recommended by Kenya Civil Aviation Authority (KCAA) are incorporated in the design of the proposed 132 kV overhead power transmission line project to prevent the potential of aircraft incidences and accidents.

4.2.27 National Museums and Heritage Act No. 6 of 2006

This is an Act of Parliament to consolidate the law relating to national museums and heritage; to provide for the establishment, control, management and development of national museums and the identification, protection, conservation and transmission of the cultural and natural heritage of Kenya. It repealed the Antiquities and Monuments Act (Cap. 215) and the National Museums Act.

Section 46 provides that all antiquities which are lying in or under the ground, or on the surface of any land already protected under any law as a monument or being objects of archaeological, paleontological or cultural interest are discovered in a part of Kenya after the commencement of this Act, shall be the property of the Government.

The proposed 132 kV overhead electricity transmission line route does not feature any gazetted antiquities.

4.2.28 International Laws

The international laws applicable to the proposed project are discussed below.

4.2.29 The 1985 Vienna Convention for the Protection of the Ozone Layer

The Vienna Convention for the Protection of the Ozone Layer, 1985 was adopted on 22 March, 1985. The overall objective of the Vienna Convention is to protect human health and the environment against the effects of ozone depletion. It establishes obligation upon the parties to protect the ozone layer (article 2) and emphasizes the need for international cooperation. The convention requires parties to take appropriate measures against the adverse effects of human made ozone depletion.

The proponent shall ensure that the air conditioning systems, to be utilized at the substations, are installed with ozone friendly substances throughout the project life cycle.

4.2.30 The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer

The Montreal Protocol was adopted in 1987 in Montreal, Canada. It establishes firm targets for reducing and eventually eliminating consumption and production of a range of ozone depleting substances. These substances are provided under annexes A-E to the Protocol and are to be phased out within the schedules given in articles 2A-21 as shown in table 31.

Table 31: The 1987 Montreal Protocol's Phase-Out Timetable for Developing Nations

Item	Substance	Developing Countries' Reduction (%)
1.	Chlorofluorocarbons (CFC's)	0% in 1999
		20% in 2003
		50% in 2005
		85% in 2007
		100% in 2010
2.	Halons	0% on 2002
		50% in 2005
		100% in 2010
3.	Carbon Tetrachloride	85% in 2005 100% in 2010
4.	1,1,1,-trichlroethane	0% in 2003 30% in 2005 70% in 2010 100% in 2015
5.	Hydrobromofluorocarbons (HBFCs)	100% in 1996
6.	Hydrochlorofluorocarbons (HCFCs)	0% in 2016 100% in 2040
7.	Methyl bromide	0% in 2002 20% in 2005 100% in 2015
8.	Bromochloromethane	100% in 2002

The proponent shall ensure that the air conditioning systems, to be utilized at the substations, are installed with ozone friendly substances throughout the project life cycle.

4.2.31 The United Nations Framework Convention on Climate Change (UNFCCC), 1992

The UNFCCC was adopted in New York in 1992 and opened for signature at the Earth Summit in Rio De Janeiro, Brazil. It came into force in 1994. The objective of UNFCCC is to tackle the negative effects of climate change. The aim of the convention is to stabilize greenhouse gas concentrations at a level that allows ecosystems to adapt naturally to climate change so that food production is not threatened, while enabling economic development to proceed in a sustainable manner. According to Article 4(1), the convention provides that all parties make general commitments regarding:

a) The establishment of national inventories of greenhouse emissions and sinks
b) The promotion of scientific and technical cooperation
c) The sustainable management of forests, oceans and ecosystems and
d) The integration of climate change considerations in national social, economic and environmental policies.

KenGen shall ensure that the selected contractor puts in place measures to reduce greenhouse gas emissions during construction phase of the proposed 132 kV overhead power transmission line.

4.2.32 The Paris Agreement

Article 6 section 4 of the Paris Agreement provides for the establishment of a mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development. The mechanism shall be supervised by a body designated by the Conference of the Parties serving as the meeting of the Parties to this Agreement, and shall aim:

(a) To promote the mitigation of greenhouse gas emissions while fostering sustainable development;

(b) To incentivize and facilitate participation in the mitigation of greenhouse gas emissions by public and private entities authorized by a Party;

(c) To contribute to the reduction of emission levels in the host Party, which will benefit from mitigation activities resulting in emission reductions that can also be used by another Party to fulfil its nationally determined contribution; and

(d) To deliver an overall mitigation in global emissions.

Article 13 section 7 provides that each Party shall regularly provide the following information:

(a) A national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases, prepared using good practice methodologies accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties serving as the meeting of the Parties to this Agreement; and

(b) Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4. Section 8 under Article 7, provides that each Party should also provide information related to climate change impacts and adaptation as appropriate.

KenGen shall ensure that the selected contractor puts in place measures to reduce greenhouse gas emissions during construction phase of the proposed 132 kV overhead power transmission line.

4.2.33 The 1971 Ramsar Convention on Wetlands of International Importance

Article 1 of the Ramsar Convention defines a wetland as "….areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres". The purpose of the convention is to stop the loss of wetlands and

to promote their conservation and wise use as a means to achieving sustainable development. According to Article 2(1), each state party shall designate at least one wetland for inclusion in a List of Wetlands of International Importance ("Ramsar List") and ensure the maintenance of the ecological character of each Ramsar Site.

KenGen shall ensure that the selected contractor puts in place necessary measures to prevent potential for contaminating Lake Naivasha which is gazetted as a wetland.

4.2.34 The Convention on Biological Diversity

The Convention on Biological Diversity was adopted in 1992, and opened for signatures in Rio De Janeiro during the 1992 United Nations Conference on Environment and Development. The three main objectives of the Convention, as stipulated under Article 1 are the:

a) conservation of biological diversity
b) sustainable use of the components of biological diversity and
c) 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 Convention provides, in Article 6, that parties shall develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity and endeavour to integrate the conservation and sustainable use of biological diversity into relevant sectorial or cross sectorial plans, programmes and policies. Article 7 of the Convention requires parties to identify components of biodiversity important for conservation and sustainable use and to monitor the components so identified, paying particular attention to those requiring urgent conservation measures and those with potential for sustainable use. In addition, parties are required to identify and monitor processes and activities which may have significant adverse impacts on conservation and sustainable use of biodiversity. Article 8 requires parties to put in place *in situ* conservation measures including:

a) The establishment of a system of protected areas
b) The promotion of the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings
c) Promotion of environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering the protection of these areas.
d) The rehabilitation and restoration of degraded ecosystems and the recovery of threatened species and
e) Prevention, control and eradication of alien invasive species.

Necessary measures stipulated in the ESMP for the proposed 132 kV overhead electricity transmission line project will need to be implemented so as to promote conservation of biodiversity. These shall include minimization of area to be cleared and rehabilitation of disturbed sites.

4.3 KenGen's Capacity to Ensure Compliance with Legal and Regulatory Requirements

KenGen is fully committed to long-term environmentally sustainable development that is consistent with National and International standards. In line with this commitment, the Company is certified in Quality Management System (QMS) and Environmental Management System (EMS) based on ISO 9001:2008 and ISO 14001:2004 standards respectively, and maintains continual improvement of its processes. Through the Environmental Management System, KenGen has identified and documented its significant environmental aspects and impacts on the environment and set in place interventions to manage these aspects.

KenGen has also articulated its commitment in environmental management to various stakeholders through an Environmental Policy Statement. The policy is aligned to its mission and vision statements. The Environmental Policy Statement commits the organization to compliance with applicable laws and regulations.

The Company has a full-fledged Environment, Quality & Liaison department at Olkaria which coordinates implementation of Environmental and Social Management Plans of the upcoming and existing projects.

5 ANALYSIS OF PROJECT ALTERNATIVES

This section identifies alternatives considered for the proposed project. Alternatives with respect to the route, technology and design of the proposed 132 kV power transmission line have been evaluated and based on the analysis, the best alternative has been arrived at. 'The No action' alternative has also been considered. The various alternatives are described in the section below.

5.1 The 'No Project' alternative

This alternative describes a situation where the proposed development fails to be implemented. From an environmental management perspective, adoption of this alternative will be beneficial in the sense that any potential negative impacts associated with the project will be avoided. However, this alternative was not considered as the best option for the following reasons:

- The industrial park will not be supplied with bulk energy thus making it not to be attractive to the potential locators.
- No added values to the reference plot for the proposed Industrial Park development.
- No added value to other establishments in the neighbourhood of the proposed development.
- No benefit from the revenue expected from the facility by the proponent.
- The government kitty would not benefit from the revenue to be earned due to the implementation of the proposed project.
- The economic status of the Kenyans and the local people would remain unchanged.
- Underutilization of local skills.
- Reduced interaction both at local, national and international levels.
- No creation of employment opportunities for thousands of Kenyans who would otherwise be employed by the proposed project.

From the analysis above, it becomes apparent that the No Project Option is not the desired alternative to the proponent, local people, Kenyans, and the government of Kenya.

5.2 'With Project' Alternative

'With Project' Alternatives provides the various options available to implement the proposed power transmission line project. The options, together with their merit and demerits, are provided in table 32.

Table 32: 'With Project' Alternatives

Project Alternative	Advantages	Disadvantages
Alternative route for the transmission line		
Along existing access road through the Hell's Gate National Park	• Shorter route and therefore less costly	• Passes through protected wildlife area • Requires more consultation and special design considerations • Restricted access to the protected area
Along RAP Land access road (Preferred alternative)	• Less environmental impact as the route is outside the protected wildlife area • Existing way leave along RAP Land access • Avoids protected wildlife areas	• Longer route therefore, more costly • A more rugged terrain that may slow down the installation process
Alternative construction materials and technology		
Wooden poles	• Lowest installation cost • Light and therefore easy to transport	• Loose soils may cause collapse of poles • Less durable as timber susceptible to rot and decay • Susceptible to insect and animal attack • Lower conductor clearance from ground due to short lengths
Concrete poles	• Cheap compared to Steel structures • Not susceptible to rot and decay • Not susceptible to insect and animal attack	• Loose soils may cause collapse of poles • Lower conductor clearance from ground • Suitable for low voltage lines • Heavy and therefore, requires heavy machinery to install • Has very low tensile strength and requires some reinforcement
Steel towers (Preferred option)	• Require minimal maintenance, saving pole replacement and labour costs • Higher ground clearance • Not biodegradable hence more durable • Have a lower carbon	• High civil works cost • Susceptible to corrosion caused by aggressive environments, chemicals and pollution • Takes longer time to install

Project Alternative	Advantages	Disadvantages
	footprint • Reliable, especially when the weather isn't good.	
Overhead transmission line (Preferred option)	• Minimal civil works • Conductors are bare/uninsulated • Quick to locate and fix faults • Has lower installation costs • Easily tapped, rerouted or modified, repaired to serve customers • Suitable for long distance transmission • Has a longer lifespan	• Susceptible to outages due to poor weather conditions and adverse winds • More prone to lightning strikes • Interfere with communication lines that are in close proximity • More voltage drop in the cables as they are of much smaller diameter
Underground transmission line	• Aesthetically pleasing • Suitable for short distances • Safer to the public, animals and environment • Not affected by trees, animals, accidents, wind, storms and other physical interference.	• Conductors require insulated covering • Susceptible to insulation deterioration • Requires construction of concrete trenches/trunks for cable laying • High installation cost. 4 to 14 times more expensive than overhead lines of the same voltage and same distance • Unsuitable for long distance installations • Longer outages in case of line failures • Mostly used for transmitting up to 33 kV • Not suitable for hilly areas like Olkaria domes area
Porcelain Insulators (Preferred option)	• Cheap and affordable • Almost no aging deterioration • Resistant to UV	• Heavy in weight • High installation costs • Tedious assembly process • Fragile to mechanical stresses or vandalism
Composite Insulators	• Light weight-lower construction and transportation costs • Vandalism resistance Improved transmission line aesthetics.	• They are subjected to chemical changes on the surface due to weathering • Life expectancy is difficult to evaluate

Project Alternative	Advantages	Disadvantages
	• Easy installation thus saving on labour cost • Reduced maintenance costs • High resistance to arcing and also to ultraviolet radiation of the sun • Silicone rubber can be colored in shades that can reduce the visual impact of overhead lines • Simplified insulator string assembly	• Long reliability is unknown • Faulty insulators are difficult to detect • Need adequate storage conditions, the rodents attacking silicone rubber
Transmission Voltage		
33kV and 66kV	• Lower cost of installation • Wooden and concrete poles can be used • Faster installation processes	• Suitable for sub-transmission voltages • High transmission losses due to high demand loads • Not reliable for high loads above 40MW • Transmission of electricity over short distances
132 kV and 220kV **(Preferred option)**	• Sufficient for the projected energy demand • Stable and can take up future load increase • Reduced transmission losses	• Higher cost of installation • Require steel structure supports • Longer installation process

5.3 The Preferred Project Alternatives

The following were the preferred options for the proposed power transmission line project.

i. The transmission line route will pass along the RAPland access road, outside Hell's Gate National Park,
ii. Use of steel lattice towers and porcelain insulators and
iii. Installation of 132 kV overhead power transmission line.

CHAPTER 6

6 PUBLIC CONSULTATION AND PARTICIPATION

6.1 General Overview

The need for public consultation and participation when carrying out ESIA studies is underscored by the Kenyan Constitution, 2010 and EMCA, Cap 387. Regulation 7 of the Environmental (Impact Assessment and Audit) Regulations, 2003 requires project proponents to seek the views of the public pertaining to the ESIA study being conducted for projects listed under the second schedule of EMCA, Cap 387. According to this regulation, when carrying out public participation, the Lead EIA Expert in consultation with the project proponent and NEMA, shall:

i. Conspicuously display notices informing the affected parties and the local community about the proposed project
ii. Publicise a notice on the proposed project in a local newspaper once in a week for two consecutive weeks
iii. Make an announcement of the notice in a radio once in a week for two successive weeks.
iv. Hold at least three public meetings with the affected parties and local communities to explain the proposed project
v. Ensure that appropriate notices, inviting the affected parties and local communities, are sent out at least one week before the meeting
vi. Ensure that a suitably qualified coordinator is appointed to receive and record both oral and written comments during the public meetings.

6.2 Objectives of the Public Consultation and Participation Exercise

The ESIA team conducted the public consultation and participation, with respect to the proposed 132 kV overhead power transmission line, to fulfil the following objectives:

i. To inform the potentially affected parties and local communities about the proposed 132 kV overhead power transmission line;
ii. To disclose the findings of the ESIA study to the potentially affected parties and local communities and
iii. To provide an opportunity for the potentially affected parties and local communities to provide their oral and/or written views about the proposed project thereby contributing positively to the decision making process.

6.3 Public Consultation and Participation Approach

Public consultation and participation was achieved through the following approaches:

i. Stakeholder Mapping

The potentially affected parties and local communities were identified through stakeholder mapping process that was conducted during scoping phase of the ESIA study. The output of this process was the list of villages and key stakeholders that were to be consulted. The villages considered were; Kamere, Olomayiana Kubwa and RAPland. The key stakeholders identified for the ESIA study are shown in table 33.

Table 33: List of Key Stakeholders Identified for the ESIA study

Stakeholder Category	Invitation Letter was Addressed to:
1. Kenya Electricity Transmission Company Limited (KETRACO)	Managing Director & CEO
2. Energy Regulatory Commission (ERC)	Director General
3. Kenya Civil Aviation Authority (KCAA)	Director -Aviation Safety, Security and Regulation
4. Kenya Power & Lighting Company (KPLC)	County Business Manager, Nakuru County
5. National Environment Management Authority (NEMA)	County Director of Environment – Nakuru County and Sub-county Environment Officer, Naivasha
6. Nakuru County Assembly	Member of County Assembly – Olkaria Ward
7. Geothermal Development Company (GDC)	The Environment Manager
8. Olkaria RAPland Community Dispensary	Nurse-in-Charge
9. Olkaria Primary School, RAPland	Head teacher
10. Olkaria Police Post	Officer Commanding Station (OCS)
11. Orpower 4 Inc.	Plant Manager
12. Oserian Development Company Ltd	Managing Director & CEO
13. Elsamere Education and Conservation Centre	Project Manager
14. Olkaria Community Health Workers, Community Based Organization (CBO)- Kamere	Chairperson
15. Local Administration, Olkaria Sub-location	The Assistant Chief
16. Local Administration, Hells' Gate location	The Chief

17. KWS –Hell's Gate & Mt. Longonot National Parks	Senior Warden
18. Kedong Ranch Company Ltd	Manager
19. Kenya Marine and Fisheries Research Institute (KMFRI)	Regional Manager –Naivasha sub-county
20. Lake Naivasha Riparian Association (LNRA)	Chairperson
21. Imarisha Naivasha Trust	Managing Director (MD & CEO)
22. WWF –Naivasha	Project Coordinator
23. Lake Naivasha Water Resource Users Association (LANAWRUA)	Chairperson
24. Water Resources Authority (WRA)	Sub-Regional Manager –Naivasha
25. Directorate of Occupational Health & Safety Services (DOHSS)	Occupational Health and Safety Officer, Naivasha Sub-County
26. Naivasha Sub-County Environment Office	Environment Officer, Naivasha Sub-County
27. Naivasha Sub-County Public Health Office	Public Health Officer, Naivasha Sub-County
28. Naivasha Sub-County Veterinary Office	Veterinary Officer, Naivasha Sub-County
29. Naivasha Sub-County Livestock Office	Livestock Officer, Naivasha Sub-County
30. Naivasha Sub-County Public Works & Infrastructure Office	Public Works & Infrastructure Officer, Naivasha Sub-County
31. Naivasha Sub-County Land & Settlement Office	Land & Settlement Officer, Naivasha Sub-County

ii. One-on-one Meetings

One-on-one meetings were carried out with key stakeholders in the immediate neighbourhood of the proposed project. They included; KWS, Kedong Ranch Company, Elsamere Education and Conservation Centre and Orpower 4 Inc. These meetings preceded the key stakeholders' consultative meeting.

iii. Public Barazas

Three public barazas were held as detailed in table 34.

Table 34: List of public barazas held

Index	Venue	Date	Number of Attendants
1.	Olkaria RAPland	17 May, 2018	75
2.	Kamere Trading Centre	17 May, 2018	86
3.	Olomayiana Kubwa Baptist Church	18 May, 2018	61

Notices inviting the local communities to the public barazas were translated to Kiswahili and Maasai languages as shown in appendix 3. They were then conspicuously displayed at strategic positions and announced in the local churches by the community representatives that were identified by the ESIA team. The minutes of the public barazas are attached in appendix 4. The public barazas were chaired by the Assistant Chief, Olkaria sub-location. Photos of the public barazas are shown in plates 5, 6 and 7.

Plate 5: Public baraza at Olkaria RAPland

Plate 6: Public baraza at Kamere Trading Centre

Plate 7: Public baraza at Olomayiana Kubwa

iv. Key Stakeholders Meeting

The key stakeholders meeting was held on 24 May, 2018. The venue of the meeting was Olkaria Social Hall. The meeting involved technical persons drawn from the sub-county departments, CBOs, NGOs, private companies and the national government departments. The invitation to the meeting were done vide letters which were sent out in advance together with a brief of the proposed project. Sample invitation letter and request made to the Deputy County Commissioner to chair the meeting are attached in appendix 4. A total of fifty (50) stakeholders attended the meeting as per the attached minutes in appendix 5. The meeting was chaired by the Deputy County Commissioner, Naivasha. Photos in plates 8 and 9 shows the meeting in progress.

Plate 8: Deputy County Commissioner addressing stakeholders

Plate 9: Lead EIA Expert presenting ESIA findings

6.4 Summary of Public Consultation and Participation Results

The summary of comments recorded during the three public barazas and the key stakeholders' workshop is provided in tables 35 and 36 respectively.

Table 35: Comments received during the three public barazas

No	Questions/Issues raised/Clarifications	Responses from KenGen Representatives
1.	Complaints on provision of employment and economic opportunities to the local communities.	KenGen has established a Stakeholder Coordination Committee. The committee comprises of the economic and employment opportunities subcommittees which will be used during the implementation phase of the proposed power transmission line project. The community liaison department will coordinate this exercise.
2.	Lack of consideration of the women, youth and persons with disabilities in employment and economic opportunities that arise.	30% of tenders advertised by KenGen takes care of the women, the youth and persons with disabilities as provided for by the Public Procurement and Disposal Act, 2015.
3.	Few or lack of scholarship slots to the community members.	The community members were reminded of the scholarship program under KenGen's CSR program which has benefited over 80 students from Olkaria. Under this program, 3 secondary and 3 university bright and needy students are awarded scholarship since 2005 to date.
5.	Concern of other requests from community members seeking assistance from KenGen	The community members were advised to make formal requests to KenGen, of community assistance like clean up and transportation of wastes, sports kits, tree seedlings etc. The requests will be discussed during the CSR committee meetings and appropriate decisions made.

Table 36: Summary of comments recorded during the key stakeholders' Consultative meeting

Stakeholder Representative	Questions/Comments/Concerns	Response from KenGen/ESIA team
Kamere Community Environment	Appreciated KenGen for the support it had been providing to	KenGen will continue providing support to stakeholders in accordance

Stakeholder Representative	Questions/Comments/Concerns	Response from KenGen/ESIA team
committee	them.	with the laid down procedures.
	KenGen was requested to consider including the local community representatives, especially those next to the project such as Olomayiana Kubwa, in project implementation committee. ()	KenGen has already established a Stakeholder Coordination Committee which represents stakeholders interests in the decision making process.
KWS	How wide and long is the buffer zone at the industrial park?	There will be another ESIA specifically for the industrial park where KenGen will engage all stakeholders. The current scope of work is 132 kV overhead transmission power line supply to the industrial park. The detailed design of the Industrial Park will establish the width and length of the buffer zone.
	Is the exact location of the industrial park known?	The exact location of the industrial park is at the Olkaria Domes area near the Olkaria RAPland as shown on the map that was displayed.
	When is the industrial park going to be commissioned?	KenGen is in the process of sourcing an anchor tenant to spearhead the development of the industrial park.
Lake Naivasha Water Resource Users Association	Explore ways of harvesting and storage of water to reduce dependency on Lake Naivasha.	Alternative sources of water will be considered during the establishment of the industrial park. These will include use of recycled water, rain water and where feasible, underground water.

Stakeholder Representative	Questions/Comments/Concerns	Response from KenGen/ESIA team
	How will the effects on wildlife dispersal areas be mitigated?	The best alternative route for the proposed power transmission will traverse outside Hell's Gate National Park. In addition, the design of the pylons will take into consideration wildlife dispersal areas.
	What is the length and width of the transmission line?	The length and the width of the transmission line will be approximately 7KM and 70 m respectively.
Water Resources Authority (WRA)	How will KenGen reduce the pressure on water due to the effect of increased population?	Alternative sources of water will be considered during the establishment of the industrial park. These will include use of recycled water, rain water and where feasible, underground water.
	How do you plan to mitigate pollution of the water resources especially Lake Naivasha?	Suitable waste management measures will be implemented.
Livestock Department	With the increase of population, how will you mitigate transmission and infection of zoonotic diseases?	KenGen will collaborate with the veterinary department on ways of mitigating potential livestock related diseases.
NEMA	How will you mitigate greenhouse gases and greenhouse effect?	KenGen will ensure that vehicles are serviced and maintained as per the manufacturers' recommendations. The Company has also established tree nurseries with an aim of issuing out trees to the local community and the general public which will

Stakeholder Representative	Questions/Comments/Concerns	Response from KenGen/ESIA team
		contribute towards offsetting the carbon dioxide gas.
	When planning waste disposal consider listing all the categories of wastes and how each category will be managed.	All the categories will be listed in the main report.
	Consider including noise pollution mitigation plan for the animals beside human beings.	A buffer zone will be developed in the industrial park to reduce effects of human activities on wildlife. Other suitable noise control measures will be considered.
Chief, Hell's Gate Location	How will KenGen manage the influx of population in the area in order to reduce pressure on social amenities such as health centers?	Health facilities have been included in the master plan of the industrial park.
	How will KenGen prevent falling of power poles so as to minimize accidents?	According to KPLC representative, in the last five years, there has never been an incident of falling of high voltage transmission line towers in Nakuru County. Kenya Power is however, handling the falling of power distribution line poles.
Kedong' Ranch	Is the transmission line passing through any other land other than KenGens'?	The best alternative route for the proposed power transmission line will pass through land owned by KenGen.
Ochieng – Olkaria Police Post	Suppose the proposed Energy Bill is not assented to by the president, which alternatives does KenGen	If the bill does not pass, KenGen will revert to the existing single buyer model. This implies that the EIA

Stakeholder Representative	Questions/Comments/Concerns	Response from KenGen/ESIA team
	have with regards to transmission of bulk power?	license for the proposed 132 kV power transmission line will be transferred to KETRACO.
Makau	Which measures are going to be put in place to mitigate on vibrations during construction?	Measures to mitigate vibration effects will be included in the ESIA report.
Solomon Ndung'u	Consider adding a standby ambulance to handle occupational accidents instead of first aid kits only.	That is an important point which shall be considered.
KPLC	Your aim is to supply cheap stable power to the industrial park. Clarify if you will also be connecting to the grid which is likely not to meet the objective of cheap power.	KenGen will import power from the grid if the Energy Bill is not passed. KenGen will also connect to the grid to make the system stable i.e. in case the main power supply system fails, KenGen will make use of the grid as a backup.

CHAPTER 7

7 POTENTIAL ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS AND MITIGATION MEASURES

7.1 Positive Environmental Impacts Associated with Implementation of the Proposed Project

The potential positive socio-economic impacts of the proposed power transmission project will mainly depend on the location and size of the project, government incentives, project implementation schedule, manpower requirements, the economic opportunities available and the involvement of the nearby communities. The potential positive socio-economic impacts of the proposed project are detailed below.

a. Creation of employment opportunities

The proposed transmission line project has the potential of creating direct and indirect job opportunities. Direct job opportunities will result from employment of the skilled and unskilled workforce, project consultant and the project contractor whereas indirect job opportunities will involve creation of business opportunities to the manufacturers and suppliers of materials during the construction and operation phase of the proposed project. It is estimated that the proposed power transmission line will generate 50 to 100 direct jobs on a daily basis during the construction phase.

b. Enhancement of business opportunities

The proposed project has the potential of enhancing business opportunities. The local community operating shops, rental houses and food kiosks in the neighbouring settlements will benefit greatly especially during construction phase of the proposed project.

c. Reduced Transmission Losses

KenGen intends to distribute and sell part of the geothermal power generated at Olkaria to the over two hundred manufacturing industries that will be located within the proposed Industrial Park. In so doing, the manufacturing industries will improve the country's electrical grid (UNEP, 2015).

d. Increased Tax Base

The proposed project has the potential of contributing indirectly towards increased revenue from excise duty, which is mainly collected from manufacturing entities in Kenya. Revenue from excise duty has been on an increasing trend from 2012-2016 (Kenya Association of

Manufacturers, 2018). Since the proposed transmission line project is a major component of the KenGen Industrial Park, the project is likely to contribute towards an increased tax base during the operation phase of the manufacturing firms to be located within the Industrial Park. Tax collection by the government of Kenya will spur economic growth of the country.

e. Improved Supply of Electricity

Infrastructure for electricity generation is a priority to support Kenya's development ambitions. Provision of a stable and secure supply of power has the potential to promote growth in Gross Domestic Product (GDP), through a multiplier effect, by creating a conducive environment for establishing manufacturing industries.

f. Promotion of Green Energy

Kenya Vision 2030 aims at promoting low carbon economic growth. Green energy supply in Kenya comprises sources of electricity and heat that are renewable and low-carbon, including geothermal, solar, wind, hydroelectricity and bio-fuels. Renewable energy has the benefit of increasing energy security, by reducing reliance on fossil fuel imports. Climate resilience is also important as it includes electricity-generating systems and a national grid that can withstand extreme weather events expected as a result of climate change. The proposed power transmission project will facilitate evacuation of power from geothermal wellhead power plants located at Olkaria Geothermal Field thus enhancing capacity expansion. Geothermal energy has many advantages when compared to other renewable sources of energy. Its main advantage is the ability to provide a stable and reliable base load power at a cost that is relatively low (ESMAP, 2012). Increasing system reliability will also be an important consideration, particularly for its importance in supporting the development of the manufacturing sector. The proposed transmission project has the potential of increasing productivity and competitiveness across the manufacturing sector in Kenya.

7.2 Environmental Aspects, Potential Negative Impacts and Proposed Mitigation Measures during Construction Phase of the Project

This subsection section provides information on the potential negative environmental and socio-economic impacts associated with the proposed 132 kV power transmission line. The impacts were determined based on project's foot print, activities, design and area of influence. The methodology employed in impact identification comprised of expert judgment, checklists and matrices, literature review of similar case studies and regulatory standards in Kenya.

7.2.1 Land Conflicts

Usually right of way land acquisition for the transmission line route has the potential of triggering conflicts with existing land owners where the route traverses private pieces of lands. This could be as a result of displacement of people or their dwellings leading to loss of livelihoods or income. The proposed 132 kV overhead transmission line will not pass through or close to any private land instead it would pass through land owned by KenGen. However, there are three temporary Maasai *manyattas* close to OW-914 wellheads, geothermal well OW-917 and OW-922, on land owned by KenGen. These temporary structures belong to the herdsmen who work for some of the Olkaria IV Project Affected Persons resettled in 2014. Failure to engage the owners of the three *manyattas,* to allow them an ample time to relocate, can result to land use conflicts.

Proposed Mitigation Measures

The following mitigation measures will be implemented in order to avert any possible land conflicts.

i. The owners of the existing Maasai *manyattas* will be identified and given a notice to vacate prior to commencement of the construction phase of the proposed project.
ii. Existing local institutions, the Resettlement Action Plan Committee (RAPIC) and Community Advisory Council (CAC) will be used to resolve any potential conflicts.

7.2.2 Clearing of Vegetation

Right of way will be required for the construction, operation, maintenance and repair of the proposed power transmission line facilities. The width of the right-of-way will depend on the voltage of the transmission lines and the height of the tower structures. During construction phase of the proposed project, land clearing, earth moving and terrain shaping will remove vegetative cover and change the topography of the affected area. These activities have the potential of resulting to changes in the local drainage patterns, emergency of invasive species of plants, visual intrusion, disruption of animal behaviors (feeding, migration, breeding, and nesting), loss of ecosystem services provided by the cleared vegetation, increased rate of soil erosion and sedimentation. Changes in the drainage patterns are likely to cause increased runoff which can destroy habitats for the terrestrial species including birds, mammals and reptiles. The magnitude and extent of these impacts will in part be determined by the resulting gradients, soil types, rainfall and local hydrology. The potential impacts on wildlife are minimal since the proposed transmission line route will be located outside Hell's Gate National Park.

Proposed Mitigation Measures

The following mitigation measures will be implemented to avoid or minimize negative impacts that accompany vegetation clearing.

i. The area to be cleared shall be confined within the projects foot print. Areas to be cleared will be surveyed and flagged to identify the limits of clearing with the expectation that clearing will be kept to a minimum. This shall be informed by the approved detailed design drawings of the proposed power transmission line.
ii. Clearing of the vegetation shall be done in distinct segments depending with scheduling of construction activities.
iii. The location of the transmission line towers, along the right of way land, shall take into consideration the slope of the land and important natural landscape features like existing gullies so as to minimize on the rate of soil erosion.
iv. The top soil that will be removed during excavation works shall be stockpiled close to the transmission route for use during landscaping.
v. The proposed transmission line route shall be landscaped using the preserved top soil and suitable species of indigenous vegetation planted. The preferred species of grass shall be sourced within Olkaria Geothermal Field whereas tree species will be sourced from the nearby tree nurseries. The contractor shall ensure regular watering of the vegetation during dry season to promote their establishment hence guaranteeing maximum survival rate.
vi. Landscaping and rehabilitation of the transmission corridor shall be done in distinct segments in tandem with construction activities. The objective will be to finalize landscaping and rehabilitation prior to testing and commissioning of the proposed transmission line project.
vii. The existing vegetative buffer strips along natural watercourses shall be left intact where practicable so as to minimize gully erosion.
viii. Use of gabions in areas already affected by gully erosion.
ix. Onsite monitoring of the transmission line route shall be undertaken to identify and uproot invasive species. The timing for uprooting will be before flowering.
x. Drivers shall be sensitized on usage of designated access roads to minimize unnecessary vegetation disturbance.

7.2.3 Dust Emission

Sources of dust emission during construction phase of the proposed project will include excavation works, transportation of loose construction materials, movement of construction vehicles on earth roads and concrete mixing. Atmospheric emission of particulate matter

beyond the recommended limits is likely to cause public nuisance, negative health effects and soiling of property. There are no residential buildings along the transmission line route thus it is anticipated that only the workers and road users will be impacted negatively by the dust emissions.

Proposed Mitigation Measures

Construction phase dust mitigation measures are as follows.

i. Use of water sprays to suppress dust emission as a result of excavation works, stockpiling and movement of vehicles along the right of way. This will be accomplished using water bowsers since there is no water connection close to the selected transmission line route.
ii. The main contractor will impose a maximum speed limit on earth roads within Olkaria and this shall be accompanied with appropriate positioning of the designated speed limit signs.
iii. Ensure vehicles entering and leaving sites with loose materials like sand, spoil or stone aggregate are covered to prevent accidental escape of materials during transportation.
iv. The loose materials shall be adequately wetted prior to and during the loading, unloading and handling operations.
v. Investigate all dust complaints and take appropriate measures to reduce emissions in a timely manner.
vi. Minimize drop heights from loading shovels and other loading or material handling equipment.
vii. All workers who are likely to be exposed to dust will be provided with suitable personal protective equipment including dust masks, eye goggles and coveralls.
viii. The concrete mixers shall be enclosed with suitable barriers to minimize airborne dust when being operated.

7.2.4 Handling, Storage and Use of Hazardous Materials

Some of the hazardous materials likely to be maintained at the site during construction phase of the project include fuel for the construction equipment, cement for the foundation works, paint for the finished structures, mineral oil (highly refined hydrocarbon-based oil used as an insulation medium and coolant in transformers and other electrical equipment for the transformers) and electrolyte used in the substation batteries to provide power for control, protection, instrumentation, alarm, communication, and emergency lighting. Unsafe handling of hazardous materials, leakage or spillage, in areas which are not lined with impervious material, is likely to contaminate soil and surface water through direct contact and storm

water runoff respectively. In addition, direct contact with body parts can cause negative health effects.

Proposed Mitigation Measures

Measures to ensure safe handling, storage and use of hazardous materials during construction phase will include the following:

i. All workers handling hazardous materials will be provided with suitable personal protective equipment including hand gloves, coveralls and respirators.
ii. Suitable storage areas, complete with impervious floor, will be provided to prevent exposure to harsh weather conditions which are likely to aggravate pollution incidents.
iii. A spill prevention, control and response plan shall be developed and maintained on site.
iv. An inventory of hazardous materials together with respective Material Safety Data Sheets will be maintained on site to act as a guide on material handling.
v. Suitable spill containment measures shall be provided in areas designated for storage of the hazardous materials.

7.2.5 Handling, Storage and/or Disposal of Waste

The waste that will be generated during construction phase will be liquid and solid in nature. The waste will also be categorized as hazardous or nonhazardous. The likely waste to be generated will comprise of sewage, cleared vegetation, empty cement bags, spoil materials, conductor cuttings, used oil, rags or other materials contaminated with oil or fuel, wrapping papers, broken insulators (porcelain), cartons, pallets, used timber and metal cuttings. Indiscriminate disposal of waste has the potential of contaminating soil and surface water through storm water runoff. Besides pollution, waste can also cause aesthetic degradation, negative health impacts and public nuisance as a result of poor handling. The potential impacts will depend on the types and quantities of waste generated and the waste handling procedures that will be put in place.

Proposed Mitigation Measures

The following mitigation measures shall be implemented to ensure sound management of waste during construction phase.

i. Provision of suitable portable toilets for use by the construction workforce. The toilets shall be maintained in clean sanitary condition.
ii. An integrated approach to waste management will be implemented. These will include provision of properly labeled waste containers, waste reuse/recycling, green purchasing, source reduction and final safe disposal.

iii. Final disposal of waste from the construction site shall be through NEMA licensed waste handlers. The contractor will be expected to maintain up to date waste tracking sheets for all the waste transported away from the site.

iv. Construction staff shall be sensitized on sound waste management practices. This shall include the dangers of burning solid waste on site.

7.2.6 Noise and Vibrations

Construction equipment will be the primary source of noise and vibrations during construction of the proposed transmission line project. Clearing of right of way, grading, tower erection, and conductor stringing all require use of heavy equipment which will generate noise and vibrations during working hours. Grinding operations, hammering of metal structures and movement of trucks during transportation of equipment, workers and materials will also result to noise emission. Potential noise and vibration impacts include hearing impairment, public nuisance, physical and psychological stress, reduced productivity, sleep disturbance, interference with communication and contribution to accidents and injuries by making it difficult for the workers to hear warning signals as detailed in table 37. In addition, excessive noise has the likelihood of disrupting animal behaviors especially if the noise sources are located within a protected area.

Table 37: Potential Impacts of Noise (Source: CAFTA-DR and US Country Experts, 2011).

Specific Environment	Critical Health Effects	LAeq^2 (dBA)	Time base (hours)
Outdoor living area	Serious annoyance, day time and evening	55	16
	Moderate annoyance, day time and evening	50	16
Dwelling, indoors	Speech intelligibility and moderate annoyance, day time and evening	35	16
Inside bedrooms	Sleep disturbance, night time	30	8
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8
School classrooms and preschools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	During class time
School playground, outdoors	annoyance	55	During play time
Hospital ward rooms, indoors	Sleep disturbance, night time	30	8
	Sleep disturbance, day time and evenings	30	16
Industrial, commercial, shopping and traffic areas, outdoor and indoors	Hearing impairment	70	24

The noise and vibrations from the proposed power transmission project will be temporary and are not envisaged to cause any hearing impairment except public nuisance.

Proposed Mitigation Measures

Noise and vibrations during construction phase shall be mitigated as follows:

i. Idling of vehicles, concrete mixers and material handling equipment shall be minimized as far as reasonably practicable.
ii. Construction activities will be limited to the hours of operation between 8.00 am and 6.00 pm.
iii. Workers performing noisy operations shall be provided with suitable ear protectors based on the expected noise levels.
iv. Drivers of motor vehicles will be warned against unnecessary hooting of vehicles.
v. The contractor shall ensure that all the vehicles, concrete mixers and material handling equipment are maintained in proper working condition in line with the manufacturer's recommendations. This will ensure that noise emission does not increase over time.

7.2.7 Gaseous Emissions

Use of mobile construction equipment and vehicles during construction phase of the proposed project has the potential of generating gaseous emissions. These emissions will comprise of Sulphur dioxide (SO_2), oxides of nitrogen (NOx), Volatile Organic Compounds (VOCs), carbon monoxide (CO) and carbon dioxide (CO_2). Idling of engines contributes to unnecessary emission of gaseous pollutants. A large diesel engine, for instance, can waste up to three litres of fuel for each hour that it idles thus contributing to increased gaseous emissions (United States Environmental Protection Agency, 2006). Diesel truck exhaust is a major source of air pollution. In 2006 for instance, the Environmental Protection Agency (EPA) estimated that idling trucks generated over 11 million tons of carbon dioxide and 18,000 tons of nitrogen oxide annually in the United States of America (Katherine, 2006).

In hot weather, nitrogen oxides react with ozone to create smog while carbon dioxide acts as a greenhouse gas, a major contributor to global warming. Fine particulate matter in diesel exhaust easily enters lung tissue to aggravate asthma, allergies, chronic bronchitis and emphysema (Katherine, 2006). Truck drivers and the neighborhoods around truck idling locations may suffer from increased air pollution. Diesel idling emissions have been found to leak into the truck cab while the truck idles. The presence of these emissions poses serious

health and safety concerns especially over a prolonged period of time typically associated with the truck drivers rest period.

The levels of gaseous emissions from the proposed transmission line project will depend on the type of equipment, type of vehicle, maintenance status, operating hours, idling time and the quality of fuel. Emission of priority air pollutants discussed above, in excess of permissible ambient levels, has the potential of causing public nuisance, health risks and climate change. There are no residential developments in the immediate vicinity of the proposed power transmission line thus it is the workers who will be impacted most by the gaseous emissions.

Proposed Mitigation Measures

The following measures shall be implemented so as to prevent impacts associated with gaseous emissions.

i. Idling of vehicles, concrete mixers and material handling equipment shall be minimized as far as reasonably practicable.
ii. The contractor shall ensure that all the vehicles, concrete mixers and material handling equipment are maintained in proper working condition in line with the manufacturer's recommendations. This will ensure that gaseous emissions do not increase over time.
iii. Burning of solid waste will not be undertaken to prevent gaseous emissions to the atmosphere.
iv. Indigenous trees will be planted along the right of way to compensate for the lost vegetation which would have acted as carbon sinks.

7.2.8 Influx of Workers to the Construction Project Site

It is expected that on average, about 50 to 100 workers/day will be engaged during the construction phase. Influx of workers to the construction site in search of job and business opportunities has the potential of creating social vices like spread of communicable diseases and promotion of crime incidents. Communicable or infectious diseases that will be of major concern during construction phase of the proposed project include HIV/AIDS and other sexually transmitted infections. Crime incidents likely to be encountered will comprise of poaching, fraud, burglary, theft and vandalism of property. The location of the project greatly affects both the amount and type of crime that occurs. According to the Chartered Institute of Building, Crime tends to increase when working in or around cities and big towns, and the nature of crime tends to vary in different regions. The proposed project is located in a remote area thus the crime incidents are expected to be minimal.

Proposed Mitigation Measures

Mitigation measures to address impacts associated with influx of workers to the project site are provided below:

i. A sensitization program, aimed at raising awareness of the local community and contractor's workforce on communicable diseases, will be developed and rolled out.
ii. The portable toilets and the permanent washrooms at the contractors lay down area shall be supplied with condoms and the workforce encouraged to use them as and when necessary.
iii. Sensitization of the site and project managers on how to deal with crime shall be undertaken jointly by KenGen, Kenya Wildlife Service and the Olkaria Police.
iv. An up-to-date employee database will be maintained at the construction site.
v. All employees of the contractor shall be issued with suitable identification cards which shall be tagged during work hours for ease of identification.
vi. To ensure the legitimacy of security-guard companies, that will be used to provide onsite security, they must be registered with the Private Security Regulatory Authority.
vii. All security guards employed by the licensed company, must be provided with uniforms for ease of identification especially during patrols.
viii. Contractor's properties including material handling equipment will be kept secure, preferably at the contractors lay down area, to prevent theft.
ix. Security measures shall be enhanced through regular patrols by the security guards.
x. All crime incidents shall be reported immediately through appropriate channels to facilitate timely and adequate investigation. Lessons learnt will be used to enhance the existing security situation.

7.2.9 Wildfire

Handling of flammable materials, welding operations and lighting of open fires by the workforce has the potential of causing wildfire. The risk of wildfire will be greatest during the dry season. Potential impacts on wildfire include destruction of the terrestrial ecosystem, loss of property and/or injuries of workforce and/or animals both domestic and wild.

Proposed Mitigation Measures

Wildfires will be mitigated as follows.

i. All welding and grinding operations will require hot work permits aimed at reducing fire risks.
ii. The contractor will provide, at strategic points, suitable firefighting equipment.

iii. The construction workforce shall be sensitized on how to fight fire.
iv. Workers will be sensitized on the dangers of open fires. This can be through use of suitable safety signage.
v. Fire drills will be carried out at predetermined intervals to enhance fire emergency preparedness.
vi. All flammable materials will be stored in line with manufacturer's recommendations.

7.2.10 Cultural, Archaeological, Ceremonial and Historic Resources

Cultural, archaeological, ceremonial and historic resources include: archaeological sites, historic buildings, burial grounds, sacred or ceremonial sites, areas used for the collection of materials used in ceremonies or traditional lifestyles, and sites that are important because of their roles in traditional stories (CAFTA-DR and US Country Experts, 2011). The proposed transmission line route does not contain any known cultural, archaeological, ceremonial or historic resources. Therefore no mitigation measure is required.

7.2.11 Aircraft Navigation Safety

Power transmission towers and transmission lines, if located near an airport or known flight paths, can endanger low-flying airplanes, especially those used in agricultural management activities (International Finance Corporation, 2007). Collision has the potential of resulting to damage to the aircraft and injuries to aircraft operators and/or the general public. However, the chances of collision are expected to be minimal due to the location of the proposed transmission line route.

Proposed Mitigation Measures

Air craft navigation safety will be guaranteed by implementing the following mitigation measures.

i. Obtain approval from Kenya Civil Aviation Authority (KCAA).
ii. The design of the proposed power transmission line project will take into consideration recommendations by KCAA.

7.2.12 Health and Safety Hazards

The potential health and safety hazards during construction phase include erection of the steel structures, working at height on pylons, working below energized power lines and handling of live power lines and hazardous materials. These hazards have the potential of resulting to

injuries, occupational ailments and to the worst extent electrocution of animals (both wild and domestic), workers or members of the general public near the construction site.

Proposed Mitigation Measures

The proposed mitigation measures that will promote health and safety of workers, the general public and animals during the construction phase of the proposed project will include the following:

i. Geotechnical investigation will be carried out at various tower locations to provide the designer with sufficiently accurate information, both general and specific, about the substrata profile and relevant soil and rock parameters at site on the basis of which the foundation of transmission line towers can be classified and designed rationally.
ii. Conduct job safety analysis for critical tasks and document safe work procedures which shall be approved by KenGen and the project consultant prior to commencement of works. Safe work procedures will include lock-out tag-out procedures which will require proper coordination between KenGen and the contractor.
iii. Establish a health and safety committee whose mandate shall be as stipulated by the Factories and other Places of Work Act (Safety and Health Committee Rules), 2004.
iv. A permit to work system will be enforced for all activities deemed to present greatest risk to the workforce. This implies that work will only start after potential hazards have been identified and safe procedures defined. The permit to work system will cover working at height, electrical works, mechanical works and hot works.
v. Critical tasks will be undertaken by trained and certified personnel. This should be coupled with the requisite competency.
vi. Suitable personal protective equipment including non-conductive safety helmet, approved safety goggles, approved safety footwear, electrical insulating hand gloves and overalls will be provided.
vii. The design of the proposed transmission line will incorporate suitable safety features including barriers to prevent unauthorized climbing on transmission towers, surge arrestors and earthing.
viii. The contractor will employ a designated environment, health and safety personnel whose function will be to enforce the required environmental and safety precautions as stipulated in the Environmental Management Plan and in line with best industrial practices.
ix. Tool box talks will be held on a daily basis prior to commencement of works. These talks serve a great way to reinforce safety basics, focus on high-risk scenarios and to

inform workers about changes to the jobsite. They are vital in the building of a strong safety culture.

x. Suitable warning signs will be installed especially where transmission lines cross roads or where high voltages are expected. This will serve to warn the general public and the workers on the potential dangers of approaching such areas.

xi. The contractor will implement a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers will be maintained.

xii. Provision of first aid kits and trained first aiders who should be able to handle persons who have been injured by an electrical shock.

xiii. Registration of the contractor's lay down area as a work place.

xiv. An emergency vehicle shall be maintained on site during work hours.

xv. Suitable fixtures will be installed on the tower components to facilitate the use of fall protection systems.

xvi. Hoisting equipment should be properly rated and maintained and hoist operators properly trained.

xvii. An approved tool bag will be used for raising or lowering tools or materials to workers on structures to avoid accidental falling of objects.

xviii. The minimum recommended overhead clearances between the transmission lines and structures such as buildings will be taken into consideration during the design of the proposed power transmission line.

7.3 Potential Environmental and Social Impacts during Operation Phase

7.3.1 Handling, Storage and Use of Hazardous Materials

Hazardous materials during operation phase will comprise of mineral oil and the battery electrolyte. Unsafe handling of hazardous materials, accidental leakage or spillage, in areas which are not lined with impervious material, has the potential of contaminating soil and surface water through direct contact and storm water runoff respectively. The potential impacts are envisaged to be very minimal since the hazardous materials will be stored in designated areas constructed with impervious materials and protected from rain.

Proposed Mitigation Measures

Measures to ensure safe handling, storage and use of hazardous materials during operation phase of the proposed project will include the following:

i. All workers handling hazardous materials will be provided with suitable personal protective equipment including hand gloves, coveralls and respirators.
ii. All hazardous materials will be kept in the designated storage areas complete with impervious floor.
iii. A spill prevention, control and response plan shall be developed and maintained on site.
iv. An inventory of hazardous materials together with accompanying Material Safety Data Sheets will be maintained on site to guide on material handling.
v. Suitable spill containment measures shall be provided at the designated storage areas.
vi. No smoking signage will be strategically posted at the storage areas designated for flammable materials.

7.3.2 Noise and Ozone

Noise in the form of buzzing or humming can often be heard around transformers or high voltage power lines due to ionization of electricity in the moist air near the wires (Public Service Commission of Wisconsin, 2013). Ozone, a colorless gas with a pungent odor, may also be produced. Neither the noise nor ozone produced by power distribution lines or transformers carries any known health risks (International Finance Corporation, 2007). Noise from transmission lines reaches its maximum during periods of precipitation, including rain, sleet, snow or hail, or as the result of fog. Normally, this kind of noise has been known to cause public nuisance. Another source of noise can be grinding operations during maintenance works.

Proposed Mitigation Measures

The following mitigation measures will be implemented during operation phase.

i. The proposed power transmission line will be located away from residential areas.
ii. Provision of suitable ear protectors to the workers carrying out noisy operations
iii. Regular maintenance of the transmission line and its components.

7.3.3 Handling, Storage and Disposal of Waste

During operation phase of the proposed project, very minimal waste will be generated. The waste will include rags contaminated with mineral oil/battery electrolyte, used batteries, blown out light bulbs and used electrical equipment parts like capacitors or bushings generated during maintenance operations.

Proposed Mitigation Measures

The following mitigations measures shall be implemented to ensure sound management of waste during operation phase.

i. An integrated approach to waste management will be implemented. These will include provision of waste segregation, properly labeled waste containers, waste reuse/recycling, green purchasing, source reduction and final safe disposal.
ii. Final disposal of waste from the facilities shall be through NEMA licensed waste handlers. Up to date waste tracking sheets for all the waste transported away from the site will be properly maintained.
iii. The maintenance contractor will be sensitized on sound waste management practices.

7.3.4 Electromagnetic Fields (EMF)

Transmission lines have the potential of creating electromagnetic fields (EMF). Magnetic fields created in the vicinity of overhead power lines depend on the current flowing on the line, the tower configuration and the conductor height above ground (Pretorius, 2006). Although there is public concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), empirical data is insufficient to demonstrate adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment (International Finance Corporation, 2007 and CAFTA-DR and US Country Experts, 2011). However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern.

The electric maintenance team typically has a higher exposure to EMF than the general public due to working in proximity to electric power lines (International Finance Corporation, 2007). Various studies carried out on the effects of electric and magnetic fields on animals show in general that electric fields from overhead power lines do not affect behavior or health of livestock, birds or wild animals (Pretorius, 2006).

Proposed Mitigation Measures

Mitigation measures for EMF are detailed below.

i. Use of engineering techniques like shielding.
ii. Identification of potential exposure levels in the workplace and the use of personal monitors when carrying out electrical operations near high voltages
iii. Limiting exposure time where levels have been confirmed to exceed the maximum limit recommended by the international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The occupational and the general public exposure limits are 50 and 10 watt per square meter respectively, at frequencies between 10 and 300 GHz (ICNIRP, 1998).

7.3.5 Health and Safety Hazards

Transmission lines have the potential of presenting a risk of electrocution to the public and the maintenance team by direct contact with high voltage equipment and lines, and also by induced voltages, especially in the case of vehicles and other machinery that would transit beneath transmission lines. Because the transmission lines are uninsulated, minimum clearances should be observed to maintain safety both in terms of access from the ground and from the airspace. Humans and/or animals can also risk electrocution or nuisance shock when inadequate grounding at substations energizes metal objects, within substation sites. Other safety risks include the accidental collapse of transmission towers during rainstorms which can cause damage to property, injuries or death.

The height of transmission towers and the electricity carried by transmission lines have the potential of creating fatal hazard to birds through collisions and electrocutions. However, the risk posed to birds depends on the technical construction type and detailed design of power facilities. In particular, electrocution risk is high with "badly engineered" medium voltage power poles (Birdlife International, 2007). In addition, avian collisions with power lines can occur where the lines are located within daily flyways or migration corridors of birds (CAFTA-DR and US Country Experts, 2011). Bird collisions with power lines or poor workmanship during maintenance operations may result in power outages and fires.

In Kenya, it has been observed that migratory bird flyways are mainly found along the potential wind farm locations like Kinangop (Muoria et al, 2013). The proposed transmission line route will pass outside Hell's Gate National Park which was listed as the 65th Important Bird Area (IBA) in the year 2015 (Barasa et al, 2015). In addition, there is no documented flyway or migration corridor for the birds traversing the proposed transmission line route thus minimal impacts are envisaged.

Proposed Mitigation Measures

The proposed mitigation measures that will promote health and safety of workers, the general public and animals during the construction phase of the proposed project will include the following.

i. An effective preventive maintenance and inspection program, for the transmission line and its components, will be developed in line with good industrial practice. This will

facilitate early detection of faults, e.g. sagging power lines, with the potential to cause injuries.

ii. The substation shall be fitted with a suitable fire protection and alarm system which shall be inspected and maintained at regular intervals.

iii. Job safety analysis will be carried out for critical tasks and standard operating procedures developed by the maintenance team.

iv. A permit to work system will be enforced for all activities deemed to present greatest risk to the operation and maintenance teams. Work will only start after potential hazards have been identified and safe procedures defined. The permit to work system will cover working at height, electrical works, mechanical works and hot works.

v. Critical tasks will be undertaken by trained and certified personnel. This should be coupled with the requisite competency skills.

vi. Suitable personal protective equipment including non-conductive safety helmet, approved safety goggles, approved safety footwear, electrical insulating hand gloves and overalls will be provided.

vii. Safe work procedures for the maintenance operations will include lock-out tag-out procedures which will require proper coordination between the operation and the maintenance teams.

viii. A fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers will be maintained.

ix. Hoisting equipment should be properly rated and maintained and hoist operators properly trained.

x. An approved tool bag will be used for raising or lowering tools or materials to workers on structures to avoid accidental falling of objects.

xi. The power transmission line and its components will be designed in an environmental friendly manner. These can involve use of visible markers on the transmission lines, appropriate phase spacing and tower design considerations to minimize incidents of electrocution or collision of birds.

xii. No work will be carried out on exposed, energized parts of equipment or systems until:

- A responsible and qualified supervisor has determined that the work is to be done while the part or system is energized;
- Workers have been trained in the hazards involved and the specific techniques in their job;

- Personal protective equipment (including insulating gloves and eye protection) has been issued and
- Necessary barriers, barricades, tags or warning signs are in place.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Environmental aspects during the different phases of the proposed project, their impacts on social and biophysical environment and proposed mitigation measures are summarized in table 38. The ESMP will form part of the contract for construction of the proposed 132 kV overhead power transmission line project. There will be a provision under the contract, for the contractor to report on the implementation of the ESMP during the construction phase of the proposed. KenGen will establish a Projects Implementation Team comprising of various professionals, including environmentalists and safety personnel, to oversee implementation of the proposed project.

Table 38: Environmental and Social Monitoring Plan for the proposed project

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
Construction Phase Impacts and Mitigation Measures					
Land Conflicts	• Loss of livelihoods or income • Negative company image	• Issuance of notice to the owners of the existing Maasai *manyattas* • Make use of existing local institutions, the Resettlement Action Plan Implementation Committee and Community Advisory Council, to resolve any potential conflicts with the owners of the *manyattas*.	No cost	Prior to commencement of construction phase	KenGen
Vegetation Clearing	• Changes in local drainage	• Areas to be cleared will be surveyed and flagged to identify the limits of clearing	To be determined	Throughout construction	Main contractor

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
	• Visual intrusion • Disruption of animal behaviours • Loss of ecosystem services • Increased soil erosion and sedimentation •	with the expectation that clearing will be kept to a minimum. • Clearing of the vegetation shall be done in distinct segments depending with scheduling of project activities. • The location of the transmission towers shall take into consideration the natural terrain and landscape features to minimize on the rate of soil erosion. • Stock piling of the top soil for use during landscaping • Undertake landscaping and plant suitable species of indigenous vegetation along the transmission corridor • Regular watering of the planted vegetation during dry season. • Landscaping and rehabilitation of the transmission corridor shall be done in distinct segments in tandem with construction activities.	during detailed design	phase	

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		• The existing vegetative buffer strips along natural watercourses shall be left intact where practicable so as to minimize gully erosion. • Use of gabions in areas already affected by gully erosion. • Monitoring the growth of invasive species and uprooting as necessary. • Drivers shall be sensitized on usage of designated access roads to minimize unnecessary vegetation disturbance.			
Dust Emission	• Public nuisance • Negative health effects • Soiling of property	• Use of water sprays to suppress dust emission as of excavation works, stockpiling and movement of vehicles along the transmission corridor. • Impose a maximum speed limit on earth roads within Olkaria which shall be supported by speed limit signs erected at strategic positions. • All vehicles entering and leaving sites	To be determined during detailed design	Throughout construction phase	Main Contractor

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		with loose materials like sand, spoil or stone aggregate should be covered to prevent accidental escape of materials during transportation. • Loose materials shall be adequately wetted prior to and during loading, unloading and handling operations. • Investigate all dust complaints and take appropriate measures to reduce emissions in a timely manner. • Minimize drop heights from loading shovels and other loading or material handling equipment. • All workers who are likely to be exposed to dust will be provided with suitable personal protective equipment including dust masks, eye goggles and coveralls. • The concrete mixers shall be enclosed with suitable barriers to minimize airborne dust when being operated.			

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
Noise and vibration	• Hearing impairment • Public nuisance • Physical and psychological stress • Reduced productivity • Interference with communication • Disruption of animal behaviours • Contribution to accidents and injuries by making it difficult for the workers to hear	• Idling of vehicles, concrete mixers and material handling equipment shall be minimized as far as reasonably practicable. • Construction activities will be limited to the hours of operation between 8.00 am and 6.00 pm. • Workers performing noisy operations shall be provided with suitable ear protectors based on the expected noise levels. • Drivers of motor vehicles will be warned against unnecessary hooting of vehicles. • Ensure that all vehicles, concrete mixers and material handling equipment are maintained in proper working condition in line with the manufacturer's recommendations.	500 per person/month for the ear protectors	Throughout construction phase	Main Contractor

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
	warning signals.				
Gaseous Emissions	• Public nuisance • Smog • Climate change • Negative health impacts	• Idling of vehicles, concrete mixers and material handling equipment shall be minimized as far as reasonably practicable. • Ensure that all vehicles, concrete mixers and material handling equipment are maintained in proper working condition in line with the manufacturer's recommendations. • Burning of solid waste will not be undertaken to prevent gaseous emissions to the atmosphere. • Indigenous trees will be planted along the transmission line corridor to compensate for the lost vegetation which would have acted as carbon sinks.	To be determined during detailed design	Throughout construction phase	• Main Contractor • KenGen
Handling, Storage and Use of	• Negative health impacts	• Provision of suitable personal protective equipment to all workers handling	To be determined during	Throughout construction phase	Main Contractor

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
Hazardous Materials	• Soil contamination • Surface water contamination	hazardous materials. • Suitable storage areas, complete with impervious floor, will be provided to prevent exposure to harsh weather conditions • A spill prevention, control and response plan shall be developed and maintained on site. • An inventory of hazardous materials together with respective Material Safety Data Sheets will be maintained on site to guide on material handling. • Suitable spill containment measures shall be provided in areas designated for storage of hazardous materials.	detailed design		
Handling, Storage and/or Disposal of Waste	• Water pollution • Aesthetic degradation • Public nuisance • Negative health	• Provision of portable toilets for use by the construction workforce. The toilets shall be maintained in clean sanitary condition. • An integrated approach to waste	To be determined during detailed design	Throughout construction phase	Main Contractor

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
	impacts	management will be implemented. These will include provision of properly labeled waste containers, waste reuse/recycling, green purchasing, source reduction and final safe disposal. • Final disposal of waste from the construction site shall be through NEMA licensed waste handlers. Up to date waste tracking sheets for all waste transported away from the site shall be maintained. • Construction staff shall be sensitized on sound waste management practices.			
Influx of Workers to the Construction Project Site	• Spread of communicable or infectious diseases such as HIV/AIDS. • Increased crime incidents such as poaching, fraud, burglary,	• A sensitization program, aimed at raising awareness of the local community and contractor's workforce on communicable diseases, will be developed and rolled out throughout. • The portable toilets and the permanent washrooms at the contractors lay down area shall be supplied with condoms and the workforce encouraged to use them as	To be determined during detailed design	Throughout construction phase	• Main contractor • KenGen

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
	theft and vandalism of property.	and when necessary. • Sensitization of the site and project managers on how to deal with crime shall be undertaken jointly by KenGen, Kenya Wildlife Service and the Olkaria Police. • An up-to-date employee database will be maintained at the construction site. • the contractor's employees shall be issued with suitable identification cards which will be tagged during work hours for ease of identification. • To ensure the legitimacy of security-guard companies, that will be used to provide onsite security, they must be registered with the Private Security Regulatory Authority. • Contractor's properties, including material handling equipment will be kept secure, preferably at the contractors lay			

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		down area, to prevent theft. • Security measures shall be enhanced through regular patrols to be performed by the security guards. • All crime incidents shall be reported immediately through appropriate channels to facilitate timely and adequate investigation.			
Wildfire	• Destruction of animal habitats • Loss of property • Injuries to workforce or animals (domestic and wild)	• All welding and grinding operations will require hot work permits aimed at reducing fire risks. • The contractor will provide, at strategic points, suitable firefighting equipment. • The construction workforce shall be sensitized on how to fight fire. • Workers will be sensitized on the dangers of open fires. This can be through use of suitable safety signage. • Fire drills will be carried out at predetermined intervals to enhance fire	To be determined during detailed design	During construction phase	Main Contractor

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		emergency preparedness. • All flammable materials will be stored in line with manufacturer's recommendations.			
Aircraft Navigation Safety	• Damage to aircraft • Injuries to aircraft operators and/or the general public	• Obtain approval from Kenya Civil Aviation Authority (KCAA). • The design of the proposed power transmission line project will take into consideration recommendations by KCAA.	10,000	Prior to commencement of construction works	KenGen
Health and Safety Hazards	• Injuries to workers • Occupational ailments • Electrocution of animals, workers or members of the general public.	• Geotechnical investigation will be carried out at various tower locations to provide information for the detailed design of the concrete foundations. • The minimum recommended overhead clearances between the transmission lines and structures such as buildings will be taken into consideration during the design of the proposed power	To be determined during detailed design	Prior to and during construction phase of the project.	• Main contractor • KenGen

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		transmission line. • Conduct job safety analysis for critical tasks and document safe work procedures. • Safe work procedures will include lock-out tag-out procedures which will require proper coordination between KenGen and the contractor. • Establish a health and safety committee whose mandate shall be as stipulated by the Factories and other Places of Work Act (Safety and Health Committee Rules), 2004. • A permit to work system will be enforced for all activities deemed to present greatest risk to the workforce for instance working at height, electrical works, mechanical works and hot works. • Critical tasks will be undertaken by trained and certified personnel.			

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		• Suitable personal protective equipment including non-conductive safety helmet, approved safety goggles, approved safety footwear, electrical insulating hand gloves and overalls will be provided. • Provision of first aid kits and trained first aiders. • Registration of the contractor's lay down area as a work place. • An emergency vehicle shall be maintained on site during work hours. • The design of the proposed transmission line will incorporate suitable safety features including barriers to prevent unauthorized climbing on transmission towers, surge arrestors and earthing. • A designated environment, health and safety personnel will be employed to enforce the required environmental and safety precautions			

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		• Tool box talks, aimed at building a strong safety culture, will be held on a daily basis prior to commencement of works. • Suitable warning signs will be installed especially where transmission lines cross roads or where high voltages are expected. This will serve to warn the general public and the workers on the potential dangers of approaching such areas. • Implement a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers will be maintained. • Suitable fixtures will be installed on the tower components to facilitate the use of fall protection systems.			

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		• Hoisting equipment should be properly rated and maintained and hoist operators properly trained. • An approved tool bag will be used for raising or lowering tools or materials to workers on structures to avoid accidental falling of objects.			
Operation Phase Impacts and Mitigation Measures					
Handling, Storage and Use of Hazardous Materials	• Negative health impacts • Soil contamination • Surface water contamination	• All workers handling hazardous materials will be provided with suitable personal protective equipment including hand gloves, coveralls and respirators. • All hazardous materials will be kept in the designated storage areas complete with impervious floor. • A spill prevention, control and response plan shall be developed and maintained on site. • An inventory of hazardous materials together with accompanying Material	Internal cost to be determined upon commissioning of the proposed project	During operation and maintenance	• KenGen • Maintenance Contractor

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		Safety Data Sheets will be maintained on site to guide on material handling. • Suitable spill containment measures shall be provided at the designated storage areas. • No smoking signage will be strategically posted at the storage areas designated for flammable materials.			
Health and Safety Hazards	• Damage to property • Injuries or death of members of the general public or animals (wild and domestic) • Fatality of birds	• An effective preventive maintenance and inspection program, for the transmission line and its components, will be developed in line with good industrial practice. • The substation shall be fitted with a suitable fire protection and alarm system which shall be inspected and maintained at regular intervals. • Job safety analysis will be carried out for critical tasks and standard operating procedures developed	Internal cost to be determined upon commissioning of the proposed project	During operation and maintenance	• KenGen • Maintenance Contractor

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		• Safe work procedures for the maintenance operations will include lock-out tag-out procedures which will require proper coordination between the operation and the maintenance teams. • A permit to work system will be enforced for all activities deemed to present greatest risk to the operation and maintenance teams • Critical tasks will be undertaken by trained and certified personnel • Suitable personal protective equipment including non-conductive safety helmet, approved safety goggles, approved safety footwear, electrical insulating hand gloves and overalls will be provided • A fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall			

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		protection equipment; and rescue of fall-arrested workers will be maintained. • Hoisting equipment should be properly rated and maintained and hoist operators properly trained • An approved tool bag will be used for raising or lowering tools or materials to workers on structures to avoid accidental falling of objects. • The power transmission line and its components will be designed in an environmental friendly manner. These will involve use of visible markers on the transmission lines, appropriate phase spacing and tower design considerations to minimize incidents of electrocution or collision of birds.			
Electromagnetic Fields (EMF)	Perceived negative health impacts	• Use of engineering techniques like shielding • Identification of potential exposure levels	Internal cost to be determined upon		

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
		in the workplace and the use of personal monitors when carrying out electrical operations near high voltages • Limiting exposure time where levels have been confirmed to exceed the maximum limit recommended by the international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP).	commissioning of the proposed project		
Noise and Ozone	Public nuisance	• Routing of the proposed power transmission line away from residential areas. • Provision of suitable ear protectors to the workers carrying out noisy operations • Regular maintenance of the transmission line and its components.		During construction and maintenance	• Main Contractor • KenGen and • Maintenance Contractor
Handling, Storage and Disposal of Waste	• Water pollution • Aesthetic degradation • Public nuisance	• An integrated approach to waste management will be implemented. These will include provision of waste segregation, properly labeled waste	Internal cost to be determined upon commissio		

Environmental/Social Aspect	Potential Impacts	Proposed Mitigation Measures	Estimated Cost (KES)	Time Frame	Responsibility
	• Negative health impacts	containers, waste reuse/recycling, green purchasing, source reduction and final safe disposal. • Final disposal of waste shall be through NEMA licensed waste handlers. • Up to date waste tracking sheets for all waste transported away from the site will be properly maintained. • The maintenance contractor will be sensitized on sound waste management practices.	ning of the proposed project		

Environmental and Social Monitoring Plan

Table 39 Shows the Environmental and Social Monitoring Plan for the proposed 132 kV power transmission line project. During the monthly project progress meetings, the selected contractor will be required to provide a report for each of the monitoring parameters.

Table 39: Environmental and Social Monitoring Plan

INDEX	MONITORING ITEM	RELEVANT STANDARD/LAW	MONITORING FREQUENCY	MONITORING MEANS/INDICATOR	MONITORING REPORTS /REMARKS.
1.	EIA license	EMCA, CAP 387	Quarterly	Tracking expiry date & fulfillment of license conditions	Application for variation where applicable
2.	Water abstraction permit	Water Act, 2016	Quarterly	Tracking expiry date and fulfillment of permit conditions.	Application for renewal where applicable.
3.	Employment creation	• Employment Act, 2007 • The Constitution of Kenya, 2010	Daily	Number of casual jobs created for the local community in terms of gender.	Monthly and quarterly reports
4.	Workplace registration	Occupational Safety & Health Act (OSHA), 2007	Annually	Tracking expiry date	Make annual renewal
5.	Ambient and occupational levels of noise emission	Environmental Management and Coordination (Noise and Excessive Vibration	Monthly	Measured levels by a hand held noise meter at identified receptor points.	Quarterly reports

INDEX	MONITORING ITEM	RELEVANT STANDARD/LAW	MONITORING FREQUENCY	MONITORING MEANS/INDICATOR	MONITORING REPORTS /REMARKS.
		Pollution Control) Regulations, 2009			
6.	Dust emission	OSHA, 2007	Daily	• Visual inspection of project site • Complaints from the public or workers	Monthly report
7.	Gaseous emissions	• Climate Change Act No. 11 of 2016 • OSHA, 2007	Daily	• Visual inspection of vehicles and equipment • Complaints from the public or workers	Monthly report
8.	Solid waste generated	Environmental Management and Coordination (Waste Management) Regulations, 2006	Quarterly	Dully completed waste tracking sheets	Quarterly reports
9.	Crime incidents	The Private Security Regulation Act No. 13 of	Monthly	Number of incidents reported and investigated	Monthly reports

INDEX	MONITORING ITEM	RELEVANT STANDARD/LAW	MONITORING FREQUENCY	MONITORING MEANS/INDICATOR	MONITORING REPORTS /REMARKS.
10.	Incidents and accidents involving workers, members of the public or animals (domestic and wild)	The Wildlife Conservation and Management Act, 2013	Monthly	Number of incidents and accidents recorded & investigated.	Monthly & quarterly reports
11.	Control of invasive species of vegetation	The Wildlife Conservation and Management Act, 2013	Quarterly	Visual inspection of disturbed sites	Quarterly reports
12.	Landscaping and revegetation of disturbed sites	EMCA, CAP 387	Quarterly	Visual inspection of rehabilitated sites	Quarterly reports
13.	Statutory trainings (first aid, fire fighting and Occupational Health and Safety Committee trainings)	OSHA, 2007	Quarterly	Certificates of trainings attended	Quarterly reports
14.	Induction of new employees	OSHA, 2007	Daily	Minutes/signed attendance sheets	Monthly reports
15.	Statutory equipment inspection (cranes, chain blocks, lifting tackles and fire fighting	OSHA, 2007	Quarterly	Verification of equipment inspection certificates	Quarterly reports

INDEX	MONITORING ITEM	RELEVANT STANDARD/LAW	MONITORING FREQUENCY	MONITORING MEANS/INDICATOR	MONITORING REPORTS /REMARKS.
	equipment)				
16.	Occupational Health and Safety Committee meetings	OSHA, 2007	Monthly	Verification of minutes of meetings conducted and implementation of corrective action plans	Monthly and quarterly reports
17.	Site inspections for compliance	OSHA, 2007	weekly	Visual observations and interviews with workers on site	Monthly and quarterly reports
18.	Sensitization compaigns targeting communicable diseases like HIV/AIDS	HIV and AIDS Prevention and Control Act (Cap 14 of 2006)	Quarterly	Verification of records pertaining to the awareness sessions conducted.	Quarterly report
19.	Electromagnetic Field	OSHA, 2007	Annually	Hand held monitoring equipment	Annual reports
20.	Complaints from the public or workers	The Constitution of Kenya, 2010	Daily	Number of complaints recorded	Monthly report

CHAPTER 9

9 CONCLUSIONS AND RECOMMENDATIONS

The manufacturing sector is one of the key pillars of the Kenya Vision 2030, which aims to encourage a "robust, diverse and competitive" manufacturing sector. Manufacturing is among the big four agenda aimed at accelerating economic growth in Kenya. Electricity is an important input in the manufacturing processes and hence the government of Kenya has made tremendous efforts in improving electricity generation in the country. However, even if power is available, poor transmission and distribution infrastructure leads to erratic power supply and outages in the country. Further, the quality of electricity supplied is also a major concern for high voltage and bulk consumers. This is due to fluctuation in power and power outages which decreases productivity. In order to encourage affordable, reliable, quality and sustainable electricity for manufacturing industry in Kenya, the government has recognized the need to allow generators of electricity to sell to bulk electricity consumers. The proposed 132 kV overhead power transmission project will provide an opportunity for KenGen to supply bulk electricity to manufacturing firms which will be located within KenGen Industrial Park thus enhancing the quality and reliability of electricity. KenGen will have therefore contributed positively towards the government's effort of fulfilling the big four agenda.

The proposed 132 kV overhead power transmission line is listed among the projects that are supposed to undergo ESIA study. Therefore, in order for the proposed project to be meaningful, an ESIA study had to be conducted. The findings of the ESIA study indicate that the proposed project has the potential of generating positive and negative impacts. The positive impacts include: Provision of employment opportunities, improved supply of reliable and cheaper electricity, promotion of green energy, reduced transmission losses and enhancement of the tax base. The potential negative impacts will be associated with vegetation clearing, handling of hazardous materials, waste management, dust, influx of workers to the proposed project site, gaseous emissions, working at height and contact with energized conductors. The potential impacts will include; contamination of soil and surface water, spread of communicable diseases, soil erosion, loss of animal habitat, mortalities of avifauna, injuries, adverse health of workers, public nuisance, climate change and loss of life and/or properties. All the potential impacts can be adequately mitigated thus the project should be considered for approval by NEMA. However, upon approval, the project proponent will need to implement the Environmental and Social Management Plan during the construction and operation phases of the proposed project in order to promote

environmentally sustainable development. The ESMP should form part of the selected contractor's obligation as specified under the contract for construction, testing and commissioning pf the proposed transmission line project.

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APPENDIX 1: APPROVED TERMS OF REFERENCES FOR THE ESIA STUDY

NEMA/TOR/5/2 Date: 17/5/2018

Kenya Electricity generating company ltd,
P.O Box 47936-00100 Nairobi

RE: ACKNOWLEDGEMENT AND APPROVAL OF TERMS OF REFERENCE (TOR) FOR THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY

We acknowledge receipt of the TOR for the above subject.

Pursuant to the Environmental Management and Coordination Act Cap 387, Legal Notice 150 and the Environmental (Impact Assessment and Audit Regulations 31 and 25, your terms of reference for the Environmental Impact Assessment (EIA) study for the proposed 132kV overhead Electricity Transmission line to supply power to the Kenger Industrial park at Olkaria Geothermal field in Naivasha sub county, Nakuru county.

has been approved.

You shall submit ten (10) copies and one electronic copy of your report prepared by a registered expert to the Authority.

BONFACE MAMBOLEO
EIA SECTION HEAD

KENYA ELECTRICITY GENERATING COMPANY LIMITED

TERMS OF REFERENCE

FOR

CONDUCTING ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED 132 kV OVERHEAD ELECTRICITY TRANSMISSION LINE TO SUPPLY POWER TO THE KENGEN INDUSTRIAL PARK AT OLKARIA GEOTHERMAL FIELD IN NAIVASHA SUBCOUNTY, NAKURU COUNTY

PROJECT PROPONENT:

KENYA ELECTRICITY GENERATING COMPANY LIMITED

PREPARED BY:

PHILIP JUMA BARASA
LEAD EIA/AUDIT EXPERT
NEMA REG. No. 1857

14th MAY, 2018

Name and Address of ESIA Team Leader

Philip Juma Barasa,
P.O. Box 785-20117,
Naivasha, Kenya.

Mobile: 0724455061

Signed: _____ 14-05-2018

EIA/EA Lead Expert
NEMA Reg. No.1857

Date

Name and Address of Project Proponent

Kenya Electricity Generating Company Limited,
Stima Plaza, Phase III,
Kolobot Road, Parklands,
P.O. Box 47936 – 00100,
Nairobi, Kenya.

Tel : +254 20 3666000
Mobile: 0711036000/0732116000

Signed: _____ 15.5.2018

Joshua Were
Environment & CDM Manager

Date

LIST OF ABBREVIATIONS

DOHSS	Directorate of Occupational Health and Safety Services
EMCA	Environmental Management and Coordination Act, 1999
ESMP	Environmental and Social Management Plan
EIA	Environmental Impact Assessment
ERC	Energy Regulatory Commission
ESIA	Environmental and Social Impact Assessment
KenGen	Kenya Electricity Generating Company Limited
KMFRI	Kenya Marine and Fisheries Research Institute
KETRACO	Kenya Electricity Transmission Company Limited
KPLC	Kenya Power and Lighting Company Limited
KWS	Kenya Wildlife Service
MWe	Megawatt of Electricity
NEMA	National Environment Management Authority
ToRs	Terms of Reference
WRA	Water Resource Authority

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1.0 Introduction

Kenya Electricity Generating Company Limited (KenGen) is the leading electric power generation company in Kenya. The Company generates about 75 percent of electricity capacity installed in the country. The Company utilizes various sources to generate electricity ranging from hydro, geothermal, thermal and wind. Hydro is the leading source, with an installed capacity of 819.9 MWe, which is 51 per cent of the Company's installed capacity. Geothermal is currently at 533.8 MWe (of which 81.1 MWe is from the innovative wellheads technology) contributing to about 32 per cent of the total installed capacity. The total installed thermal and wind capacity is 253.5 MWe and 25.5 MWe respectively.

Amid the rapid growth of Kenya's economy and Foreign Direct Investment (FDI) in-flows, KenGen has set out to develop an Industrial Park (IP) on a piece of land measuring approximately 453 Ha at Olkaria Geothermal Field in Naivasha subcounty, Nakuru County. The proposed industrial park will serve as an effective instrument to attract FDIs and to generate employment opportunities. It would thus contribute to community and regional growth and ultimately sustained growth of the national economy as a whole. This development heavily relies on the availability of quality, efficient and reliable electricity supply so as to make business sense to the industrial locators. KenGen intends to sell part of the geothermal power generated at Olkaria to the manufacturing industries that will be located within the proposed Industrial Park. It is against this background that KenGen is proposing to install a 132 kV overhead electricity transmission line to supply power to the Industrial Park site from the existing wellhead substation at well pad OW-914.

Pursuant to section 58 of the Environmental Management and Coordination Act (EMCA), 1999 (Cap. 387) proponents are required to carry out Environmental and Social Impact Assessment (ESIA) study for projects listed under the second schedule. Item 10 of the second schedule requires ESIA study to be carried out for electric transmission lines above 66 kV. The proposed 132 kV electric transmission line therefore requires an ESIA study. However, prior to initiating the ESIA study, Terms of Reference (ToRs) for conducting the study must be prepared and submitted to National Environment Management Authority (NEMA) for approval as provided for by the Environmental (Impact Assessment and Audit) Regulations, 2003. In fulfillment of this requirement, the proponent in consultation with the EIA/Audit Experts has prepared the ToRs for carrying out a full ESIA study for the proposed 132 kV electric transmission line project.

The objective of the ESIA study is to ensure that all potential environmental, social and economic impacts of the proposed project are identified and that an Environmental and Social Management Plan for the project is prepared with an aim of promoting environmentally sustainable development.

1.1 The Project Proponent

The project proponent is Kenya Electricity Generating Company Ltd (KenGen) and the registered office and contact addresses are:

Stima Plaza, Phase III,
Kolobot Road, Parklands
P.O. Box 47936 – 00100 Nairobi, Kenya
Tel : +254 20 3666000
Mobile : 0711036000/0732116000/203666000
Web : www.kengen.co.ke
E-mail : pr@kengen.co.ke

1.2 Description of the Proposed Projects

The proposed project shall involve construction of a single circuit, 132 kV overhead electricity transmission line to supply power to the proposed KenGen Industrial Park from the existing KenGen wellhead substation at well pad OW-914. The project will be located within the greater Olkaria area specifically in the domes area.

The components of the proposed project are as described below.

v) Substation extension works at the well pad OW-914 substation. This shall include introduction of a 220 kV bus bar, construction of a complete bay for termination of the proposed 132 kV and a new 220/132 kV transformer bay. Additional components shall include; circuit breakers, current transformers and voltage transformers complete with other related switching equipment.

vi) Approximately 20-30 transmission line metallic towers together with 3 phase conductors complete with associated insulation materials as well as an Optical Ground Wire (OPGW) for communication. The towers are to be spaced approximately 250 m – 350 m apart depending on the terrain of the specific areas along the proposed line route.

vii) 132 kV substation to be located near the proposed Industrial Park site for purpose of transforming voltages from 132 kV to 11 kV or 33 kV depending on consumers requirements. A 132/11 kV or 132/33 kV transformer complete with associated circuit breakers, current transformers, voltage transformers, isolators, surge arrestors among

other substation high voltage equipment shall be installed. It shall also include a control room building which shall host the switchgear room and the control and communication equipment.

viii) 11kV or 33kV distribution lines depending on requirements of tenants at the industrial park. These low voltage distribution lines shall be constructed within the industrial park site and terminated at the premises within the park.

The 132 kV transmission line towers shall be hot deep galvanised and shall have a minimum height of approximately 30 m (dependent on specific designs and tower types). The lowest energized conductors on the towers shall be at an elevation of approximately 20 m above ground (dependent on specific designs and tower types).

The proposed substations shall be fenced with chain link materials and installed with an access gate to avoid intrusion by wild animals and/or unauthorised personnel to the high voltage equipment and as such minimise the risk of electrocution.

The transmission line route is proposed to start with a terminal tower near the OW-914 substation located in Olkaria domes area and it shall traverse to the Industrial Park site following the existing Resettlement Action Plan (RAP) road way leave and terminate to the industrial park site near the proposed 132/11kV substation.

The substations and the transmission line works are expected to be implemented within 24 months upon enforcement of the works contract with a selected contractor.

1.3 Scope of the Environmental and Social Impact Assessment (ESIA) Study

The broad scope of the assignment will be to carry out Environmental and Social Impact Assessment (ESIA) study for the proposed 132 kV overhead electricity transmission line to the proposed industrial park site at Olkaria Geothermal Field. The ESIA study will endeavour to identify potential environmental, social and economic aspects and predict the positive and negative impacts associated with the proposed project. The ESIA study will also help to develop the best possible mitigation measures in the form of Environmental and Social Management Plan (ESMP) as well as monitoring plans that will be used to evaluate the effectiveness of the mitigation measures. The ESIA study will be structured to meet the requirements of existing legal frameworks.

The ESIA study report will provide the following salient information in line with the provisions of Environmental (Impact Assessment and Audit) Regulations, 2003:

q) the proposed location of the project;
r) a concise description of the national environmental legislative and regulatory framework, baseline information, and any other relevant information related to the project;
s) the objectives of the project;
t) the technology, procedures and processes to be used in the implementation of the project;
u) the materials to be used in the construction and implementation of the project;
v) the products, by-products and waste generated by the project;
w) a description of the potentially affected environment;
x) the environmental effects of the project including the social and cultural effects and the direct, indirect, cumulative, irreversible, short-term and long-term effects anticipated;
y) alternative technologies and processes available and reasons for preferring the chosen technology and processes;
z) analysis of alternatives including project site, design and technologies and reasons for preferring the proposed site, design and technologies;
aa) an environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures;
bb) provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the cause of carrying out activities or major industrial and other development projects;
cc) the measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies;
dd) an identification of gaps in knowledge and uncertainties which were encountered in compiling the information;
ee) an economic and social analysis of the project;
ff) an indication of whether the environment of any other state is likely to be affected and the available alternatives and mitigating measures; and
gg) such other matters as NEMA may require.

1.4 Responsibilities of the ESIA Team

The ESIA team, under the leadership of a registered and licensed Lead EIA/Audit Expert, shall carry out the ESIA study in accordance with the general Environmental Impact Assessment guidelines and administrative procedures issued by NEMA. To achieve this objective, the ESIA team will execute the following tasks:

Task 1: Description of the Proposed Project

The ESIA team will be expected to provide a comprehensive description of the proposed project including the following:

i. Type and nature of the project including sources and destination of power;
ii. Transmission line route details;
iii. Design and engineering features such as voltage level, length of transmission lines, minimum height over ground level for overhead lines, tapping point, type of electric poles and manholes;
iv. Activities to be undertaken during construction and operation phase of the project;
v. A complete list of raw materials to be used for the construction of the transmission line;
vi. Contractors lay down area;
vii. Details of workforce to be employed and
viii. Alternative technologies and transmission routes considered.

Task 2: Description of the Project Environment/Baseline Data Collection

Baseline data on the project's area of influence will be established through field survey and review of relevant literature. The following shall form part of the baseline data.

Information on the Physical Environment

The ESIA team will provide a description of the following:

i. the topography, soil characteristics and the hydrogeology of the proposed project site.
ii. Surface and sub-surface water characteristics including inventory of lakes, rivers, streams and/or springs along the proposed transmission line and its surroundings.
iii. Existing ambient air quality including parameters such as particulate matter, gaseous pollutants, and information on existing meteorological conditions such as temperature, humidity, rainfall and wind characteristics.
iv. Existing ambient noise levels and the potential sources of noise pollution.

Information on Flora and Fauna of the Project's Area of Influence

The ESIA team will collect baseline information on the existing biodiversity and determine how it will be affected by construction activities. This shall be done in liaison with Kenya Wildlife Service (KWS) since the site lies within Hell's Gate-Mt. Longonot National Parks Ecosystem. The project alternative sites will be evaluated by considering areas which have unique habitat, endemic or threatened species, or species of high economic and cultural value to society or ecosystem.

Information on Socio-economic/Cultural Aspects

Socio-economic/cultural aspects to be considered will include the following:

i. Land uses;
ii. Land ownership;
iii. Way leaves;
iv. Demographic profile;
v. Economic activities around the project site;
vi. Existing public infrastructure and social services i.e education, health, communication and transport network, etc;
vii. Prevalent diseases;
viii. List of cultural and heritage site falling along the proposed transmission line.

Task 3: Carry out Public Participation and Consultations

The ESIA team will ensure adequate public participation and/or consultations throughout the ESIA study for the proposed project. This will ensure that all relevant concerns and opinions regarding the proposed project are integrated into the project decision making process and are adequately addressed in the ESIA study report. The non-technical summary of the ESIA study report will be presented to the relevant stakeholders with an aim of soliciting comments from them with regards to the proposed electric transmission line project. Three public meetings/barazas and a key stakeholders' workshop will be conducted to fulfil this requirement. The list of stakeholders who will be consulted during the workshop that will be chaired by the Deputy County Commissioner, Naivasha Sub-county is provided below.

a) Kenya Electricity Transmission Company Ltd (KETRACO)

b) Energy Regulatory Commission (ERC)
c) Kenya Power & Lighting Company (KPLC)
d) Akiira One Geothermal Company Ltd
e) Orpower 4 Inc.
f) National Environment Management Authority (NEMA) –Nakuru County
g) Oserian Development Company Ltd
h) Kedong Ranch Company Ltd
i) Chief Hell's Gate location
j) Assistant Chief Olkaria Sub-location
k) OCS, Olkaria Police Post
l) Imarisha Naivasha Trust
m) Lake Naivasha Riparian Association (LNRA)
n) WWF –Naivasha
o) Elsamere Conservation Centre
p) Nature Kenya
q) Kenya Marine and Fisheries Research Institute (KMFRI)
r) KWS –Hell's Gate National Park
s) Water Resources Authority (WRA)
t) Directorate of Occupational Health & Safety Services (DOHSS), Naivasha sub-county
u) Headmistress, Olkaria Primary School, RAP land
v) Nurse in charge, Olkaria RAP land community dispensary and
w) Member of County Assembly – Olkaria Ward.

The three public meetings will be held at the Olkaria RAP land village, Olomayiana Kubwa village and Kamere trading centre. The meetings will be chaired by the Chief, Hell's Gate location. Notices for the public meetings and stakeholders' workshop will be sent out seven days prior to the planned meeting dates to facilitate adequate preparation.

Upon submission of the ESIA study report to NEMA, the report will be disclosed to the public for a period of 30 days to facilitate submission of comments. Notices to invite comments will be done by way of a radio, local newspapers and the Kenya Gazette.

Task 4: Determination of Potential Impacts of the Proposed Project

The ESIA team will identify possible positive and negative impacts arising from all aspects related to the proposed project during construction and operation phase. Potential impacts will be drawn from case studies of similar power plants at Olkaria geothermal field and other fields worldwide. Each negative impact shall be described in detail. The assessment shall include short term and long-term impacts of the proposed project as well as cumulative impacts. The issues to be considered when identifying potential impacts will be guided by the criteria provided under the second schedule to the Environmental (Impact Assessment and Audit) Regulations, 2003. The criteria covers the following issues:

1. Ecological Considerations

   a) Biological diversity including effect of proposal on the number, diversity and breeding habits of wild animals.
   b) Sustainable use including
      i. effect of proposal on soil fertility;
      ii. breeding populations of wild animals;
      iii. natural regeneration of vegetation and sustainable yield;
      iv. wetland resource degradation or wise use of wetlands;

   c) Ecosystem maintenance including
      i) effect of proposal on food chains;
      ii) nutrient cycles;
      iii) aquifer recharge, water run-off rates, soil erosion;
      iv) a real extent of habitats;
      v) fragile ecosystems.

2. Social considerations including
      i. economic impacts;
      ii. social cohesion or disruption;
      iii. effect on human health;
      iv. immigration or emigration;
      v. communication - roads opened up, closed, rerouted;
      vi. effects on culture and objects of culture value.

3. Landscape

i. views opened up or closed;
ii. visual impacts (features, removal of vegetation);
iii. compatibility with surrounding area;
iv. amenity opened up or closed, e.g. recreation possibilities.

4. Land uses
   i. Effects of proposal on current land uses and land use potentials in the project area;
   ii. possibility of multiple use;
   iii. effects of proposal on surrounding land uses and land use potentials.

5. Water
   a) water sources (quantity and quality);
      i. rivers;
      ii. springs;
      iii. lakes (natural and man-made);
      iv. underground water;
   b) drainage patterns/drainage systems.

Design parameters for the proposed electric transmission line that will guide the identification of the potential impacts include the following:

i. Required voltage;
ii. Conductor type and configuration;
iii. Support structure design and spacing;
iv. Land requirements for construction staging areas, substations, or other facilities;
v. Routing, including the length, width, and acreage of the proposed right of-way;
vi. Areas where construction will require permanent clearing of trees, shrubs and herbaceous vegetation;
vii. Changes in topography needed to accommodate the line;
viii. Requirements to remove man-made structures and
ix. Areas where transmission line will cross ecologically sensitive sites and/or roads.

The potential environmental and social impacts associated with the proposed 132 kV electric transmission line include:

a) **Positive impacts**

The positive impacts envisaged include:

i. Provision of power supply to the proposed KenGen Industrial Park;
ii. creation of employment opportunities;
iii. enhancement of business opportunities;
iv. skills and knowledge transfer.

b) Negative impacts

The negative impacts envisaged include:

i. impact of the immigrant labour and project personnel on the local environment and on the host population, including health risks such as HIV/AIDS;
ii. the impact of dust emissions on human health and its nuisance effect;
iii. the impact of noise emission, from construction equipment and increased traffic, on the local population, workers and wild animals around the project site;
iv. impact of sewage and solid waste disposal on the local environment;
v. changes in land use;
vi. vegetation clearing and its related impacts on wildlife;
vii. impact on cultural, archaeological, historical and religious properties ;
viii. soil erosion due to storm water run-off;
ix. Impact of raised high voltage lines on avifauna;
x. Impact on existing residential settlements;
xi. Handling of hazardous materials for the transformers with the potential for contaminating water and soil resources;
xii. Climate change impacts and
xiii. Occupational health and safety hazards related to handling of high voltage of electricity.

Task 5: Legislative and Regulatory Framework.

A description will be given of the pertinent regulations, standards and institutional framework governing environmental management, health and safety. Consideration will be given to the national and international legislations. Among those to be considered include the following.

1. The Constitution of Kenya, 2010
2. Environmental Management and Coordination Act, 1999 (Cap. 387)
3. Occupational Safety and Health Act, 2007
4. The Work Injury Benefits Act, 2007

5. Environmental (Impact Assessment and Audit) Regulations of 2003
6. The Environmental Management and Co-ordination (Waste Management) Regulations 2006
7. The Environmental Management and Co-ordination (Water Quality) Regulation, 2006
8. The Environmental Management and Co-ordination (Noise and Excessive Vibrations Pollution Control) Regulations, 2009
9. The Environmental Management and Co-ordination (Air Quality) Regulation, 2014
10. The Water Act, 2016
11. Public Health Act, Cap 242
12. The Factories and Other Places of Work (Fire Risk Reduction) Rules, 2007
13. The Factories and Other Places of Work (Hazardous Substances) Rules, 2007
14. The Factories and Other Places of Work (Noise Prevention and Control) Rules, 2005 – Legal Notice No.25
15. The Factories (Building Operations and Works of Engineering Construction) Rules, 1984
16. The Wildlife Management and Conservation Act, No. 47 of 2013
17. The Energy Act, 2006 (No. 12 of 2006)
18. Geothermal Resources Act No. 12 of 1982
19. The Geothermal Resources Regulation, 1990
20. Occupiers Liability Act (Cap 34)
21. Water Resources Management Rules, 2007, Legislative Supplement No.52.
22. The HIV and AIDS Prevention and Control Act (Cap 14 of 2006)
23. The Paris Agreement
24. The United Nations Framework Convention on Climate Change (1992 UNFCCC)
25. The 1971 Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat
26. The Convention on Biological Diversity

Task 6: Mitigation and Management of Negative Impacts

Recommendations will be made for feasible and cost-effective measures to enhance the environmental and social benefits of the proposed project; avoid, minimize or remediate the adverse impacts; and to ensure that the residual adverse impacts are kept within acceptable levels. These measures will culminate into the Environmental and Social Management Plan (ESMP) covering all phases of the proposed project, right from pre-construction to the

operation and maintenance phases of the transmission line project. The ESMP will outline mitigation measures that will be undertaken to ensure compliance with environmental laws and regulations and to establish systems and procedures for this purpose.

A monitoring plan will also be developed taking into consideration the following:

i. The activity to be monitored and the parameters chosen to effectively carry out the exercise;
ii. The methodology to be employed and the frequency of monitoring and
iii. The locations to be monitored.

Task 7: Preparation of ESIA Study Report

The ESIA team will be required to prepare the ESIA study report which will focus on key findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data.

1.5 Methodology

Standard ESIA techniques will be used to collect the requisite information pertaining to the proposed project. These will include site reconnaissance, desktop review, mapping of the site using Geographic Information System (GIS), measurement of noise, particulate matter and hydrogen sulphide gas levels, expert judgement, case studies of similar projects, stakeholder workshop, one-on-one meetings and public meetings.

1.6 Proposed ESIA Study Team

A multidisciplinary team, whose details are indicated in the table below, has been appointed to conduct the ESIA study for the proposed 132 KV electric transmission line project.

Name	Qualifications	NEMA Reg. No.
Philip Juma Barasa	BSc. Environmental Science and MSc. Geothermal Energy Technology	Lead Expert No.1857
Douglas Gichangi	BSc. Environmental Conservation and Natural Resource Management	Associate Expert No. 8118
Gideon Kaile Lolim	BA. Community Development and Post Graduate Diploma in	Not Registered

	Education.	
Rolex A. Rang'ang'ah	BSc. Environmental Studies	Not Registered
Johannes Onjala Ochome	BSc. Electrical & Electronics Engineering and Post Graduate Diploma in Geothermal Energy Utilization	Not Registered
Andrew Mbaji	BSc. Electrical and Electronics Engineering	Not Registered

Detailed CVs for the team are attached for reference.

1.7 Expected Outputs

Ten hard copies and an electronic copy of the ESIA study report will be prepared and submitted to NEMA for review and approval. The report will include an appendix with items such as layout design drawings, land ownership documents, site plans, approved ToRs and other relevant documents. The soft copy of the report will be submitted electronically via NEMA website.

1.8 Proposed Work plan for the ESIA Study

The proposed work plan is provided below.

ITEM DESCRIPTION	DURATION (No. of days)
Preparation, submission and approval of terms of reference by NEMA	10
Baseline data collection	15
Public participation	20
Desk top ESIA study & report preparation	15
Presentation of draft ESIA report to KenGen management	1
Preparation of the final ESIA study report, printing, binding, endorsement and submission to NEMA	3
Public participation and consultations including: i. Preparation of public notice by NEMA ii. Submission of public notice to government printers for incorporation in Kenya gazette	40

iii. Submission of public notice to print media for incorporation in the newspaper with wider local circulation iv. Advertising in local newspaper, radio and Kenya Gazette for 2 successive weeks v. Receipt of comments from the public and key stakeholders vi. Response to the public and/or stakeholders comments by the ESIA team in form of a report and submission of the report to NEMA as an addendum to the ESIA study report where necessary.	
Review of the ESIA study report & decision making by NEMA (Issuance of EIA license)	50
TOTAL No. of days to complete ESIA study Report & receive approval from NEMA	**150**

NB: Some activities will run concurrently.

APPENDIX 2: LAND TITLE

REPUBLIC OF KENYA

THE LAND REGISTRATION ACT, No. 3 OF 2012
(*Section* 108)

THE REGISTRATION OF TITLES ACT
(*Chapter* 281) (Repealed)

CERTIFICATE OF TITLE

TITLE NUMBER I.R. 165000

TERM 999 YEARS FROM 1-5-1950

ANNUAL RENT SHILLINGS 379,250/= (*Revisable*)

I HEREBY CERTIFY that KENYA ELECTRICITY GENERATING COMPANY LIMITED

of Post office Box Number 47936-00100 NAIROBI

in the Republic of Kenya pursuant to a Transfer registered as Number I.R. 163073/5
is/are now registered proprietor(s) as Lessee(s)

from the Government of the Republic of Kenya for the term of Nine Hundred and Ninety Nine

years for the First day of May One ~~Two~~ thousand Nine Hundred

and Nakuru of ALL that piece of land situate South of Lake Naivasha

in the Nakuru District containing by measurement One Eight Nine Five

hectares/~~acres (less road reserve of)xxx~~ (1895)Ha.

hectares/acres) or thereabouts and being Land Reference Number 8396/12

(Original Number 8396/7/5))

as delineated on Land Survey Plan Number 380363

annexed to the said Transfer

SUBJECT however to the revisable annual rent of Shillings Three Hundred and Seventy Nine two Hundred and fifty and to the Act(s) Special Conditions Encumbrances and other matters specified in the Memorandum hereunder written.

IN WITNESS whereof I have hereunto set my hand and seal this 14th

day of May Two thousand and fifteen

Registrar of Titles
P. K. Tonui 250

LAND TITLES REGISTRY - NAIROBI REGISTRY
REGISTRATION OF TITLE ACT
REGISTERED AS No. I.R. 165000/1
PRESENTED 14th May 2015
TIME 0900 Hrs
Registrar of Titles
P. K. Tonui 250

MEMORANDUM

(1) The Land Act, No. 6 of 2012.
(2) The Land Registration Act, No. 3 of 2012.
(3) The Government Lands Act (Chapter 280) (Repealed).
(4) The Special Conditions contained in a Grant registered as Number I.R. 1977/1

REPUBLIC OF KENYA

DISTRICT OF NAKURU

Locality N.E. of Naivasha Municipality

Reference map South A 37 / A · III · d — 485

Land Reference No 8396/12

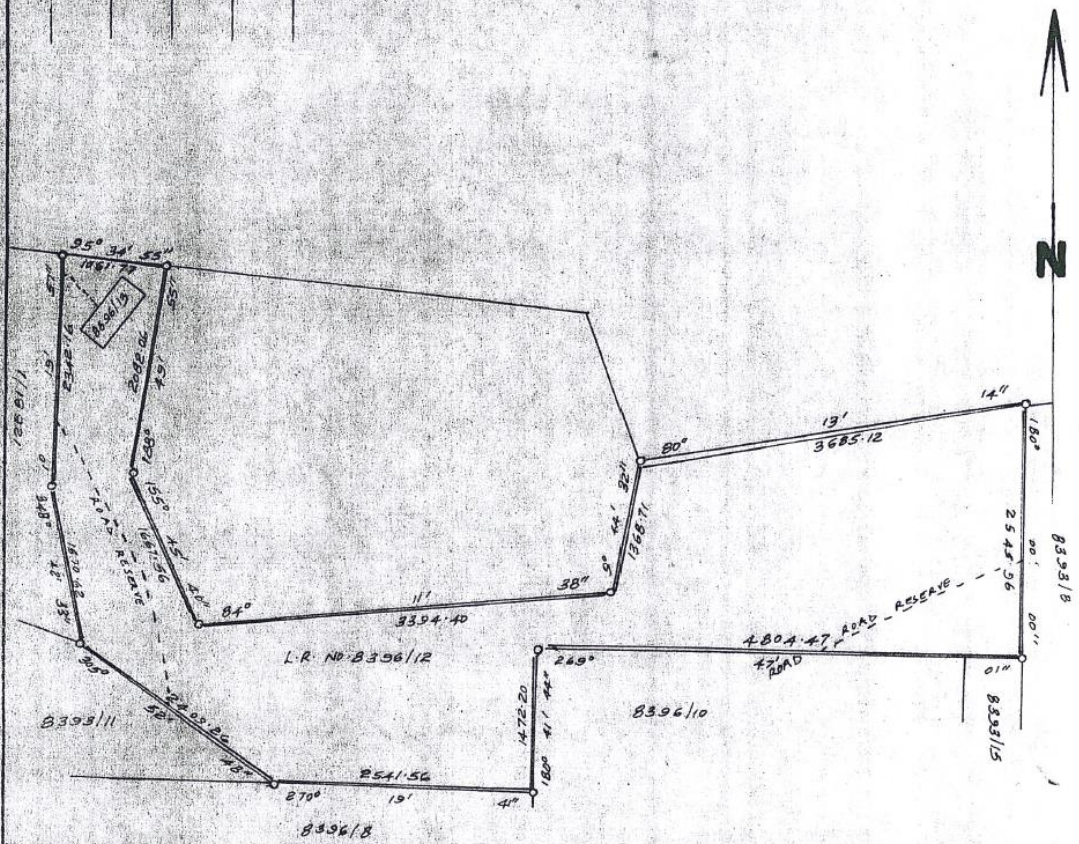
(Orig No. 8396/7/5)

Sub division No. (Orig No.

of Section No.

Bearings	Distance Metres

Total Area = 1897.25 Ha. (Approx.)
Less Road Reserve Area = 2.50 Ha. (Approx.)
Net Area = 1894.75 Ha. (Approx.)



B.C. Mwanyungu
Licensed Surveyor

F.R. No. 407/49
COMPS No. 66924

Traced by

Compared by

Scale 1 in 50,000

for. Director of Surveys

Nairobi 25TH MARCH 2015

DEED PLAN No. 380363

APPENDIX 3: NOTICES FOR THE PUBLIC BARAZAS

TANGAZO

MKUTANO WA WAKAAZI WA RAP LAND

Kampuni ya Kuzalisha Umeme Nchini Kenya (KenGen) ina furaha kualika wakaazi wa vijiji vya RAP land kwa mkutano utakaofanyika:

Tarehe: 17/05/2018

Saa: Saa nne asubuhi (10.00 am)

Mahali: RAP Land Social Hall

Agenda ya mkutano huo ni ifuatayo:

i. Kufahamishwa mpango wa kusambaza umeme wa megawati 50 kwa viwanda kwa viwanda vitakavyojengwa kwa ardhi ya kampuni ya KenGen
ii. Kupokea maoni ya wakaazi kuhusu mradi unao pendekezwa kwa mujibu wa sheria ya Usimamizi wa Mazingira

Mna karibishwa wote kwa huo mkutano

Cc: Chief, Hell's Gate Location

TANGAZO

MKUTANO WA WAKAAZI WA RAP LAND

Kampuni ya Kuzalisha Umeme Nchini Kenya (KenGen) ina furaha kualika wakaazi wa vijiji vya DCK, Kwa Muhia na Kamere kwa mkutano utakaofanyika:

Tarehe: 17/05/2018

Saa: Saa nne asubuhi (10.00 am)

Mahali: Soko la Kamere

Agenda ya mkutano huo ni ifuatayo:

i. Kufahamishwa mpango wa kusambaza umeme wa megawati 50 kwa viwanda vitakavyojengwa kwa ardhi ya kampuni ya KenGen
ii. Kupokea maoni ya wakaazi kuhusu mradi unao pendekezwa kwa mujibu wa sheria ya Usimamizi wa Mazingira

Mna karibishwa wote kwa huo mkutano

Cc: Chief, Hell's Gate Location

TANGAZO

MKUTANO WA WAKAAZI WA RAP LAND

Kampuni ya Kuzalisha Umeme Nchini Kenya (KenGen) ina furaha kualika wakaazi wa vijiji vya Narasha na Oloomayiana Kubwa kwa mkutano utakaofanyika:

Tarehe: 18/05/2018

Saa: Saa nne asubuhi (10.00 am)

Mahali: Oloomayiana Kubwa Baptist Church

Agenda ya mkutano huo ni ifuatayo:

i. Kufahamishwa mpango wa kusambaza umeme wa megawati 50 kwa kwa viwanda vitakavyojengwa kwa ardhi ya kampuni ya KenGen
ii. Kupokea maoni ya wakaazi kuhusu mradi unao pendekezwa kwa mujibu wa sheria ya Usimamizi wa Mazingira

Mna karibishwa wote kwa huo mkutano

Cc: Chief, Hell's Gate Location

ORKILIKUAI LE POOKING`AE

KINTAYIOLO POOKING`AE ENTUMO ENJURORRE ERAMATARE ENKULUPUONI OLOING`ANG`E E ENKAJI ENKIMA NAITAYU OSITIMA LE 50 MWe NAYIEUNI NEEISHOORI TE SILE AISHO INKAJIJIK NAASISHOREKI.

Egira KenGen aas enjurrore eramatare enkulupuoni oloing`ang`e enkaji enkima naitayu ositima le 50Mwe naishoori te sile metaasishoreki too nkajijik naitobirishoreki. Ore enkipirta ele kilikuai naa kintoomoni entumo epooking`ae enaa enalimuno tene tiabori:

EWUEJI ENTUMO: RAP Land Social Hall

INTARIKINI: 17th May, 2018

ESAA: Eiteru saa Ong`uan Entedekenya (1000 am)

Ore enkipirta ena tumo epooking`ae naa pee ebalie neitawang ilomon ooipirta ina sia (Project) nelimuni sii inkoitoi naiboorieki enking`ialata enkulupuoni oloing`ang`e.

Te Enkitasheikinoto:
GEOTHERMAL DEVELOPMENT DIRECTOR

ORKILIKUAI LE POOKING`AE

KINTAYIOLO POOKING`AE ENTUMO ENJURORRE ERAMATARE ENKULUPUONI OLOING`ANG`E E ENKAJI ENKIMA NAITAYU OSITIMA LE 50 MWe NAYIEUNI NEEISHOORI TE SILE AISHO INKAJIJIK NAASISHOREKI.

Egira KenGen aas enjurrore eramatare enkulupuoni oloing`ang`e enkaji enkima naitayu ositima le 50Mwe naishoori te sile metaasishoreki too nkajijik naitobirishoreki. Ore enkipirta ele kilikuai naa kintoomoni entumo epooking`ae enaa enalimuno tene tiabori:

EWUEJI ENTUMO: Kanisa e Baptist Oloomayiana Kubwa

INTARIKINI: 18th May, 2018

ESAA: Eiteru saa Ong`uan Entedekenya (1000 am)

Ore enkipirta ena tumo epooking`ae naa pee ebalie neitawang ilomon ooipirta ina sia (Project) nelimuni sii inkoitoi naiboorieki enking`ialata enkulupuoni oloing`ang`e.

Te Enkitasheikinoto:
GEOTHERMAL DEVELOPMENT DIRECTOR

APPENDIX 4: INVITATION LETTERS

Our Ref: GEO-816/PMM/kdt

14th May, 2018

To:

_____

_____

_____

_____

KenGen

Kenya Electricity Generating Company Ltd.

Olkaria Geothermal Project
P.O. Box 785-20117, Naivasha
Tel: 0711 036000, 0732 116000, 203666000

Dear Sir/Madam,

INVITATION TO KEY STAKEHOLDERS' CONSULTATIVE MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED OLKARIA WELLHEAD LEASING AND INDUSTRIAL PARK ELECTRICITY DISTRIBUTION NETWORK PROJECTS

KenGen intends to carry out Environmental and Social Impact Assessment (ESIA) Study for a proposed Olkaria wellhead leasing project and electricity distribution network for the proposed Olkaria Industrial Park, in accordance with the requirements of the Environmental Management and Coordination Act (1999).

As part of the ESIA study, KenGen has organized for a Stakeholders' Consultative Meeting that will be held on **Thursday 24th May, 2018** at the **KenGen Olkaria Social Hall** from **1000 hours.**

The purpose of the consultative meeting is to disclose information on the proposed projects including potential environmental impacts, and to seek input from the invited stakeholders on how the mitigation measures could be enhanced. The project briefs are attached for your reference.

We have identified you as one of the Stakeholders. You are therefore, invited to the stakeholders' consultative meeting on the said date and venue. In the event that you will not be available, please notify us in advance and/or email your written comments/suggestions by 22nd May, 2018. The contact person is Philip Barasa (**Mobile:** 0724455061 and **Email:** pbaraza@kengen.co.ke).

Yours faithfully,
For: **THE KENYA ELECTRICITY GENERATING COMPANY LIMITED**

Eng. **ABEL ROTICH**
GEOTHERMAL DEVELOPMENT DIRECTOR

Our Ref: GEO-816/PMM/kdt

KenGen

Kenya Electricity Generating Company Ltd.

Olkaria Geothermal Project
P.O. Box 785-20117, Naivasha
Tel: 0711 036000, 0732 116000,
203666000

May 14, 2018

The Deputy County Commissioner,
Naivasha Sub-County.

Dear Sir,

REQUEST FOR YOU TO CHAIR KEY STAKEHOLDERS' CONSULTATIVE MEETING ON ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED OLKARIA WELLHEAD LEASING AND INDUSTRIAL PARK ELECTRICITY DISTRIBUTION NETWORK PROJECTS

KenGen intends to carry out Environmental and Social Impact Assessment (ESIA) Study for a proposed Olkaria wellhead leasing project and electricity distribution network for the proposed Olkaria Industrial Park, in accordance with the requirements of the Environmental Management and Coordination Act (1999).

As part of the ESIA study, KenGen has organized for a Stakeholders' Consultative Meeting that will be held on **Thursday 24th May, 2018** at the **KenGen Olkaria Social Hall** from **1000 hours.**

The purpose of the consultative meeting is to disclose information on the proposed projects including potential environmental impacts, and to seek input from the invited stakeholders on how the mitigation measures could be enhanced. The project briefs are attached for your reference.

KenGen recognizes the pivotal role played by your office, and the support offered towards the successful implementation of KenGen's geothermal projects. The purpose of this letter, therefore, is to invite you to the ESIA consultative meeting, and further request that you chair the meeting.

We appreciate your support.

Yours faithfully,
For: **THE KENYA ELECTRICITY GENERATING COMPANY LIMITED**

Eng. **ABEL ROTICH**
GEOTHERMAL DEVELOPMENT DIRECTOR

APPENDIX 5: MINUTES OF PUBLIC BARAZAS & STAKEHOLDERS MEETING

PUBLIC PARTICIPATION FOR ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT FOR PROPOSED ELECTRICITY TRANSMISSION LINE TO INDUSTRIAL PARK HELD AT RAPLAND OPEN GROUND OPPOSITE COMMUNITY SOCIAL HALLON 17TH MAY, 2018 AT 1100HRS.

Members present

As per the attached attendance sheet

AGENDA:

1. Preliminaries
2. Presentation by KenGen
3. Plenary Session
4. Resolution
5. A.O.B

<table>
<tr><th>Min</th><th>Agenda</th><th>Discussions/Issues/Resolutions</th></tr>
<tr><td>1.</td><td>Preliminaries</td><td>The area Sub-Chief being the Chairperson called the meeting to order and the meeting commenced with a word of prayer from Mr. Peter Suyanga.
Mr. Philip Barasa introduced the KenGen employees who graced the occasion.
This was followed by a brief explanation from Kelly Tamakaro on the purpose of the Public Baraza.</td></tr>
<tr><td>2.</td><td>Presentation by KenGen</td><td>The KenGen ESIA team led by Philip Barasa, informed the meeting that the Environmental Management and Coordination Act (EMCA), 1999 requires that an Environmental and Social Impact Assessments (ESIA) should be carried out for all projects which may have environmental as well as social impacts.The reports are then submitted to National Environment Management Authority (NEMA) for review and decision making.

Public participation and consultation is an integral process in the exercise. The proposed Electricity transmission line project was presented to the community members with emphasis on the potential impacts and mitigation measures, as follows:
<table>
<tr><th>Nature of Impact</th><th>Description</th><th>Mitigation</th></tr>
<tr><td>Positive Impact</td><td>i. Increase of electricity supply to the grid.
ii. Job opportunities for the community
iii. Increased economic opportunities.
iv. Increased knowledge and skill among community members.
Corporate Responsibility-Being a “green project” community will earn through CDM projects</td><td></td></tr>
</table>
</td></tr>
</table>

		Negative Impact	i.	Air pollution- Increased dust during construction, speeding vehicles etc.	Avoid speeding of vehicles, lorries carrying construction material should be covered, watering of path ways during construction.
			ii.	Noise Pollution	Provision of proper personal protective equipment.
			iii.	Solid waste	Reduce, Reuse and recycle system to be adopted, use of appropriate license holder to dispose waste, waste segregation.
			iv.	High Voltage Lines	Use of pylons to avoid the high voltage coming to contact with people and animals.
			v.	Clearing of trees and vegetation	Minimal clearing of trees and vegetation, rehabilitation of affected sites/areas.
			vi.	Aesthetic interferences- coloration and design of steam pipes clash with surrounding environment	Usage of colors and designs that blend in with the environment.
			vii.	Welfare, safety and health of employees	Safety briefs to be conducted prior to commencement of contracts, daily tool box meetings to be conducted. The welfare of employees to be observed- provision of transport, health facilities.

3.	Plenary session	**NAME OF STAKEHOLDER**	**QUESTIONS/COMMENTS/CLARIFICATION**	**RESPONSE FROM KenGen ESIA TEAM**
		1. Tonou Kisotu	• Members will want the issue of employment addressed before the commencement of the project.	The liaison office will check on the issue to ensure that the community benefit.
		2. Tatiye Parkire	• The youth are not in support to the project as much as it is a good one. Most of their employment issues have not been addressed. • Youth might plan strikes if their demand is not met	
		3. Sosio Magadi Parkire-Oloosinyat	Requested that the chairpersons of the Stakeholder Coordination Committee (SCC) to involve the local community when selecting members for employment.	This was agreed that the Liaison office will check on this issue so as the whole community can benefit from the projects.
		4. Peter Suyanga	• The children within the community have been educated and therefore should be considered in the project as skilled workers. • The project is a good idea that will bring opportunities to the community as a whole.	The contractors within KenGen have had issues regarding employment but the problem has been addressed as is been handled together with the elected officials.
		5. Sururu Mwangi	• Does not accept the proposed project. Most of the projects within Olkaria have not given job opportunities to the community. • Economic opportunities that come with such projects are not available to the community	A bus was provided to the community but due to poor management it has not been utilized fully by the community
4.	Resolution	• Employ the skilled members of the community during and after the project. • The elected representatives should ensure that the new projects come with opportunities for members of the community.		
5.	A.O.B	• The community members were requested to plant trees in the area to maximize on the rains being experienced countrywide. • The area Sub-Chief warned against burning charcoal and anyone caught will be dealt with by the law.		

Signatures	The Chairperson thanked members for attending the meeting. There being no other business, the meeting adjourned at 1300 hrs. **Chairperson**. GODFREY N. CHEGE **Sign**.... G.N.CHEGE ASST CHIEF KAKAMEGA SUB CO. DATE **Date**. 29/5/2018 **KenGen Rep**. Gideon Kaile **Sign**..... **Date**. 29/05/2018

KENYA ELECTRICITY GENERATING COMPANY LIMITED

KenGen

PURPOSE: ESIA FOR THE PROPOSED WELLHEAD LEASING AND POWER SUPPLY LINE PROJECTS TO THE INDUSTRIAL PARK

CONVENER: CHIEF ENVIRONMNET MANAGEMENT OFFICER

VENUE: RAPLAND SOCIAL HALL(PUBLIC BARAZA)

DATE: 17/05/2018 TIME: 1000HRS

ATTENDANCE LOG SHEET

NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
1.	TURASHA KWENIA	21689472	OLOONONGOT	[signature]
2.	PETER SUYANGA	21688324	OLOONONGOT	[signature]
3.	Johnstone lelenguya	7026115	Cultral Center	lenso
4.	Sosio magadi Parkire	6852821	OLOSIANYFe	[signature]
5.	Sitoi Kisamiu	7096306	Olamaa	[signature]
6.	SENDERO OLEMARON	0438321	CULTURAL CENTRE	[signature]
7.	KITAGETI KISAINE	22855750	OLOOSINYAT	[signature]
8.	SADIRA SITATIA	20988588	OLOMAYIANA NDOGO	[signature]
9.	MPASOI NKAMASIA	8710387	OLOONONGOT	[signature]
10.	SAKAYIAN NKAMASIA	0199782	OLOONONGOT	[signature]
11.	David Kitai	30933494	Cultural center	[signature]
12.	TONOU KISOTU	6155954	OLOONONGOT	[signature]
13.	MPOYO PARTEYIE	21741710	OLOMAYIANA NDOGO	[signature]
14.	TINO NKAMASIA	9430261	OLOONONGOT	[signature]
15.	JEREMIA KIKAMON	5307047	OLOOSINYAT	[signature]
16.	ISAAC LOTULA	21222295	KAMPI TURKANA	[signature]

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NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
17.	PETER ESEKON	20213628	KAMPI TURKANA	[signature]
18.	PETER LOGIALAN	12972464	KAMPI TURKANA	[signature]
19.	DOMINIC LOYETE	24718540	KAMPI TURKANA	[signature]
20.	LOKURUSH LOKITOE	3647938	KAMPI TURKANA	[signature]
21.	EDUNG EKURU	5946988	KAMPI TURKANA	[signature]
22.	JOHN MUTHEE	8626339	KAMPI TURKANA	[signature]
23.	Paul Njoroge	30871028 ~~1028 3087~~	Kampi Turkana	[signature]
24.	Samwel Lokurani	1245 1415	Kampi Turkana	[signature]
25.	Daniel Leparingo	7965388	Kampi Turkana	[signature]
26.	SAMWEL NJUGUNA	7965389	KAMPI TURKANA	[signature]
27.	KISENTO SUYENGA	0723622653	OLOONONGOT	[signature]
28.	Moses Leparan	136539917	Lorropil ~~Kampi Turkana~~	[signature]
29.	Peter maina	25332623	LULU PIPI ~~Kampi T~~	[signature]
30.	JAMES LOTIAN	0791717959	KAMPI TURKANA	[signature]
31.	Mathew Kuduiye	34785021	Oloonongot	[signature]
32.	Wilson Kireu Nkarika	39929321	OLOONONGOT	[signature]
33.	JANE NAIRENYU	26371060	OLOOSINYAT	[signature]
34.	NAITUATI MEREU	29189118	OLOOSINYAT	[signature]
35.	TATIYE PARKIRE	21175465	OLOOSINYAT	[signature]
36.	KOIYIASI KARANI	32123286	OLOOSINYAT	[signature]
37.	DAMARIS NGAWASA	0725956698	KAMPI TURKANA	Damaris

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NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
38.	ANASTASIA LOKIDOR		KAMPI TURKANA	
39.	CHRISTINE EMANMAN		KAMPI TURKANA	
40.	TERESIA AKAMAIS		KAMPI TURKANA	
41.	ESTHER LEMPAYIA		KAMPI TURKANA	
42.	LYDIA LOKODOM		KAMPI TURKANA	
43.	GIDEON LENGOIBONI	13045219	LAMAYANA ndogo	
44.	NYERERE MURKUKU	8751689	OLOOSINYAT	
45.	Joseph GITHUKa	8576519	kambi turkana	
46.	Stephen Karuki	31776212	kambi turkana	
47.	ROBERT EKWAM	0611805	KAMPI TURKANA	
48.	DAVID ESEKON		KAMPITURKANA	
49.	Richard maina	28080876	KAMPITURKANA	
50.	JANE MURUMI	36118749	KAMPI TURKANA	
51.	JOSPHAT. EWOI	25335540	KAMBI-TURKANA	
52.	Edwards Gachagui	[illegible]	Kambi Turkana	
53.	Maina mungo	- -	Kambi Turkana	
54.	MARK AEMUN	34133681	KAMPI TURKANA	
55.	JOSEPH ABEI	25431210	KAMPI TURKANA	
56.	MWANGI	20586639	Olomayana Ndogo	
57.	MURESI NTIYA	22768953	CULTURAL CENTRE	
58.	BEATRICE WAINAINA	26681610	KAMA TURKANA	

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NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
59.	Ole Nkamasiai	27720989	Oloonongot	
60.	JAMES HASSAN	0913567	CULTURAL CENTRE	
61.	JOHN LOKADELI	0773672702	KAMPI TURKANA	
62.	NOMERA KAKIMON	11845463	OLOOSINYAT	
63.	ELIZABETH TONOU	27666942	OLOONONGOT	
64.	STEPHEN MANKUYO	8751680	OLOOSINYAT	
65.	MICHAEL GICHERU KIARIE	31629053	LULU PIRI	
66.	CORNELIUS NDETEI	21719941	EIA/EA LEAD EXPERT	
67.	PHILIP BARASA	21192463	EIA/EA LEAD EXPERT	
68.	GIDEON KALE	12911747	EIA/EA	
69.	Anita Mugiru	28436951	EIA/EA	
70.	Rolex A. Ranglangith	28335798	EIA/EA	
71.	TERESIA N. NJAU	31499426	EIA/EA	
72.	DAVID M. KAHORO	28049400	EIA/EA	
73.	Kuria Agness	29581967	EIA/EA KenGen	
74.	Kelly Tamalkan	11428531	KenGen	
75.	GODFREY N. CHEGE	2321544	ASS/CHIEF	
76.				
77.				
78.				
79.				

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THE MINUTES OF PUBLIC PARTICIPATION ON ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT FOR PROPOSED ELECTRICITY DISTRIBUTION LINE TO THE INDUSTRIAL PARK PROJECT HELD AT KAMERE MARKET ON 17TH MAY, 2018 AT 1404HRS.

Members present

As per the attached attendance sheet

AGENDA:

1. Preliminaries
2. Presentation by KenGen
3. Plenary Session
4. Resolution
5. A.O.B

<table>
<tr><th>Min</th><th>Agenda</th><th colspan="3">Discussions/Issues/Resolutions</th></tr>
<tr><td>1.</td><td>Preliminaries</td><td colspan="3">The meeting was called to order by the Local area Chief at 1404hrs followed by prayers from Dennis Wafula. The Local area Chief then welcomed everyone and thanked those in attendance. Kelly Tamakaro from KenGen was invited to give a brief overview of the projects and the purpose of the Public Baraza.</td></tr>
<tr><td>2.</td><td>Presentation by KenGen</td><td colspan="3">The KenGen ESIA team led by Mr Philip Barasa, informed the meeting that the Environmental Management and Coordination Act (EMCA), 1999 require that an Environmental and Social Impact Assessments (ESIA) must be carried out for all projects likely to have impacts on the environment. The report is then submitted to National Environment Management Authority (NEMA) for review and decision making.

Public participation and consultation is an integral process in the exercise. The proposed electricity distribution line project to the industrial park may cover approximately 7kms from the evacuation point. He further presented to the community members the likely potential impacts and mitigation measures, as follows:
<table>
<tr><th>Nature of Impact</th><th>Description</th><th>Mitigation</th></tr>
<tr><td>Positive Impact</td><td>i. Increase of electricity supply to the grid.
ii. Job opportunities for the community
iii. Increased economic opportunities.
iv. KenGen Corporate social Responsibility benefits
Being a “green energy project” the community will be able earn through Carbon Development</td><td></td></tr>
</table>
</td></tr>
</table>

			Mechanism (CDM) projects	
		Negative Impact	i. Air pollution due to increased dust during construction and speeding motorists etc.	Speed limits on the moving vehicles carrying construction material will be enforced and watering of path ways.
			ii. Noise Pollution	Provision of proper personal protective equipment.
			iii. Solid waste	Reduce, Reuse and recycle system to be adopted, use of appropriate license holder to dispose waste, waste segregation.
			iv. H_2S gas and brine	Regular monitoring of H_2S levels, fencing off and proper signage of potential source points of H_2S/ brine ponds, use of impervious material in brine ponds.
			v. Clearing of trees and vegetation	Minimal clearing of trees and vegetation, rehabilitation of affected sites/areas.
			vi. Aesthetic interferences-coloration and design of steam pipes clash with surrounding environment	Usage of colors and designs that blend in with the environment.
			vii. Welfare, safety and health of employees	Safety briefs to be conducted prior to commencement of contracts, daily tool box meetings to be conducted. The welfare of employees to be observed- provision of transport, health facilities.
3.	Plenary Session	**NAME OF STAKEHOLDER**	**QUESTIONS/COMMENTS/ CLARIFICATION**	**RESPONSE FROM KenGen ESIA TEAM**
		1. Mr. Caleb Kinne (Youth	• Low employment opportunities available for the youths. • Difficulties getting tenders from both	• KenGen assured the locals more job opportunities will come up when the industrial park project is commenced.

		Representative)	Kengen and the Contractors. • That KenGen supply the community with clean drinking water.	• Mr Philip explained a bit on the companies' procurement policy and encouraged the community to frequent the company website for tenders, with emphasis on women, youths and the disabled.
		2. Purity Nderi	• Raised an issue on getting scholarships for the orphans • Gender insensitivity when employing people whereby women are not so much considered. • Applauded KenGen for the few job opportunities they have given to the Kamere people and also requested them to improve.	• KenGen told the locals of how competitive the scholarship program is since few slots are available but also said they were in the process of trying to get more funding for the same.
		3. Mark Situma	• Accessibility to the liaison office was termed difficult to the locals • Request to offer permanent jobs to the locals.	• Liaison office said that they have never received an issue on the accessibility problem but promised to deal with the issue.
4.	Resolution	• By the show of hands, the local community gave the go ahead for the project. • The company to ensure that job opportunities is available to people leaving in Kamere during the project and after. • Women to be considered for job opportunities. • Individuals and groups interested in tenders to frequent the KenGen's website and ensure availing of all required documents.		
5.	A.O.B	• The locals complained about the poor sanitation in the Kamere Market • The community requested KenGen to assist them through roofing of their stalls thereby improving their working environment. • Thanks giving to KenGen for providing the community with tree seedling for planting as well as job opportunities given to the community in the previous projects. • They also mentioned that the next World Environmental Day will be held at Kamere and requested KenGen to offer them with a truck for collection and transportation of waste for disposal.		

		• KenGen asked the local leaders to follow protocol of making the request.
6.	Adjournment	The Chairperson thanked members for attending the meeting. There being no other business, the meeting adjourned at 1500Hrs.
Signatures		**Chairperson** GODFREY CHEGE **Sign**..... **Date** 29.15.12018 G.N.CHEGE ASST CHIEF OLKARIA **KenGen Rep** Gideon Kaile **Sign**..... **Date** 29/05/2018

KENYA ELECTRICITY GENERATING COMPANY LIMITED

KenGen

PURPOSE: ESIA FOR THE PROPOSED WELLHEAD LEASING AND POWER SUPPLY LINE PROJECTS TO THE INDUSTRIAL PARK

CONVENER: CHIEF ENVIRONMNET MANAGEMENT OFFICER

VENUE: KAMERE MARKET (PUBLIC BARAZA)

DATE: 17/05/2018 TIME: 1400HRS

ATTENDANCE LOG SHEET

NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
1.	BOSIRE KELVIN	29983715	KAMERE	[signature]
2.	NANCY BOSIBORI	25625746	KAMERE	[signature]
3.	DAMACKLINE BOSIBORI	27164392	KAMERE	[signature]
4.	FAITH WANCHIRA		DCK	X
5.	MARY KARUKA		KWA MUTHIA	X
6.	HANNAH MUMBI	22165106	KAMERE	[signature]
7.	JOHN NJENGA	24304402	Kamere	[signature]
8.	MARY NJOKI	11293852	Kamere	MN
9.	KAZONGO KAMBI	26799176	Kamere	[signature]
10.	DEBORAH KERUBO	31381666	KAMERE	[signature]
11.	Wycliffe Wenani	23028342	Kamere	[signature]
12.	JANE WAITHERA	20389200	Kamere	JW
13.	Stanley Ruto	24606629	Kamere	[signature]
14.	ARTHUR NGUGI MAINA	20327019	KAMERE	[signature]
15.	John Kamau	13438725	Kamere	[signature]
16.	KIARIE CALEB	32222884	KAMERE	[signature]

NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
17.	ALFRED LADYGAT	29771983	KAMERE	
18.	Sophia Anyoka	28185590	Kamere	
19.	Dennis Wekesa	30113784	Kamere	
20.	Dickens Ochieng	29762869	Kamere	
21.	Joseph Ontita	23576217	KAMERE	
22.	DANIEL NYAMARI	25669675	KAMERE	
23.	Benjamin	27666935	RAPLANDS	
24.	Stephen Njenga	25512851	Kamere	
25.	Jamerose Kwamboka	34306875	Kamere	
26.	GLADYS LUCIA	25254421	KAMERE	
27.	MELLEN KEMUNTO	21330633	KAMERE	Mellen
28.	KSHILLY KEMUNTO	25571526	KAMERE	
29.	IMELDAH KWAMBOKA	25054306	KAMERE	
30.	TABITHA WAMUGURU	30161605	KA MERE	
31.	SAMMY Wycliffe	30019989	KAMERE	
32.	Mary Wanjiru	0713098626	KAMERE	
33.	Jane Pher Nasiga	24263760	Kamere	
34.	ANNE NJAU	23527900	Kamere	
35.	SUSAN KAGURU	25981121	KAMERE	
36.	Elias Waswa	32155841	Kamere	
37.	BERNARD ONDIEKI	0727860104	KAMERE	

NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
38.	IRENE CHEPKORIWO	32222801	KAMERE	[signature]
39.	PATRICK TATICH	20820030	KAMERE	[signature]
40.	FIDELIS ONYANGO	36031283	KAMERE	[signature]
41.	DORCAS TORDITICH	28752967	KAMERE	[signature]
42.	Domitila Katilu	24228011	KAMERE	[signature]
43.	Purl Kimani	25679243	Mungai	[signature]
44.	Peter Aura	28965675	KAMERE	[signature]
45.	Pamela Mungai	2876613	Kamere	[signature]
46.	VIOLET AMOIT	29190396	Kamere	[signature]
47.	LOREN JUMA		KAMERE	[signature]
48.	Edewa Elud	23654959	KAMERE	[signature]
49.	DAMARIS NYABOKE	22972801	KAMERE	[signature]
50.	DORREN AUMA	9794180	KAMERE	[signature]
51.	Regina njeri	3137008 3	KAMERE	[signature]
52.	Gorrety Achieng	31663948	KAMERE	[signature]
53.	Catherine Jumwa	28281067	Kamere	[signature]
54.	NAOM KWAMBOKA	11555996	KAMERE	[signature]
55.	MARY ALWOCH		KAMERE	[signature]
56.	Alice Atieno	27816013	Kamere	[signature]
57.	ERICK KABUYEFU ZAKAYO	27682287	KAMERE	[signature]

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NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
58.	CHARLES KATIKO	9176008	KAMERE	
59.	COLLINS MBAYA	30521674	KAMERE	
60.	MERCY MUTHONI	22805817	KAMERE	
61.	LILLIAN NDIKU	13124475	KAMERE	
62.	Jane Wanjugu	24455332	Kamere	
63.	EPHRAIM NJOROGE	21068827	"	
64.	MARY WANGARI	24072930	"	
65.	Langat	33514875	"	
66.	KELVIN KIPLAGAT	072813059	"	
67.	David Odhiambo	D7928622	Kamere	
68.	MARGEN KINAMBA	D4029226/5	KAMERE	
69.	TRUSHLA ONDIEKI	11691323	KAMERE	
70.	Julius Mungai	26475677	KAMERE	
71.	DANIEL MURUTHI	0727126461	KAMERE	
72.	Joshua T. MAHARIA	0727425733 24371571	KAMERE	
73.	ERICK J WANYONYI	26265141	KAMERE	
74.	PURITY NDERI	7669429	KAMERE	
75.	MARK SITUMA	26776210	KAMERE	
76.	CORNELIUS NDETEI	21719941	EMIEA LEAD EXPERT	
77.	PHILIP BANSA	21192463	ELAPEA LEAD EXPERT	
78.	GIDEON KALE	12911747	ELAPEA	

NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
79.	Stanley Kitaikoy	27753773	KenGen	
80.	Rolex A. Rangitangyah	28335798	KenGen	
81.	TERESIA N. NJAU	31499426	Kengen.	
82.	DAVID M. KAHORO	28049408	KenGen	
83.	Kuria Agnesu	29581967	KenGen	
84.	Anita Mujira	28436951	Kengen	
85.	Kelly Tamalkan	11428531	KenGen	
86.	GODFREY N. CHEGE	2321844	ASS ICHIEF	
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MINUTES ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED ELECTRICITY TRANSMISSION LINE FOR INDUSTRIAL PARK AT OLOOMAYIANA KUBWA BAPTIST CHURCH HELD ON 18TH MAY, 2018- NAIVASHA SUB-COUNTY, NAKURU COUNTY

Members present

As per the attached attendance sheet

AGENDA:

1. Preliminaries
2. Presentation by KenGen
3. Plenary Session
4. Resolution
5. A.O.B

<table>
<tr><th>Min.</th><th>Agenda</th><th colspan="3">Discussions/Issues/Resolutions</th></tr>
<tr><td>1.</td><td>Preliminaries</td><td colspan="3">The meeting was called to order at 1103hrs with prayers from sitatia. The chairman Mr. Siloma then welcomed everybody in attendance and handed the meeting over to kenGen to brief the community on the importance of the meeting which was done by Mr. Kelly Tamakaro.</td></tr>
<tr><td>2.</td><td>Presentation by KenGen</td><td colspan="3">The KenGen ESIA team led by Mr Philip Barasa, informed the meeting that the Environmental Management and Coordination Act (EMCA), 1999 require that an Environmental and Social Impact Assessments (ESIA) must be carried out for all projects likely to have impacts on the environment. The report is then submitted to National Environment Management Authority (NEMA) for review and decision making.

Public participation and consultation is an integral process in the exercise. The proposed electricity distribution line project to the industrial park may cover approximately 7kms from the evacuation point. He further presented to the community members the likely potential impacts and mitigation measures, as follows:
<table>
<tr><th>Nature of Impact</th><th>Description</th><th>Mitigation</th></tr>
<tr><td>Positive Impact</td><td>i. Increase of electricity supply to the grid.
ii. Job opportunities for the community
iii. Increased economic opportunities.
iv. KenGen Corporate social Responsibility benefits
Being a “green energy project” the community will be able earn through Carbon Development</td><td></td></tr>
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			Mechanism (CDM) projects	
		Negative Impact	i. Air pollution due to increased dust during construction and speeding motorists etc.	Speed limits on the moving vehicles carrying construction material will be enforced and watering of path ways.
			ii. Noise Pollution	Provision of proper personal protective equipment.
			iii. Solid waste	Reduce, Reuse and recycle system to be adopted, use of appropriate license holder to dispose waste, waste segregation.
			iv. H_2S gas and brine	Regular monitoring of H_2S levels, fencing off and proper signage of potential source points of H_2S/ brine ponds, use of impervious material in brine ponds.
			v. Clearing of trees and vegetation	Minimal clearing of trees and vegetation, rehabilitation of affected sites/areas.
			vi. Aesthetic interferences-coloration and design of steam pipes clash with surrounding environment	Usage of colors and designs that blend in with the environment.
			vii. Welfare, safety and health of employees	Safety briefs to be conducted prior to commencement of contracts, daily tool box meetings to be conducted. The welfare of employees to be observed- provision of transport, health facilities.
3.	Plenary Session	**NAME OF STAKEHOLDER**	**QUESTIONS/COMMENTS/ CLARIFICATION**	**RESPONSE FROM KenGen ESIA TEAM**
		1. Nkararika Oitosi	-Lack of job opportunities for the local communities -The local community has no faith with the SCC so they want job opportunities to be presented	-KenGen advised the community to educate their children since with the coming industrial park,a lot of job opportunities will be available.

			to the locals and they can make a decision on who gets the slot. -The contractors should also bring social benefits to the communities.	
		2. Siloma Ken	-The powerlines should be high above to create enough space for animals to graze without any obstruction to prevent any electrocution accidents. -Gender insensitive-women are not equally considered when job opportunities come up. -The locals want to feel the direct positive impact of the projects to them and their children through job offers	-The increased job opportunities from the industrial park and the developments thereafter will benefit the community directly from different angles.
		3. Jecinta Akale	-No employment for both the women and the youths.	-All genders will be considered when opportunities arise.
		4. Youth representative	-The youths do not benefit from the projects and tenders that are available because those already existing do not favour the community.	-KenGen gave the youths the procedure of application for tenders and what is required for one to be a successful bidder.
		5. Matayo Kiraison	-The women have formed groups to help them get some of the tenders given to the contractors.	-The community was informed that the government has set upto 30% of the tenders to be given to youth and women groups.
4.	Resolution	• The local community gave the go ahead for the project. • The company to ensure that job opportunities is available to neighbouring people during the project and after. • Women to be considered for job opportunities. • Individuals and groups interested in tenders to frequently visit the KenGen's website and ensure availing of all required documents.		

5.	A.O.B	• The locals complained about the delay on the promise made by KenGen to construct them classrooms but Kengen informed the community that the project had already been approved only that the procurement process is a long one hence the delay. • The community made a request to KenGen to help a pregnant lady whose house got burnt and is due for birth in few weeks time. They were advised to write a proposal for assistance through liaison office to be considered by CSR. • The community also made a request for Kengen to supply the community with electricity and also supply them with trees for planting. • The community raised the issue of KenGen offering their children with jobs and later dismissing them. Kengen told the community that the few that had been relieved of their duties had been employed under contract basis and their work is currently being assessed by the human resource department to see if their contract can be renewed.
6.	Adjournment	The Chairperson thanked members for attending the meeting. There being no further business, the meeting was adjourned at 1310hrs.
Signatures		**Chairperson** GODFREY CHEGE **Sign**..... **Date** 29/5/2018 **KenGen Rep** Gideon Kaile **Sign**..... **Date** 29/05/2018

G.N. CHEGE
ASST CHIEF
OLKARIA - SUB LOC
DATE

KENYA ELECTRICITY GENERATING COMPANY LIMITED

PURPOSE: ESIA FOR THE PROPOSED WELLHEAD LEASING AND POWER SUPPLY LINE PROJECTS TO THE INDUSTRIAL PARK

CONVENER: CHIEF ENVIRONMNET MANAGEMENT OFFICER

VENUE: OLOOMAYIANA KUBWA BAPTIST CHURCH (PUBLIC BARAZA)

DATE: 18/05/2018 TIME: 1000HRS

ATTENDANCE LOG SHEET

NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
1.	Stanley Kirakon	27753773	KenGen	
2.	Dickson Saangonyo	24976970	Oloomayiana	
3.	Salash Tinke	0728744426	Oloomayiana	
4.	SILOMS KEN	34392790	Oloomayiana	
5.	Michael Parteyie	0721574059	Oloomayiana	
6.	EDWARD SANINGO	0706912784	OLOMATIANA	
7.	MIKE KIPENJU	0726764777	OLOMATIANA	
8.	DANIEL PARSAMPULA	0797575650	OLOMATIANA	
9.	ISAAC LESHISHI	0722166411	OLOMAYIANA	
10.	Adusa Parteyie	0728396244	OLOMAYIANA	
11.	Mataya Kwakon	0728383279	Oloomayiana	
12.	Charles Leina	0795905578	Oloomayiana	
13.	Daniel Kisanja	0725415863	Oloomayiana	
14.	Seko Mosiro	0790752495	Oloomayiana	
15.	Elik Kirakon	0791814358	Oloomayiana	
16.	Daniel Saangonyo.	0799611273	Oloomayiana	

NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
17.	NKARARIK OITOSI	0705666494	OLOMAYIANA	
18.	MANUEL Saitoti .. P.	0702433520	Olomayiana	
19.	Oloibon Parteyie	0704518606	Olomayiana	
20.	olenkushe kosoto	0704406290	Olomayiana	
21.	Mpaiyo Sendeo	070624026	Olomayiana	
22.	Lesiamo Kisoto	0722181656	Olomayiana	
23.	Tobiko Tangarei	0716783585	Olomayiana	
24.	Yiano lerefen	35018994	Olomayiana	
25.	Koitikir kaleke	0714816635	Olomayiana	
26.	Jonathan Topesa	0796358640	Olomayiana	
27.	Koisini Parteyie	0729012063	Olomayiana	
28.	Samwel Karani	0726302029	Olomayiana	
29.	Florence TANGARO	0726547148	Olomayiana	
30.	merumu ole Tangaro	0711697871	Olomayiana	
31.	Satana Tangaro	- -- -	Olomayiana	
32.	TENTERE KARSO	0712678413	OLOMAYIANA	
33.	NANCY parteyie	0726740126	Olomayiana	
34.	Mary parsanke	35620326	Olomayiana	
35.	Mary Akukun	0729828491	Olomayiana	
36.	Kinkiri Sendo	0727867011	Olomayiana	
37.	David LETIKOICH	0723978252	Olomayian	

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NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
38.	Jeremia Kuvaru	0705124199	Olomayiana	[signature]
39.	Laban Karani	0719404191	Olomayiana	[signature]
40.	OLEKOOL FRANCIS	072336137 5	Olomayiana	[signature]
41.	Kimutii Partejie	0712402081	Olomayiana	[signature]
42.	ELIJAH LESHISHI	0716689506	Olomayiana Kubwe	[signature]
43.	Joseph Kedienye	072959 3196	Olomayiana Kubwe	[signature]
44.	Andrew Tipape	0790636539	Olomayiana Kubwa	[signature]
45.	Siloma Hairetu	0721214434	Olomayiana Kubwa	[signature]
46.	Kelly Tamakaro	70360	Kenken	[signature]
47.	GODFREY N. CHEGE	0720280937	ASS. CHIEF	[signature]
48.	EMMANUEL K Sengeo	0721127485	Olomayiana	[signature]
49.	~~0790551689~~			
50.	Daudi Kisotu	0790551689	Olomayiana	[signature]
51.	John Lemayian Mosiro	0741473744	Olomayiana	[signature]
52.	Secunta AKALE	0792595926	Olomayiana	[signature]
53.	Anna Narumpe	072672637	Olomayiana	[signature]
54.	Lucy Akiru	0723085121	Olomayiana	[signature]
55.	Joseph Tamin	0721953184	Olomayiana	[signature]
56.	Jeremy Kisimia	0700750984	Olomayiana	[signature]
57.	Philip Barasa	21192463	EIA/AUDIT LEAD EXPERT	[signature]
58.	CORNELIUS NDETEI	21719941	EIA/AUDIT LEAD EXPERT	[signature]

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NO	NAME	ID NO/MOBILE NO	DESIGNATION/VILLAGE	SIGNATURE
59.	Anita Mugira	28B6951	KenGen	
60.	TERESIA N. NJAU	31499426	KENGEN	
61.	DAVID KAHORO	28049400	KenGen	
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MINUTES FOR THE STAKEHOLDERS' WORKSHOP ON ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE 132KV OVERHEAD ELECTRICITY TRANSMISSION LINE TO SUPPLY POWER TO THE PROPOSED KENGEN INDUSTRIAL PARK

Members present

As per the attached attendance sheet.

Agenda

i. Preliminaries
ii. ESIA process and finding
iii. Plenary session
iv. Resolution
v. Closing remarks
vi. A.O.B.

Min 1-24/05/2018: Preliminaries

The meeting was called into order at 11:44AM by Haron Kiraison followed by a word or prayer from Mama Peace and a safety brief from Philip Barasa.

Welcoming remarks from KenGen were given by Cyrus Karingithi. The proposed project was presented to the stakeholders. It was stated that KenGen's responsibility is to provide quality and affordable power to Kenyans and in the process it creates employment. KenGen is facilitating implementation of the Big four agenda by enabling provision of sufficient electricity to power projects. In addition, KenGen is planning to develop an industrial park which will create over 100,000 jobs. The proposed project will have a major impact to the economy when implemented and rolled out. KenGen is therefore following the due process in accordance with EMCA CAP 387 in conducting ESIA studies which includes stakeholder consultations. KenGen welcomed stakeholders to give views on the proposed project ESIA and offer suggestions for improvement.

Remarks from NEMA were presented by Jessica. The government's big 4 are anchored in environment. The objectives of the plan will not be achieved if the environment and natural resources are not management well to ensure sustainability. Stakeholders were urged to make the session interactive, criticize and provide suggestions that will enable KenGen build a process that will ensure protection and enhancement of the environment.

Naivasha Sub-County Deputy County Commissioner (DCC) welcomed all the stakeholders to the ESIA consultative forum. He stated that KenGen is a pillar in running the Kenyan's economy since they produce about 75% of the power consumed in Kenya. He stated that the forum shouldn't only focus on critiquing the ESIA report and the project but to provide valuable feedback to enable improve the report and build up a good strategy to enhance the environment. He requested the stakeholders to exhaust all concerns at the meeting so that they can addressed.

Min 2-24/05/2018: ESIA process and finding

The overview project and ESIA finding were presented by the ESIA team. It was explained that the objective the stakeholders' participation is to disclose the ESIA findings and have a forum of questions, clarifications and suggestions to improve the report. The report will be a public document once submitted to NEMA to allow public to submit their comments.

Min 3-24/05/2018: Plenary session

Stakeholder	Question/comment/suggestion	Response from KenGen/ESIA team
Kamere Community Environment committee	Appreciated KenGen for the support they have been offering. We ask for support when we are advocating for peace to ensure that the project is sustainable.	KenGen will continue supporting its stakeholders in accordance with the laid procedures
	Consider including community in the project implementation (especially the communities next to the project such as OlomayanaKubwa among others)	Stakeholder Coordination Committee is in existence to represent stakeholders in decision making process.
KWS	How wide and long is the buffer zone at the industrial park?	a. There will be another ESIA specifically for the industrial park where we will engage all stakeholders again. The current scope of work is 132KV overhead transmission line to the industrial park.
	Is the exact location of the industrial	There were three alternatives. The

	park known?	map which has been presented shows the best alternative chosen
	When is the industrial park going to be commissioned?	We are in the process of sourcing a project manager to spearhead the development the park.
Lake Naivasha basin user association	Explore harvesting and storage of water to reduce dependency on Lake Naivasha.	We will include that suggestion in our plan when establishing the industrial park.
	How are you mitigating on the effects on wild life dispersal areas?	We have considered constructing the transmission line outside the park. We will also use existing road wayleaves.
	What is the length and width of the transmission line?	The transmission line is approximately 7KM with a width wayleave of 70M.
WARMA	How will you reduce the effect of increased population on pressure on water resources?	We will plan to harvest rain water to supplement abstraction of lake water.
	How do you plan to mitigate pollution of the water resources especially Lake Naivasha?	A feasibility study on underground water resources will be carried out at the industrial park to see if water will be found on shallow wells.
Livestock department	With the increase of population and how will you mitigate transmission and infection of zoonotic diseases?	a. We will include veterinary personnel in our planning to map diseases and ensure management of these diseases both in animals and humans.
NEMA	How will you mitigate greenhouse gases and greenhouse effect?	We will service our fleet of vehicles on time. We also have tree nurseries where we issue tree seedlings to communities to offset the CO2 in the atmosphere.
	When planning waste disposal	All the categories will be indicated in

	consider listing all the categories of wastes and how each category will be managed.	the main report.
	Consider including noise pollution mitigation plans on animals apart from human beings.	A buffer zone will be developed in the industrial park to reduce effects of human activities on wild life.
Chief	What is the new idea that KenGen is employing to managed the influx of population to reduce pressure on social amenities such as health centers?	In the plan of the industrial park, health facilities have been included.
	What methods are KenGen using to reduce falling of power poles to minimize accidents?	There has never been any cases of falling of high voltage transmission towers. Kenya Power is however, handling the falling of power distribution lines.
Kedong' Ranch	Is the transmission line passing through land other than KenGens'	The tentative route that we have does not pass through the park. It passes through KenGen's land. However, in case of changes, we will communicate with the affected persons.
Ochieng – KWS	Suppose the proposed Energy Act does not pass which opens electricity transmission and distribution to other parties, what alternatives do you have?	If the bill does not pass, we will revert to the existing one buyer model. We will thereafter import power from the grid (Kenya Power and KETRACO) instead of supplying directly to the Industrial Park from our wellheads. We will then transfer the EIA license to the transmitting party.
Makau	I have not seen project alternatives for the electricity transmission to the industrial park. Was it considered in	We have discussed several alternatives in our preliminary report (route and technology). We did not

	the study?	include it in this presentation because of time.
	I have not seen measures put in place to mitigate vibrations during construction?	We have included it in our draft report measures to mitigate effects of excessive vibrations.
Solomon Ndung'u	Consider adding a standby ambulance to handled occupational accidents instead of first aid kits only.	That is an important addition. We will consider as we consult our management.
KPLC	Your aim is to supply cheap stable power to the industrial park. Clarify if you will also be connecting power from the grid which will not meet the objective of cheap power.	We will import power from the grid if the Energy bill is not passed. We will also connect to the grid to make the system stable. In case of our main power supply system fails, we will have a second or a third back up from the grid.

Min 4-24/05/2018: Resolution

The project was supported by the stakeholders. It was however requested that the ESIA team incorporates comments from the stakeholders in the ESIA report and EMPs.

Min 5-24/05/2018: Closing remarks

1. **From the DCC**

The DCC appreciated the presenters, ESIA team and the stakeholders for their great input. He stated that the project has started on a good note since it has been supported by the stakeholders and local communities. He asked the ESIA team to incorporate all issues raised even if they are outside the scope of KenGen so that it can be addressed by other agencies. He requested KenGen to work closely with KWS when drafting the lease agreement with the wellhead developer.

2. **From KenGen**

KenGen representative appreciated the DCC for the good moderation and the stakeholders form heeding the call for the stakeholders' consultation. He assured that the issues which were raised will be incorporated in the report and develop appropriate action plan. He stated that KenGen will use the guidelines in the PPP Act in developing the lease agreements with the developer. He noted that the issue of security was not explicitly addressed by the ESIA team and urged them to incorporate the issue.

3. **Vote of thanks**

Vote of thanks were given by Kelly Tamakaro.

Min 6-24/05/2018: A.O.B

i. Ministry of Livestock Naivasha Sub-County stated that there is an alert of Rift Valley Fever. Look out for the following symptoms. Massive aborting in goats and sheep, tears in cows and high fever in humans which lasts for more than 2 days.

ii. KWS representative requested to know the entry of the industrial park after commissioning. It was stated that the entry will be through Suswa and not through the Park.

iii. Kamere Community Environment committee urged KenGen give priority to local community member for employment opportunities for both skilled and unskilled labour. The representative also stated that World Environment Day will be held in in Kamere on June 5, 2018 and urged KenGen for their support when called upon.

iv. KenGen and the DCC advised local leaders to advice local community members to pursue technical and market driven courses from TVETs such as masonry, welding and machine operations among others to easily access job opportunities in the energy sector especially in Olkaria business area.

v. Since there was no other business, the meeting was adjourned at 3:30PM.

Chairperson.....Jim Njoka.....**Sign**.....**Date**.....21.5.18.....

KenGen Rep .....Gideon Kaile.....**Sign**.....**Date**.....31/05/2018

DEPUTY COUNTY COMMISSIONER
P. O. BOX 11 - 20117
NAIVASHA

KenGen

STAKEHOLDERS' WORKSHOP ON ESIA STUDIES FOR THE PROPOSED 50MW WELLHEAD LEASING PROJECT AND 132 KV OVERHEAD ELECTRICITY TRANSMISSION LINE TO SUPPLY POWER TO THE KENGEN INDUSTRIAL PARK AT OLKARIA GEOTHERMAL FIELD IN NAIVASHA SUB-COUNTY, NAKURU COUNTY

DATE: 24TH MAY, 2018 TIME: 1000 HOURS VENUE: KENGEN OLKARIA SOCIAL HALL

ATTENDANCE LOG SHEET

	NAME	ID NO.	DESIGNATION	INSTITUTION	MOBILE NO.	SIGNATURE
1.	AMOS OTIENO	6469737	MANAGER	KEDONG RANCH	0722639333	[signature]
2.	WAITHAKA EDNA	12440793	RAS / CO-ORDINATOR	KMFRI	0721206913	[signature]
3.	KENNEDY OCHIENG	25968797	WATER RESOURCES DATA O.	WRA	0724967266	[signature]
4.	ALICE MUTIE	23165016	RESEARCHER	KMFRI	0721764162	[signature]
5.	Rotich Ben	11329791	RESEARCH (DRIVER)	KMFRI	0721929357	[signature]
6.	ENOCK S KIMINTA	22189599	CHAIRMAN	LANABWRUA	0720125948	[signature]
7.	ELIJAH CHEGE	23243736	General Manager.	LNRA	0729834870	[signature]
8.	Francis M. Mwaura	2305833	CLPO	Livestock	0722362214	[signature]
9.	Miriam Nekeel	6209716	SCVO	Veterinary	0723535170	[signature]
10.	HUSSEN J. GUYO	10153767	CHIEF ~~[illegible]~~	OOP	0702011360	[signature]
11.	JESSICAH KAHURA	25271078	~~NEMA~~ E.O	NEMA	0726495772	[signature]

	NAME	ID NO.	DESIGNATION	INSTITUTION	MOBILE NO.	SIGNATURE
12.	DAVID MANYARA	22043708	ENV. SCIENTIST	GDC	0720 6[illegible]	[signature]
13.	HARUN KGUMBAT	11616549	Eng.	Orpower	0705060737	[signature]
14.	PURITY ANDERI	7669029	Romen environmental	KAMERE	0727-242-984	[signature]
15.	CALVINS OCHIENG	23435476	OCS Olkaria Police	Kenya Police	0724515615	[signature] IP
16.	SITATIA VANDERA	20988588	RAPLAND REP.	RAPLAND.	0718407789	[signature]
17.	MARTIN OCHIENG	4438583	Geology Tech	KenGen	0721868062	[signature]
18.	Stephen Ngamp'a	21745326	I/c Olkaria Disp.	Rapland	0723806868	[signature]
19.	CORNELIUS NDETE	21719941	LEAD EIA/LEAD EXPERT	KenGen	0721389[illegible]	[signature]
20.	PHILIP J. ITBARASA	21192463	LEAD EIA/EIA EXPERT	KenGen	0724[illegible]061	[signature]
21.	TERESIA NTOKABI NJAU	31499426	INTERN	KENGEN	0703799292	[signature]
22.	VALENTINE KAPKOYO	27188628	Olkaria Police	Police	0710 [illegible]	[signature]
23.	GIDEON KAILE	12911747	ESIA TEAM MEMBER	KenGen	0728659985	[signature]
24.	GODFREY N. CHEGE	2321544	ASS/CHIEF/OLKARIA	O.D.P	0720280937	[signature]
25.	Susan Taptamei	22920529	Senior Education Officer	Elsonen	0721481469	[signature]
26.	JOHANNES OCHOMA	22479509	ESIA TEAM MEMBER	KENGEN	0724464808	[signature]
27.	PETER MUTURI	20758843	MIN OF LIVESTOCK	NAIVASHA	0717430344	[signature]

	NAME	ID NO.	DESIGNATION	INSTITUTION	MOBILE NO.	SIGNATURE
28.	TIMOTHY IKIME	22289544	ARS	KWS	0733-596931	[signature]
29.	NELSON CHEBUTOT	22865889	PW	KWS	0729162970	[signature]
30.	Felister Chelimo	21247108	CSO	KWS	0729933932	[signature]
31.	MALETO JOEL	22236815	DRIVER	KWS	0723492896	[signature]
32.	JOHN K. KANGETHE	9257658	HT OLKARIA PRI	OLKARIA PRI	0721350228	[signature]
33.	CHARLES M. MAGATI	14578935	DHT OLKARIA	OLKARIA PR	0711335305	[signature]
34.	Solomon Ndungu	10934256	P.H.O.	M. O. H.	0721967197	[signature]
35.	KIPKEMOI KIBIAS	21443274	COUNTY MANAGER K.P.L.C	K.P.L.C	0722424491	[signature]
36.	DOUGLAS GICHANDI	26551433	Env. Officer	Kenken	0714794207	[signature]
37.	Cyrus Kariithi	7038314	AWRD	Kenken	0722597434	[signature]
38.	HOSEA TALLAM	21924608	DCC - Driver	Office of D.CC.	0715273437	[signature]
39.	Clarence Macau	27557759	Personnel Officer	Imarisha	0729967577	[signature]
40.	Hadian Wangari	23951511	MRE Officer	Imarisha	0720584756	[signature]
41.	KIZITO M. OPONDO	9182376	CRADO	Kenken	0727938515	[signature]
42.	DAVID M KAHORO	28049400	Env. Intern	KenGen	0720563327	[signature]
43.	NAOM KWAMBOKA	11555996	KAMERE ENV. REP.	KAMERE	0711260404	[signature]

	NAME	ID NO.	DESIGNATION	INSTITUTION	MOBILE NO.	SIGNATURE
44.	Kelly Tamakan	11492854	CLO	KenGen	0726029366	
45.	Hebron Kiraijo	12652642	CLO	KenGen	0721612053	
46.	EPHRAIM NJOROGE	21068827	Human Env Rep.	KenGen	0729512385	
47.	Jim Njoka	3515082	DCC	Interior	0720651158	
48.	Florence Chebet	21558901	Driver	NEMA	0725772207	
49.	Sanya S. Charles	32508275	NEMA INTERN	"	0729912603	
50.	Anita Muyira	28426951	Kengen - Intern	Kengen	0729332745	
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APPENDIX 6: LEAD EIA EXPERT'S LICENSE

FORM 7 (r.15(2))

mazingira yetu | uhai wetu | wajibu wetu

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/7285

Application Reference No: NEMA/EIA/EL/10273

M/S **PHILIP JUMA BARASA**
(individual or firm) of address

P.O. Box 103532-00101, Nairobi

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**

registration number **1857**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **2/20/2018**

Expiry Date: **12/31/2018**

Signature.....

(Seal)
Director General
The National Environment Management Authority

P.T.O.

ISO 9001: 2008 Certified