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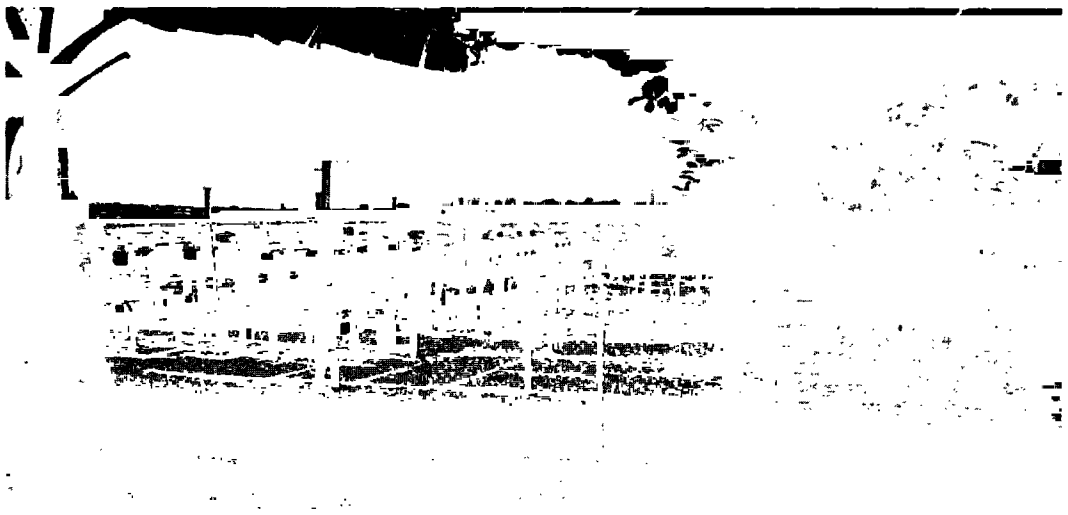
UGANDA ELECTRICITY TRANSMISSION COMPANY LIMITED



ENVIRONMENTAL IMPACT STATEMENT

FINAL REPORT

FOR THE

PROPOSED MUTUNDWE THERMAL-POWER PLANT

SUBMITTED BY

EMA CONSULT LTD

MARCH 2006

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Acknowledgements

The Environmental Impact Assessment Team for the proposed construction of Mutundwe emergency thermal-power plant would like to express its sincere gratitude to all those who made the study a success. Special thanks go to the numerous people that were consulted in Rubaga Division and at the project site. Particular mention must be made of Mr. Andrew Omalla Geno and Mr. John Othieno of Uganda Electricity Transmission Company Limited (UETCL). Finally, the EIA Team remains indebted to Local Council (LC) officials who assisted in mobilising the community for consultation meetings.

However, while acknowledging the contributions and support received during the course of the study, the EIA Team assumes full responsibility for any omissions and errors contained in this Environmental Impact Statement Report.

Abbreviations and Acronyms

AIDS	Acquired Immune Deficiency Syndrome
CAO	Chief Administrative Officer
CO_2	Carbon dioxide
CO	Carbon monoxide
DEO	District Environment Officer
DWD	Directorate of Water Development
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Associates
EMP	Environmental Monitoring Plan
ESIA	Environmental and Social Impact Assessment
ERA	Electricity Regulatory Authority
ERT	Energy for Rural Transformation
GHGs	Green House Gases
GoU	Government of Uganda
HIV	Human Immuno – Deficiency Virus
HFO	Heavy Fuel Oil
IDA	The International Development Association
KV	Kilovolt
LC	Local Council
MW	Megawatt
MWh	Megawatt – hour
NEMA	National Environment Management Authority
NEMP	National Environment Management Policy
NGO	Non-Governmental Organization
NO_2	Nitrogen dioxide
PM_{10}	Particulate Matter$_{10}$
SO_2	Sulphur dioxide
TSP	Total Suspended Particulates
ToR	Terms of Reference
UETCL	Uganda Electricity Transmission Company Ltd
VOCs	Volatile Organic Compounds
WB	World Bank

Executive Summary

Background

Uganda Electricity Transmission Company Limited is proposing to construct a 50 MW thermo-power plant near the existing 132 kV electricity substation at Mutundwe in order to meet the increasing powx er demand in the country. The Company intends to acquire 1 acre of land located to the south of existing substation from one land owner that is willing to sell. The 1 acre piece of land was assessed by the EIA Team to be environmentally feasible for the construction of the 50 MW thermal power plant.

Uganda Electricity Transmission Company Limited is proposing to construct a 50 MW thermo-power plant adjacent to the existing 132/33 kV sub-station at Mutundwe in order to meet the increasing power demand in Kampala. The power company intends to purchase additional 1-acre piece of land located to the south of the existing substation for the proposed thermo-power plant.

This Environmental Impact Assessment (EIA) is to provide information on the potential negative and positive environmental and social impacts of the project. It also aims to make recommendations for the mitigation of the potential negative impacts and enhancement of the positive ones. A field survey of the project site was conducted and potential environmental impacts of project activities were identified, assessed, and documented. The EIA Team carried out consultations with various stakeholders, particularly lead agencies, local authorities and the affected people.

Both the Ugandan and World Bank's social safeguard policies were applied during the assessment.

Project Description

The Mutundwe Thermal Power Project will comprise 50 MW auto Engine-Driven power plant that will be constructed near the existing Mutundwe electric power substaion. The recommended site, which will involve acquiring new land belonging to one land lady located to the south of the substation. The site is already classified as residential but retail business activities exist. Construction is expected to begin by the middle of 2006.

The Engine driven diesel power plant will be powered with either diesel (i.e., Light Fuel Oil) or Heavy Fuel Oil (HFO) with sulphur content of 1.9% or lower that will be supplied through pipes from storage tanks to be constructed on the site. Details of the specific type of the engine-driven generators are not yet available. The power generated by the plant will be fed into the existing grid at the Mutundwe substation.

Project Setting

According to UETCL the detailed specifications of the 50MW thermo-power plant, which might influence the exact installation of the facility including its associated infrastructure is not yet available pending a tendering process. The additional 1 acre of land is private *Mailo* land located at Kitaluuzi zone in Mutundwe Parish, Rubaga division. The land can be identified as Block 32, Plot 1023, Kyadondo in Kampala District and covers an area of 1 acre. The land belongs to one elderly woman who is willing to sell to UETCL.

Project Impacts

The potential ecological impacts identified in the construction of the power plant are: (i) wastes that will be generated by the thermal power plant, (i) change of land use, (ii) soil erosion, (iii) dust, emissions and noise pollution and (iv) possibility of water pollution from oil spills. Numerous designs of engine-driven generators exist but the best alternative, in terms fuel consumption, emission and noise levels has been recommended by the EIA Team.

Nonetheless, no matter how best the generator type is in terms of fuel consumption, emission and noise pollution, the project is still likely to create some social impacts like population influx as a large number of people is expected to move into the area in search for employment. There is a likelihood of social disruption, spread of diseases, particularly HIV/AIDS, and traffic accidents due to increased vehicular movements. On the other hand, positive impacts will come in the form of increased employment opportunities to the youth in the area, particularly during the construction phase. Also local women in the area are likely to benefit from petty trade. In regard to the positive impact, there will be a boost in electricity supply that will ultimately lead to the following: a reduction in deforestation due to limited use of fuelwood; enhanced industrialization, commercialisation, education and research.

Recommendations

A number of mitigation measures are recommended against the adverse activities during the construction and operation phases of the project. Measures recommended during the construction phase include watering of area during surface soil removal, putting in place speed limits for truck drivers, control of soil erosion, sensitising workers on HIV/AIDS, ensuring workers safety, and proper management of oil spills and litter. While during the operation phase, emphasis has been on the control of emission levels, noise (particularly for the workers), stringent and proper management of oil spills, precaution against fire accidents and electrocution and the periodic monitoring of noise and emission levels and drinking water quality.

From the study findings, the study team concludes that the impacts of the proposed project are minor and easily mitigable. The developer is strongly advised to implement the recommendations made by the EIA Team.

1.0 INTRODUCTION

1.1 Background

In Uganda, power demand is increasing at 8% due to economic growth, leading to constant load shedding (Electricity Regulatory Authority (ERA, 2006). Electricity demand has continued to grow at 24 MW per year without substantial new generation capacity. Currently, the electricity supply is insufficient. This is evident as electricity demand in the evening is about 350 MW yet the country generates only 250 MW, leaving a shortage of 125 MW during the evening hours. On the other hand, during the day the demand is almost 300 MW presenting a power deficit of 70 MW. According to ERA, the prolonged drought, which has led to a sharp drop in the water level of Lake Victoria, has worsened the electricity generation situation.

Power generation at both the Nalubale and Kiira hydropower stations has been insufficient. To alleviate the power shortfall, UETCL with support from IDA (International Development Association), is planning to construct a 50 MW thermo-power plant in Mutudwe near the UETCL substation in the same area.

It is not until the publication of the World Comission report, *Our Common Future*, on Environment and Development (WCED, 1987) that the concept of sustainable development, which integrates all dimensions of the environment in all development efforts, took a centre stage globally. Consequently, the greening of development efforts throughout the last decade until now has made the integration of environmental and social concerns mandatory (World Bank, 1991 a, b, c & Lohani *et al.*, 1997 a,b.). An important means of such integration is the application of an EIA.

Why EIA?

An EIA is a process that provides decision-makers with likely consequences of development actions consequently assisting them in making environmentally and socially sound and sustainable choices among a range of development options. The EIA process has the potential to improve transparency and strengthen participatory planning by involving the public in decision-making process thereby making development efforts more acceptable and successful.

In Uganda, the *National Environment Statute*, Section 4 of 1995 requires that before such a project like that of the thermal power plant is implemented, an Environmental and Social Impact Assessment (ESIA) has to be conducted. The assessment should be conducted early in the project cycle in order to establish baseline data from which the monitoring and

management plan can be drawn . It is against this background that Ema Consult Limited was contracted to do an ESIA for the planned thermal-power project. The findings from the study have been compiled into this Environmental Impact Statement (EIS) report.

1.1 The EIA Report

This report is an Environmental Impact Assessment (EIA) for the construction of a thermal-power plant. The project will require an additional 1 acre of land. Uganda Electricity Transmission Company Ltd has already identified the land from an elderly woman is has expressed willingness to sell. The site is located 0.2 Km from Nalukolongo and about 5 Km west of Kampala City. The report presents the physical, biological and socio-cultural conditions, potential positive and negative environmental impacts of the proposed project and gives recommendations for mitigating the negative impacts together with a monitoring plan to ensure compliance.

The recent greening of development efforts has made the integration of environmental and social concerns mandatory (World Bank 1991 a, b, c & Lohani *et al.* 1997 a,b.). An important means of such integration is the application of an EIA.

Structure of the report

This report discusses potential environmental and social impacts related to the construction of an electrical infrastructure of a 50 MW capacity that has been proposed to use (HFO) as fuel for operation. The generators will be constructed adjacent to the existing 132/33 kV substation at Mutundwe, Rubaga Division, Kampala District.

The structure and format of the Report is in line with both local and international guidelines (NEMA EIA guidelines, and World Bank Source Book) for the structure of an EIS.

The main sections are as outlined:

Executive Summary: Gives an abstract of the major findings that includes the likely project impacts, measures to mitigate them and suggested recommendations.

Chapter 1: This chapter describes the EIA report, which includes the project background and the methodology used.

Chapter 2: Presents the legal and institutional framework concerns of the power project.

Chapter 3: Gives the project description.

Chapter 4: Presents the environmental baseline data.

Chapter 5: Identifies potential environmental impacts

Chapter 6: Is a presentation of mitigation measures.

Chapter 7: The chapter gives an analysis of alternatives.

Chapter 8: Is a presentation of the Environmental Management and Monitoring Plan.

Chapter 9: This chapter presents the conclusions drawn and recommendations made by the EIA Team.

Chapter 10: Is a presentation of public consultations.

Appendices: Six appendices have been attached to this Report and these include:

1. List of references.
2. List of birds seen in the area.
3. List of plants recorded near Project site.
4. List of persons met.
5. Terms of Reference.
6. A map showing Project area.

1.3 General Objectives of the Study

The general objective of the study is to assess the potential environmental and social impacts (positive and negative) of the proposed thermal-power plant and how to mitigate negative impacts in compliance with NEMA and World Bank Safeguard Policies.

1.3.1 Specific Objectives of the Study

Outlined below, are the specific objectives for the EIS for the proposed 50 MW Kiira thermal-power plant:

- establish an appropriate baseline for environmental, social, health and safety issues. Establish among others a baseline for air quality and noise levels and assess impacts of air pollution and noise in the project area and develop a simple air quality monitoring program;
- establish an inventory of GHGs and abatement plan;
- prepare an oil spill emergency plan;
- identify environmental, health (e.g. HIV/AIDS) and safety impacts of the new investments during construction and operational phases;
- prepare analysis of alternatives, e.g. various sites for new thermal-power plant, including the "no project" alternative. The selected site should take into account economic, technical, social and environmental parameters;
- identify any hazardous materials used during construction and operation;
- develop draft environmental regulations for the electricity sector (if not existing), including *inter alia*, the monitoring and mitigation of emissions (e.g. air), noise as well as soil and groundwater hydrocarbon contamination. The new facilities need to comply with existing Ugandan legislation and with World Bank Safeguard Policies and Guidelines (Environmental and Safety Guidelines);
- provide an institutional strengthening plan, prepare an Environmental Monitoring and Management Plan (EMP), identify responsibilities and costs for its implementation; and

- carry out a public consultation on the draft Environmental Assessment with affected people, interested people and local NGOs. The public consultation should be a separate chapter in the EA report, while minutes of the public consultation meetings need to be presented in an annex (when were meetings held, who attended, major concerns, how addressed in documentation, etc.).

1.4 The EIA Team

The EIA was carried out by a team of consultants as given below:

Dr. Yakobo Moyini – Team Leader.....

Dr. Natal Ayiga – Sociologist .....

Mr. Luka Agwe – Socio economist (Study Coordinator).....

Mr. Isaiah Owiunzi – Ecologist .....

1.5 Methodology

Three main methods were used by the EIA Team in formulating this report and these include:

- literature review of thermal power documents, UETCL reports, and relevant information about the project;
- site visit to the proposed project area (including the project sites, access roads and the area surrounding the project sites); and
- consultations with district officials, local leaders and the community who will potentially be affected by the project implementation.

2.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Policies

This chapter discusses the policy, legal and institutional arrangement/ framework within which this EIS was drawn. National/local and international environmental safeguard requirements and guidelines are discussed along with relevant international environmental agreements and conventions.

2.1.2 National Environment Management Policy

The *National Environment Management Policy* (NEMP) was adopted by Cabinet in 1994. Its overall goal is the promotion of sustainable economic and social development that enhances environmental quality. One of the strategies identified to achieve this goal is Environmental Impact Assessment. The policy clearly states that an Environmental Assessment should be conducted for any project that is likely to have potential adverse impacts on the socio-economic, cultural, physical and biological environment. This statement is further embedded in the *National Environment Statute* No. 4 of 1995 which makes EIA a legal requirement for eligible projects, policies and programmes.

2.2 Legal and Regulatory Framework

The relevant laws that promote environmental management in Uganda have been adequately reviewed and applied by the EIA Team including the following:

2.2.1 The Constitution of the Republic of Uganda 1995

The Constitution is that the supreme law of the country provides the legal and regulatory framework for Uganda on all aspects pertaining to environment management in order to ensure sustainable development. Environmental legislation and the regulatory framework are provided for in the *National Environment Act.*

2.2.2 National Environment Act and Regulations

The *National Environment Act, 1995* (GoU, 1995a) provides tools for environmental management that includes the conducting of EIAs. The *Act* imposes a mandatory duty on a project developer such as UETCL to have an EIA conducted before implementing a project like this under study.

The EIA Regulations, 1998 specifies the types of projects to be subjected to EIAs. An EIA should be conducted for planned activities that may, are likely to, or will have significant adverse impacts on the environment. The EIA required should be appropriate to the scale and possible effects of the project, and therefore the *National Environment Act* and the Regulations recognise three levels of EIA:

- an environment impact review shall be required for small scale activities that *may* have significant impact;
- environmental impact evaluation for activities that are likely to have significant impacts; and
- environmental impact study for activities that will have significant impacts.

The third and last requirement of the National Environment Statute 1995 and EIA Regulations 1998 applies to the Mutundwe thermal-power project.

2.2.3 Water Act

The *Water Act, 1995* (GoU 1995b) provides for the use, protection and management of water resources and supply. The objectives of the *Act* are to promote the national management and use of water resources of Uganda through the introduction and application of standards and techniques, the coordination of all public and private activities that may influence water quality and quantity and to allow for the orderly development and use of water resources for any activity requiring water use. This study has duly recognised the *Water Act* and water samples near the proposed project site have been.

2.2.4 Land Act 1998

The *Land Act 1998* (GoU 1998) provides for the ownership and management of land. It provides for four different forms of land tenure (customary, leasehold, *mailo* and freehold) and the procedure for applying for grant of any of these tenures. The *Act* provides that non-citizens of Uganda may only be granted leases not exceeding 99 years.

The *Act,* inter alia, provides that the construction of electric lines, construction of dams and hydro-power plants are public works and any person authorised to execute public works on any land may enter into mutual agreement with an occupier or owner of the land in accordance with the *Act.* UETCL is acting in comformity to this law since it has engaged the land owner for the additional 1 acre piece of land it requires for the construction of the

thermal-power plant. The EIA Team consulted the land owner and learnt that negotiations with the UETCL were going on.

2.2.5 Local Governments Act 1997

The *Local Governments Act 1997* provides for the decentralisation and devolution of government functions, powers and services from the central to local governments and sets up the political and administrative functions of the latter. The *Electricity Act 1999* authorises the ERA to delegate some of its licensing functions to local governments. Kampala City Council (KCC) will have to be consulted particularly on issues pertaining land use plan for this area during the process of land acquisition.

2.2.6 The Energy policy for Uganda

The main policy Energy goal is to meet needs of Uganda's population for social economic development in an environmentally sustainable manner. The policy seeks to establish availability, potential and actual demand of the various energy resources in this country. The policy further seeks to increase modern affordable and reliable energy services as contribution to poverty eradication and to improve energy governance and administration. The policy encourages the GOU to ensure that energy policies promoted should not only stimulate development but their related environment impacts are managed.

The GOU energy policy allows for the liberation of the energy supply and use. Open and competitive markets are allowed to operate in the energy sector. Especially the private sector participation in the provision of electricity is encouraged. It is however, recognized that some rural areas are not viable for the private sector to invest in. Therefore the policy allows the GOU to prioritize underserved areas and initiate grid extensions or off grid investments based on other technologies such as photovoltaic solar grids or home systems, or wind-based technologies, and concession the operation and management (O&M) of such schemes to local authorities or private sector operators.

2.2.7 Waste management Regulations 1999

These are regulations made in accordance with Section 54 (2) of the *Act* and are meant for management of wastes that may have significant potential impact.

2.2.7 Public Health Act 2000

Section 7 of the *Act* provides local authorities with administrative powers to take all lawful, neccessary and reasonable practicable measures to prevent the occurrance or dealing with any outbreak or prevalence of any infectious communicable or preventable diseases to safeguard and promote the public health conferred or imposed by this *Act* or any other law.
Section 105 of the *Public Health Act 2000* imposes a duty on the local authority to take measures to prevent any pollution dangerous to the safety of any water supply that the public has a right to use for drinking or domestic purposes. In accordance to this Act the consultants have assesed any possiblities that may lead to water source pollution including water tests from the nearest water points.

2.2.8 Factories Act 2000

The *Act* makes provision for the health, safety and welfare of persons employed in the factories and other places (including power generation plants such as the proposed Mutundwe thermal power plant).

Section 13 of the Act requires that every factory be kept in a clean state, including floors, walls, workrooms, ceilings or top of rooms.

Section 14 (1) states that a factory shall not, while work is carried out, be so overcrowded so as to cause risk of physical injury or to the health of the persons employed therein.

Section 15 provides for ventilation in which effective and suitable provision shall be made for securing and maintaining the circulation of fresh air in each workroom in order to maintain a healthy environment.

Section 16 states that effective provision shall be made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of the factory in which persons are working or passing.

Section 19 to 46 in part V of the *Act* deals with general provisions of safety in a factory including work in confined spaces and fire safety. For example, in section 29, no person shall be employed at any machine or in any process, being a machine or process liable to cause bodily injury, unless he has been fully instructed as to the dangers likely to arise in connection therewith and the precautions to be observed, and:

a) Has received sufficient training in working with the machine or still in the process and
b) Is under adequate supervision by a person who has thorough knowledge and expericience of the machine or process.

Section 51 to 55 provide for the welfare of persons employed in factories. It requires the provision of protective clothing and appliances for the protection of eyes, ears, nose, limbs, et.in certain processes and other special applications. It is the duty of the owner of the premises to provide for safety of the workers from any dangerous aspect of his establishment at the owner's cost.

2.2.9 World Bank Policy on Environmental Assessment (OP 4.01)

The World Bank requires environmental assessments (EAs) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable in order to improve decision making of the Bank on the project. Therefore, this study is in line with the Bank's requirements. The Bank's guidelines regarding the conduct of an EIA has been adequately followed by the EIA Team from Ema Consult Limited.

2.3 Institutions

The following institutions have some stake in the environmental assessment for the proposed thermo-power plant at Mutundwe.

2.3.1 National Environment Management Authority (NEMA)

Under the *National Environment Act, 1995* (GoU 1995a) the National Environment Management Authority (NEMA) is the principal agency in Uganda for the management of the environmet and shall coordinate , monitor and supervise all activities in the field of the environment. NEMA is under the Ministry of Water, Lands and Environment, and has a cross-sectoral mandate. It will also review and approve this EIS.

NEMA has issued guidelines on EIAs (NEMA 1997), and the Environmental Impact Assessment Regulations (GoU 1998) was approved by the Ugandan Parliament. The actual implementation of the EIA process remains a function of the relevant line ministries and departments, the private sector, NGOs and the general public.

2.3.2 The Electricity Regulation Authority (ERA)

The Electricity Regulatory Authority is a corporate body established to oversee the implementation of the Electricity Act 1999. Under the Acts, ERA is mandated to review proposed investments in the energy sector and guides the promoters through implementation. The main functions of ERA, among others, include:

- Issuing licences for generation, transmission, distribution, of electricity;
- Processing application for investors in the energy sector
- Enforcement of requirement under the act to ensure compliance with regulations
- Establishing tariffs, reviewing, and approving rates of investment in the electricity sector
- Advising the minister regarding the need for electricity projects
- Developing and enforcement of energy standards

The electricity Act lays down procedures and legal requirements for the development of generation of electricity. Part VII (69) deals with acquisition of land. It provides that whenever the developer is to acquire land, he should acquire land; he should acquire it by agreement with the owner. However if the owner does not agree with the developer, the licensee notifies the minister to impose such terms as he may deem fit to acquire the land.

The procedures for actual works for an electricity project line as stipulated in the Act are:

- ERA Board gives notice to the local authority before survey is carried out;
- the notice served should indicate the plan of the proposed work is to be made available for inspection;
- the persons served have 14 days to consent or consent subject to certain condition and terms;
- the developer begins the survey work and final routes are earmarked and drawn;
- before construction the surveyors are authorized to clear vegetation to prevent interference with the works;
- access roads are constructed for every section of the line to allow maintenance crews to access the line;
- buildings and crops that are within the corridor of the transmission line are demolished and the owners paid compensation for such damage as provided by section 56 of the Act. The compensation in only for the crops and buildings and not the land; and
- any dispute arising from the payments is determined by the district Commissioner and with appeals to the minister responsible for energy.

2.3.3 Directorate of Water Development

The Water Act, 1995 (GoU, 1995b) created the Directorate of Water Development (DWD) which provides for the use, protection and management of water resources and supply. The

objectives of the Act are to promote the rational management and use of the waters of Uganda through the introduction and application of standards and techniques, the coordination of all public and private activities that may influence water quality and quantity and to allow for the orderly development and use of water resources including such activities as construction activities related to power supply.

2.3.4 Kampala City Council (KCC) Administration

The Mutundwe thermal power project is located in Rubaga divisioin Kampala District. The district's top administration includes the Kampala mayor and the Chief Administrative Officer (CAO) and the Town Clerk.

The Departments at the District level which are directly involved in the project as a whole include the District Environment Officer, the District Medical Officer, the District Planner, the District Security Officer, the District Water Officer, Community Development Officer, District Forest Officer, District Agriculture Officer, District Education Officer, and District Engineer. The District Environment Officer- Kampala is expected to monitor the Environmental Management Plan drawn by EIA Team.

3.0 PROJECT DESCRIPTION

3.1 Location

The site is located 0.2 Km from Nalukolongo and about 5 Km west of Kampala City. The land is private *Mailo* land located to the south of the existing substation at Kitaluuzi zone in Mutundwe Parish, Rubaga division. The land is identified as Block 32, Plot 1023, Kyadondo in Kampala District and covers an area of 1 acre. It belongs to one elderly woman who is willing to sell to UETCL.

The Mutundwe Thermal-Power Project will comprise 50 MW auto Engine-Driven diesel power plant to be constructed close to the existing Mutundwe electricity substation. As mentioned above this will involve acquiring additional new land, on the southern wing of the existing power substation.

The Engine driven diesel power plant will be powered with low sulphur auto diesel fuel supplied through pipes from storage tanks that will be constructed on the site.

3.2 The Thermal-Power Plant

The site will accomodate the thermal power plant and its associated infrastructure that includes fuel storage facilities and an office block.

There are three designs of generators capable of producing power capacity of 50 MW. These designs are: the conventional steam producing thermal plant, engine driven power plant and combine cycle power plant. However, given the urgency for power, reliability of fuel supply and other logistics involved, the engine driven plant is being considered as the likely alternative. Details of the plant are described below.

The engine-driven power plant uses fuel such as diesel oil, fuel, gas or emulsion and crude oil. The two types of engines normally used are the medium-speed four-stroke trunk piston engine and the low-speed two-stroke crosshead engine. Both types of engines operate on the air-standard diesel thermodynamics cycle. Air is drawn and forced into cylinder and is compressed by a piston. Fuel is injected into a cylinder and is ignited by heat of the compression of air. The burning mixture of fuel expands, pushing the piston.

Table 3.1. Different types of engine-driven diesel generators

Thermal Engine	**Function and Characteristics**			
	Fuel	Functioning	Characteristics	Impact on environment
Diesel Engine Generator	Petro diesel-hydrocarbon mixture, product of refining crude oil; has various grades	Fuel is burnt in an internal combustion engine; engine is coupled to drive alternator	Low initial cost, high running cost; transported & stored in tanks; second to coal in pollution of air; best for peak loads; small to medium footprint; higher energy content than coal	Impacts mainly on air quality; noisy; disposal of waste lubricating oil; high levels of sulfur, NOx and SO_2 emission
HFO Diesel Engine Generator	Heavy Fuel oil; a grade of diesel; thick dark brown viscous substance; requires heating to flow; has various other grades	Fuel is first heated by steam; it is then pumped into an internal combustion engine; engine is coupled to drive alternator	More expensive than coal, next to coal in air pollution; source of water for steam;	Impacts heavily on air quality; noisy; disposal of waste oil
Bio-diesel Engine Generator	Non fossil fuel obtained from vegetable oil & animal fats	Fuel is burnt in an internal combustion engine; engine drives alternator to generate electricity	Commonly used mixed with petro-diesel to reduce air pollution	Lowest level of sulfur, NOx and SO_2 emission

Finally the products of combustion are removed from the cylinder, completing the cycle. The energy released from combustion of fuel is used to drive an engine, which rotates the shaft of an alternator to generate electricity. Engine-driven plants are usually considered for power generation capacities of up to 150 MW. They have the added advantages of shorter building period, higher overall efficiency (low fuel consumption per unit of output), optimal matching of different loads demands, and moderate investment costs, compared with conventional thermal power plants.

The wastes generated are typical of those from combustion processes. The exhaust gases contain particulates (including heavy metals if present in fuel), sulfur and nitrogen oxides, and, in some cases, volatile organic compounds (VOCs). Carbon dioxide (CO_2) emissions are approximately 600g/kWh of electricity, and total hydrocarbons (calculated as methane equivalent) are 0.5g/kWh of electricity.

3.3 PROJECT ACTIVITIES

3.3.1 Preconstruction Phase

This will involve land acquisition of which negotiations for the site are being held. The land will be acquired from Mrs. Muwuya Kasuba

3.3.2 Construction Phase

This will begin with civil works. However, it is anticipated that civil works will go concurrently with the mobilisation of materials

1. Civil works:

- Site leveling and fencing
- Construction of drainage systems
- Construction of a generator house
- Construction of fuel storage tanks
- Construction of an office block and stores
- Oil collection systems
- Oil pipes from the storage tank to the generators

3.3.3 Mobilisation of materials

Materials for construction will be obtained offsite and these include cement, stone aggregates, sand, steel, etc. Mobilisation will involve transportation and consequently heavy vehicular movement at the site. The generators and associated accesories will be imported into Uganda through the main port of Mombasa in Kenya. The equipment will then have to be transported to the project site via the Tororo-Jinja-Kampala Highway.

3.3.4 Decommissioning

Thermal power plant will have to be decommissioned once the construction of the two hydropower dams at Bujagali and Karuma are completed and commissioned.

4.0 ENVIRONMENTAL BASELINE DATA

This chapter provides information on the physical, biological and socio-economic elements of the environment, which shall be used as benchmarks for future monitoring.

4.1 Physical Environment

4.1.1 Climate

There were no meteorological information at the three proposed sites but average data from Kampala District were used. It is unlikely that the data from the sites will vary from the average data from the district. The rainfall is between 1750 mm and 2000 mm distributed in two peaks, one in March to May and another from September to November. The area has an annual mean rainfall of 1180 mm and the monthly mean rainfall of approximately 50 mm.
The mean annual temperatures are 21.9°C, while the mean the annual range temperature is 24°C.

4.1.2 Ambient Air Quality

There were no previous air quality measurements taken at the proposed site although measurements that were taken in the neighboring Divisions around Wandegeya, Mulago and Kawempe in Kampala District showed high carbon dioxide (CO_2) levels of 8,000 ppm, which is above the national standard guidelines.

Table 4.1. Air Quality measurements at the site and the National Standards.

Pollutant	Baseline at Sites (Average)	Averaging Time for Ambient Air	Standard for Ambient Air (NEMA)	Standard for Emission (Point Sources) (NEMA)
Carbon dioxide	510 ppm	8hr	9.0 ppm	NA
Carbon monoxide	0.1 ppm	8hr	9.0 ppm	NA
Hydrocarbons		24hr	5mg/m^3	NA
Nitrogen oxides (NO_X)	0.0 ppm	24hr 1 year Arithmetic mean	0.10 ppm	300mg/Nm^3
Smoke	-	Not to exceed 5 min. in any one hour	Ringleman scale No.2 or 40% observed at 6m or more	NA
Soot	-	24hr	500µg/Nm^3	NA
Suphur dioxide	0.1 ppm	24hr	0.15 ppm	400mg/Nm^3
Suphur trioxide	-	24hr	200µg/Nm^3	NA
TSP/ PE	-	24hr	300µg/Nm^3	<50mg/Nm^3

NA = Not Available, TSP = Total Suspended Solids, PE = Particulate Emission

4.1.3 Noise

The area proposed for the construction of the 50 MW thermal power plant is classified as residential although pockets of industrial and commercial premises exist. Such areas fall under Facility D (Part 1, Regulation 6(1) of the The National Environment (Noise Standards and Control) Regulations, 2003. This regulation recommends noise limits of 55 dB (A) and 45 dB (A) for day and night respectively. The ambient noise levels measured at the three proposed sites are given below:

Table 4.2.a Ambient Noise Levels at Night

Location	**Noise Levels (dB (A)**		
	Min.	**Max.**	**Leq.**
North of the Existing Substation	32.7	33.5	32.9
East of Substation	37.8	38.9	38.4
South of Substation	42.7	44.3	43.5
West of Substaion	36.0	39.2	37.6

Table 4.2.b Ambient Noise Levels during the Day

Location	**Noise Levels (dB (A)**		
	Min.	**Max.**	**Leq.**
North of the Existing Substation	34	36.2	35.1
East of Substation	38.2	38.2	38.2
South of Substation	42.7	44.7	43.5
West of Substaion	36	39.3	37.7

4.1.4 Water Resource

There is a community-protected spring that is also located 500m down hill of the proposed site. It's position makes it susciptible to contamination that may araise from the presesnce of

oil storage facilities, possibilities of oil spills from routine maintenance and storm water from the project site. These are matters of serious environmental concern in regards to pollution of water sources.

Water quality tests were carried out for the spring water that the people in the community use. Tests results are indicated in table 4.3 below:

Table 4.3. Water quality measurements and the national standards

Parameters	**Units**	**Water from the spring**	**National Standards For potable water**
WS	--	**c-373**	
pH	--	4.88	**6.5-8.5**
Temperature	^{0}C	23.2	**NS***
Total Suspended Solids	mg/L	1	**0**
Iron (Total)	mg/L	0.06	**0.30**
Chromium	mg/L	0.00	**0.05**
Copper	mg/L	0.10	**1.00**
Oil and Grease	mg/L	0.02	**0.00**

*Not Specified

4.2 Biological Conditions

4.2.1 Wetlands

To the north of the proposed power plant, there is a wetland that runs parallel to the existing substation in the East-West direction. This wetland is currently being reclaimed for settlements and industrial development and is located downhill. However there is a railway line and a road that run through the wetland along the length of the wetland itself. The wetland is separated from the proposed project site by a residential strip of land. It is clear some of the settlements are in the reserves of both the railway line and the road.

4.2.2 Vegetation

The land located in the northern part of the substation is owned by UETCL and is already modified for expansion and is devoid of any vegetation of conservation concern. The land located to the south of the current substation belongs to a willing seller and is an agricultural plot used for growing crops on a subsistence basis.

4.2.3 Wildlife

As noted above, the land proposed for the development of the 50MW thermo-power plant is highly modified by human activities that there is no wildlife of major conservation concern in the area. However there were a few species of birds like the Hammerkop (*Scopus umbreta*), the Black-headed Weaver (*Ploceus cucullatus*) and the Black Kite (*Milvus migrans)* that were nesting on the few remaining *ficus* trees found in the area. These species are normally associated with settlements and could be found in most parts of the country. They will most probably relocate to other nesting sites once the project commences.

4.2.4 Social Environment

A study conducted within 100 m radius from the edge of the project site indicated that there were 16 households with an estimated population of 100 people live in Kitaluuzi zone. These people were mainly landlords and derived their income from rent. Most of the houses in the zone are permanent with very few temporary structures. Shanty structures do not exist around the project site. However, a few households (about 15%) practiced subsistence farming (sweet potatoes beans, cassava, matooke), brick making and petty trade (hawker, retail traders, motorbike hires). There is an existing access road to Mutundwe Eletric Power Substation from Nalukolongo. There are two primary schools around the project area namely; F.D.K, Lubiri, Mutundwe Church of Uganda and Bright Trust Primary Schools while Happy and Joy is a nursery school. There is also a secondary school nearby.

There are five protected springs and two unprotected springs both of which are used as sources of water for domestic use. Most families are within less than 1.5 Km to the mentioned water sources. However, of the seven springs one spring is susceptible to contamination as detailed in under the water resources.

4.3 Health and Safety

Kitebi Health Center III managed by Kampala City Council is located 3 km from the project site. A privately owned Banzadde Clinic is the closest health facility (1.5 km) that serves the project area.

From the Focus Group Discussions held with the communities surrounding the project areas, the most common diseases are malaria and diarrhoeal diseases. There are also claims of HIV/AIDS among these communities.

5.0 POTENTIAL ENVIRONMENTAL IMPACTS

This section of the report describes the potential environmental impacts, both negative and positive, that are likely to result from the construction and operation of the thermal-power plant in Kitaluuzi Zone, Mutundwe. The possible mitigation measures identified for the significant negative impacts are presented in the next chapter.

5.1 NEGATIVE IMPACTS

The discussion on potential impacts identified by the EIA Team starts with the negative ones and subsequently followed by that of the positive project impacts.

ISSUE/CONCERN	POTENTIAL IMPACTS	ASSESSMENT OF IMPACTS
Pre-construction phase		
Land take	Loss of livelihood as a result of loss of agricultural land	**SIGNIFICANT**
Air quality	Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or haul route.	**INSIGNIFICANT**
Noise	Noise/disturbance at closest residential or sensitive receptor.	**INSIGNIFICANT**
Construction phase		
Ecological (Wetlands, Vegetation and Wildlife)	Ecologically disturbed land due to human activities. There is no flora or fauna of conservation concern. Site is not a wetland.	**INSIGNIFICANT**
Air quality	Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or haul route.	**LOW** and short lived
Noise	Excessive noise/disturbance at closest residential or sensitive receptor.	**INSIGNIFICANT**

Human Sanitary Waste	Potential for impairment of surface water quality and spread of disease vectors.	**SIGNIFICANT**
Solid Waste Other Waste	Localised impairment of air quality during burning of solid waste, either on-site. Incremental impacts on water quality and sediments from erosion and leaching of waste. Environmental contamination from spillage or disposal of fuels, lubricants, oils and solvents on the construction site.	**INSIGNIFICANT** **LOW** or **INSIGNIFICANT**
Traffic	Community disturbance and potential hazard.	**SIGNIFICANT**
Occupational Health and Safety Hazards	Risks of physical injury or chemical burns to personnel.	**SIGNIFICANT**
Operation and Maintenance Phase		
Air Quality	Increased ground level concentrations of NO_X, SO_X, and particulate matter	**SIGNIFICANT**
Noise	(i) Noise at nearby receptors i.e., the surrounding communities is likely to be above the recommended 85 dB(A). (ii) Noise to workers is likely to be above the recommended limit for workshop places	**SIGNIFICANT** **SIGNIFICANT**
Sanitary Waste	Possibility of spread of disease vectors and odours.	**SIGNIFICANT**

Solid Waste Other Wastes	Oil contaminated towels, rags, empty oil/fuel cans; used filters and uncontaminated solid wastes if improperly disposed could lead to water contamination, blockage of drainage, etc. Release of sludge, used oil, hydraulic fluid, paint, solvents and other similar materials into the environment may contaminate surface and ground water.	**SIGNIFICANT**
Fuel spills or other contaminating waste.	Possibility of surface and underground water contamination.	**SIGNIFICANT**
Health and Safety Electrocution Fire Accidents	Improper Health and Safety measures or facilities can lead to hearing impairment or chronic health problems to the workers. Possibility of death to the workers Severe risks to workers and the surrounding community.	Rare but **SIGNIFICANT** Very rare but **SIGNIFICANT** in case it happens
Decommissioning	Possibility of leaving behind structures such as pits, contaminated sites, etc. that are potential risks to humans, animals and/or the natural environment.	**SIGNIFICANT**

5.2 POSITIVE IMPACTS

Environmental dimension	**Issue**	**Impacts**
1. Ecological	Fuelwood.	Sufficient electricity supply will reduce the long-term pressure on fuelwood thereby limiting deforestation.
2. Socio-economic	Employment.	During the construction phase many local people will find employment as temporary casual workers. Once completed and plant becomes operational, more industries and factories will come up employing both causal and permanent workers thereby easing problems of unemployment.
	Industrialization, education and research.	Adequate, steady electricity supply will promote industrialization thereby boosting economic growth of the country. A vibrant economy will lead to more investment in education and research ultimately enhancing environmental protection. A well-protected environment improves on the quality of life and standard of living of the people.
	Expanded participation of the private sector, particularly in the Service Industry.	Adequate and reliable supply of electricity will attract more involvement of the private sector in the provision of services such as restaurants, hotels, lodges, grocery stores, etc. This will improve government revenue through an expanded tax base from the private proprietors.
Environmental dimension	**Issue**	**Impacts**
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2. Socio-economic	Employment.	During the construction phase many local people will find employment as temporary casual workers. Once completed and plant becomes operational, more industries and factories will come up employing both causal and permanent workers thereby easing problems of unemployment.
	Industrialization, education and research.	Adequate, steady electricity supply will promote industrialization thereby boosting economic growth of the country. A vibrant economy will lead to more investment in education and research ultimately enhancing environmental protection. A well-protected environment improves on the quality of life and standard of living of the people.
	Expanded participation of the private sector, particularly in the Service Industry.	Adequate and reliable supply of electricity will attract more involvement of the private sector in the provision of services such as restaurants, hotels, lodges, grocery stores, etc. This will improve government revenue through an expanded tax base from the private proprietors.

6.0 MITIGATION MEASURES

The purpose of impact mitigation is to look for alternative and better ways of implementing the proposed project or associatied activities so that the negative impacts are eliminated or minimised, while benefits are enhanced. Impact mitigation requires that the full extent of the anticipated environmental problems are understood. In view of this, this section of the EIS presents mitigation measures resulting from the impacts identified.

The EIA Team, identified some potential negative impacts that are likely to occur as result of the construction of the 50 MW thermal power plant in Mutundwe. The negative impacts are likely to occur on both the bio-physical and the socio-cultural environment. The matrix on the following pages gives the impacts, their effects, the mitigation measures and costs.

Table 6.1. Mitigation Measures

ISSUE/CONCERN	POTENTIAL IMPACTS	MITIGATION MEASURES	RESPONSIBILITY
Pre-construction phase			
Land take	Loss of livelihood as a result of loss of agricultural land	Compensation for land acquired and crops ▪ 1 acre of land ▪ Crops	UETCL
Air quality	Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or haul route.	▪ maintaining equipment in good running condition ▪ protecting friable material with a barrier, vegetation, or windscreen ▪ covering friable material during transportation ▪ enforcing a 35 km/hr speed limit on dirt roads ▪ suppressing dust on roads using water sprays	Contractor UETCL/Contractor
Noise	Excessive noise/disturbance at closest residential or sensitive receptor.	Ensure that all vehicles and construction equipment have properly functioning silencers or mufflers.	UETCL
Air quality	Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or haul route.	▪ maintaining equipment in good running condition ▪ protecting friable material with a barrier, vegetation, or windscreen ▪ covering friable	UETCL

		material during transportation ▪ enforcing a 35 km/hr speed limit on dirt roads ▪ suppressing dust on roads using water sprays	
Noise	Excessive noise/disturbance at closest residential or sensitive receptor.	Ensure that all vehicles and construction equipment have properly functioning silencers or mufflers.	UETCL/ Contractor
Human Sanitary Waste	Potential for impairment of surface water quality and spread of disease vectors.	Provide appropriate numbers of toilets and hand-washing stations at the work site. Provide on site treatment of sanitary waste. Train construction employees on sanitation practices	UETCL

Solid Waste Other Waste	Localised impairment of air quality during burning of solid waste, either on-site. Incremental impacts on water quality and sediments from erosion and leaching of waste. Environmental contamination from spillage or disposal of fuels, lubricants, oils and solvents on the construction site.	• systematic collection and protected-storage on site • a waste management program consisting of reduction, reuse and recycling of materials • burning of waste as a last resort and only when disposal impractical only dry, clean-burning material (wood, cardboard, paper, dry vegetable material) to be burn. Prohibition on dumping of any contaminating material into the environment, including waste oils Storage and routine handling of fuels, lubricants and other potentially contaminating substances in a weather-protected area having secondary containment for spills. Implement spill prevention procedures and a spill contingency plan. Have available on site all equipment and materials required to execute a clean-up. All wastes recovered during cleanup operations to be collected and stored in labelled and secure containers for subsequent disposal by on-site high incineration	UETCL UETCL
Traffic	Community disturbance and potential hazard.	Provide safety training for truck drivers. Contractors to implement safety programme (signs, speed restrictions, lights on trucks, truck load restrictions, equipment inspections (brakes, horn, etc)	Contractor
Occupational Health and Safety Hazards	Risks of physical injury or chemical burns to personnel.	Implement UETCL Health and Safety Plan. Contractors and sub-contractors should comply with the plan and with Ugandan health and	UETCL

		safety requirements.	
Air Quality	Increased ground level concentrations of NO_X, SO_X, and particulate matter	Use diesel or HFO, which has 1.9% or lower sulphur content.	UETCL
Noise	(iii) Noise at nearby receptors i.e., the surrounding communitie s is likely to be above the recommend ed 85 dB(A).	Plant should be installed in an acoustically insulated powerhouse. Exhausts and air intakes should be equipped with silencers to reduce the noise level at source by a bout 35 dB(A).	UETCL UETCL
	(iv) Noise to workers is likely to be above the recommend ed limit for workshop places	Workers should be provided with ear muffs to protect them from excessive noise.	UETCL
Sanitary Waste	Possibility of spread of disease vectors and odours.	Provision of Septic tanks for safe disposal of sewage.	UETCL
Solid Waste	Oil contaminated towels, rags, empty oil/fuel cans; used filters and uncontaminated solid wastes if improperly disposed could lead to water contamination, blockage of drainage, etc.	Provision of systematic collector and protected-storage on site.	UETCL
Other Wastes	Release of sludge, used oil, hydraulic fluid, paint, solvents and other similar materials into the environment may	Provision of systematic collector and protected-storage on site. All other potentially contaminating wastes (used lube oil, drained hydraulic fluid, spent solvents, etc.) should be collected in leak	

	contaminate surface and ground water.	proof and properly labelled containers.	
Fuel spills or other contaminating waste.	Possibility of surface and underground water contamination.	Storage areas for the containment of a worst-case spill should be constructed. Interceptors for spilled fuel should be constructed in the area where fuel is unloaded (e.g. couplings of fuel unloading systems).	UETCL
Health and Safety Electrocution Fire Accidents	Improper Health and Safety measures or facilities can lead to hearing impairment or chronic health problems to the workers. Possibility of death to the workers Fire damage to property and deaths	The employees should strictly follow UETCL Health and Safety Manual. Safety gears against noise and chemical should be worn by personnel while on duty. Only trained personnel should work in areas of high power voltage and entry to such places should be restricted. The employees should strictly follow UETCL Health and Safety Manual. Provision Fire fighting equipment, fire safety regulations.	UETCL
Decommissioning	Possibility of leaving behind structures such as pits, contaminated sites, etc. that are potential risks to humans, animals and/or the natural environment.	Site restoration should be conducted to remove any structure/s that may pose risk to human. animals and/or the natural environment.	UETCL

6.1 Oil spill emergency plan

The developer is encouraged to adopt the no or zero spill philosophy, which advocates for putting in place strict monitoring and surveillance measures at all high-risk areas where spills are likely to occur. However, in case of spills occurrence, the following procedures should to be employed:

- all spills or leaks should be reported immediately to the Environmental Health and Safety (EHS) department;
- spill decontaminants and cleanup equipments should be available and kept at the thermal plant, including booms, absorbent pads, oil absorbent material and metal drums designated for storage of spent cleanup equipments. All service vehicles should have a small spill kit on board;
- if the spill can be safely controlled and contained, take appropriate action to control and contain the release (i.e. turning off valve, placing the tank in an upright position or distributing absorbent pads, booms and floor dry, etc);
- determine the type of material spilled and follow the recommended safety measures outlined in the appropriate Material Safety Data Sheets (MSDS); and
- after safely containing and controlling the spill, notify the location Manger immediately with the following information:

    - The name of the person reporting the spill and telephone number at which he/she can be reached if further information is needed.
    - Time and date of the spill occurrence or was observed.
    - Duration of spill.
    - Location of the spill.
    - Approximate a mount and type of spill material.
    - The source of the spill and action take to control the spill.
    - Weather conditions (Wind, precaution, etc.).
    - Direction of movement.
    - Suggestion for additional action.

The Location Manager shall complete the spill Reporting Form with all information pertinent to the spill. Only approved remediation contractors should be called for clean up and decontamination of the area. All spill materials should be properly disposed of. The EHS guidebook should be consulted for proper disposal.

Inventory of greenhouse gas emissions and abatement plan

As part of the Framework Convention on Climate Change, countries will be asked to record their emissions of greenhouse gases (GHGs). As an input to this and to facilitate possible future activities implemented jointly with countries, the emissions of the individual project will be estimated on the basis of the chemical composition of the fuel or measured directly. However, the developer will have to recruit a specialist to monitor the annual GHG emissions.

6.2 Compensation

The one-acre piece of land that the developer plans to buy will have to be compensated in a timely and transparent manner. The compensation value is currently under discussion between the buyer and UETCL and is covered in the Resettlement Action Plan report.

Payment Procedures

Both the local and international social safeguard policies require that a development project such as the Mutundwe thermal power plant construction should not leave the people worse off than before the project. In view of this, the study observed that UETCL will have to make prompt compensation for the land it plans to purchase. The following payment procedures shall be followed:

Payments by cheque: All payments of compensation in excess of 300,000/= shall be made by cheque, issued by the UETCL and drawn on the UETCL Bank Account.

a) Payment Documents and Forms:

Uganda Electricity Transmission Company Limited will have to print the following documents which will be used for compensation payment.

(i) Form (A): Verification Identity Document.

The Verification Identity Document, should be in the form of a book with two copies as described below:

- Original (white): To be issued by the UETCL, duly signed in the presence of the LC 1 Chairperson of the area.

- Copy (blue): Should be retained by the UETCL's cashier for accountability to the power company.

(b) Form (B): Payment Voucher

Payment Vouchers should have three copies and should be issued as follows:

- Original (white): should be taken by the Payee.
- Copy (pink): should be kept by the District Environment Officer for the District Local Government.
- Copy (blue): should be retained by UETCL for accountability purposes.

Upon the conclusion of the compensation exercise, UETCL shall have to compile all the filled forms and vouchers including copies and submit them to the Ministry of Energy and Mineral Develpment. Any other documents of accountability that support genuine payments made should also be included.

Compensation Agreement

To ensure complete and transparent compensation process, a compensation agreement between the UETCL and the landlord will have to be made and witnessed by the LC officials of Mutundwe village. The landowner shall have to sign the verification form in the witness of the LC1 Chairperson of the village. A Certificate of completion shall also be counter signed by the LC1 Chairperson.

During a socio-economic survey of the area, a radius of 500 m from the project site was covered. This aimed at determining the socio-economic conditions of the people settled in this area in respect to their livelihood before the project implementation. The survey found out that apart from one landowner, from whom land will be purchased nobody will lose land or any property due to the implementation of the power project. Compensation will therefore be strictly to the single landowner and this should be adequate and timely.

7.0 ANALYSIS OF ALTERNATIVES

The purpose of the analysis of alternatives as part of the EIA process, is to select the best among all possible project options. However, in this particular case of the construction of Mutundwe thermal power plant, there are two choices to consider; the generator and fuel types. The assessments and recommendations made by the EIA Team are presented below:

7.1 Site

1. Land has already been identified and the owner has been contacted and has indicated willingness to sell the land at existing market rates.Therefore the land is free of conflict.
2. The site is well located in regard to the following:
    a. Easy access.
    b. Close proximity to the Nalokolongo industrial area.
    c. Close proximity to the already existing grid line.
    d. Has no settlements.
3. Uganda Electricity Transmission Company Ltd is willing to make adequate and timely compensation for the acquired land.

7.2 Fuel Types

The World Bank recommends that cleanest fuel economically available should be chosen. In Uganda natural gas is not available for power generation leaving heavy fuel oil (HFO) and diesel as the available alternatives. HFO requires heating before it can be moved through pipes to burning chambers; consequently, can only be used by facilities that have preheating capabilities. HFO is typically high in sulphur and rich in other impurities that are released into the air when the fuel is burned. E.g. currently type of HFO produced by Kenya Petroleum Refinery in Mombasa has upto 3.7% sulphur although this is expected to reduce to 2.5% sulphur in future. While HFO is cheaper (US $ 0.43) in Uganda compared to diesel which costs US $ 1, the reliability of supply posses a big problem since Mombasa is the only source at the moment. However, it would be economical to use HFO for the thermal plant. But it anticipated that the cost of diesel will be low since the government of Uganda intends to waive the tax on diesel that will be used in the thermal power generation (New Vision, 2006). It is very unlikely that the plant in Mombasa will produce HFO of lower sulphur content of 1.9% or lower yet using HFO with 3.7%

sulphur will have adverse impacts on the environment. The World Bank Guidelines 1998 limits the level of SOx emissions to 2,000 mg/Nm^3 plus 0.2 tonne per day per MW and the national maximum limit at the source is 400 mg /N m^3 which can only be met by using HFO with a sulphur content of 1.9% or lower. **Therefore if HFO is preferred to diesel because of the costs involved then type to be utilised should have sulphur content of 1.9% or lower.**

Table 7.1. Differences between heavy and light fuel oils

Fuel Characteristic	**Fuel type**		**Comments**
	Heavy Fuel Oil (HFO)	Light Fuel Oil (LFO)	
Viscosity	High	Low	HFO requires preheating prior to transmission to burning chambers unlike LFO
Specific gravity	High	Low	
Stability	Poor	Good	Poor stability leads to precipitation into sludge that blocks filters
Cetane No.	High	Low	
Asphatene content	High	Low	
Carbon residue	High	Low	Emissions from HFO are higher in carbon content compared to LFO when burned
Sulphur content	High	Low	Emissions from HFO are higher in sulphur content compared to LFO when burned
Vanadium and Sodium content	High	Low	
Presence of solids e.g. rust, sand and aluminium silicate	High	Low	
Cost	Cheap ($ 0.43 per litre)*	Expensive ($ 1 per litre)*	
Reliability of supply	Could be Unreliable for the case of Uganda since it is processed at only one plant at Mombasa, Kenya for the whole of East Africa region.	Reliable. Uganda will in the near future be connected directly to the refineries in Kenya through a direct pipeline that is currently under construction	The reliability of supply, low sulphur and carbon emission levels make LFO a better fuel for use in thermal power plants than HFO although HFO is a cheaper fuel.

Note: * Current pump price in Uganda.

7.3 Engine-Driven thermal power generators

Two types of engine-driven thermal generators are likely to be used: one that uses diesel or the type that uses HFO. Differences of the two types are given in Table 7.2 below.

Table 7.2. Generator types

Thermal Engine	**Function and Characteristics**			
	Fuel	Functioning	Characteristics	Impact on environment
Diesel Engine Generator	Petro diesel-hydrocarbon mixture, product of refining crude oil; has various grades	Fuel is burnt in an internal combustion engine; engine is coupled to drive alternator	Low initial cost, high running cost; transported & stored in tanks; second to coal in pollution of air; best for peak loads; small to medium footprint; higher energy content than coal	Impacts mainly on air quality; noisy; disposal of waste lubricating oil; high levels of sulfur, NOx and SO_2 emission
HFO Diesel Engine Generator	Heavy Fuel oil; a grade of diesel; thick dark brown viscous substance; requires heating to flow; has various other grades	Fuel is first heated by steam; it is then pumped into an internal combustion engine; engine is coupled to drive alternator	More expensive than coal, next to coal in air pollution; source of water for steam;	Impacts heavily on air quality; noisy; disposal of waste oil

Based on the analysis of fuel, emmisions and noise, the preferable generator type that should be installed should have the following qualities:

- Provide high power output with low fuel consumption and emission levels. Low emissions levels of Sox, CO, CO_2, and particulate matter that are achieved through an advanced fuel injection systems and carefully designed combustion chamber for that purpose.
- Should use fuel with low sulphur content (1.9% or lower)
- Spare parts should be easily accessible to minimise cost, the complexity and extent of maintenance required. If possible engines in which the local personnel have experience in operation and maintenance should be encouraged.
- The plant should have automated systems that will control and monitor all engine and plant functions, as well as provide operational alarms and protection from hazards. A plant with automated system will greatly increase plant reliability and security while freeing operating staff to perform other important duties.
- The generators should be fitted with latest low NO_X combustion control technology to meet the national and World Bank guidelines 1998 limits of NO_X emissions of 300 mg/Nm^3.

- The plant should be cooled using closed circuit air radiators to avoid thermal discharge to water bodies and excessive consumption of water by evaporative coolers. This is important because the current electricity crises in Uganda are as a result of a drop in volume of water in Lake Victoria due to drought. Therefore excessive consumption of water by the thermal plant from the lake will exacerbate the current water crises. Similarly, the excessive discharge of water from the thermal plant into the nearby Victoria Nile will not be environmentally friendly due to pollution and temperature differences.
- The plant should not generate noise that is above the national recommended level of 85 (dB(A) measured as Leq as maximum exposure limit for 8 hr daily exposure or 40 hrs weekly exposure at the plant or of 55 dB (A) and 45 dB (A) for day and night respectively for the surrounding areas.

7.4 THE "DO NOTHING" SCENARIO

The 'Do Nothing' scenario presupposes that the project cannot go ahead due to significant environmental problems that could be associated with the proposed project. However, in this particular case part of the site is owned by UETCL and is earmarked for eletrical power development. Moreover, the construction of 50MW is part of the proposed 150MW thermal power to be constructed to alleviate a short fall of 125MW that can not be generated at Nalubaale and Kiira hydropower stations because of a sharp drop in water level of Lake Victoria. The proposed site is also located near existing power grid that makes it easy for power evacuation hence saving valuable resources. It is therefore recommended that the project goes ahead but should take into consideration all the suggested mitigation measures.

8.0 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The goal of an environmental management and monitoring plan is to ensure that mitigating measures are satisfactorily carried out and that regular monitoring is undertaken in a systematic and responsible manner. In order to achieve this it will be necessary UETCL Environment Officer to work together with the Kampala District Environment Officer and others who will most likely implement the plan and co-ordinate efforts with contractors and stakeholders.

Monitoring, started with the collection of background data as part of the EAR study and will continue with appropriate follow-up procedures during commercial operation of the plant. Monitoring will provide data on key environmental, social and occupational health and safety aspects and on the effectiveness of mitigation measures of the project. Much of the work during the construction stages can form part of the routine inspection of the contractor's work that will be included in contract monitoring. Recommended measures identified in Chapter 7 should, therefore, be part of the contractual items to be monitored in order to reduce the negative impacts and/or enhance the benefits identified in this report.

8.2 NEGATIVE IMPACTS

- Increased traffic and thus traffic related accidents.
- Occupational hazards among workers (Electrocution).
- Loss of livelihood.
- Pollution (air, water and soil).
- Noise.
- Solid wastes (used fuel/oil filters, cleaning towels, gaskets, oil and fuel containers, etc).
- Liquid wastes (oil spills, wastewater).

8.3 POSITIVE IMPACTS

- Jobs for the locals.
- Long term socio-economic development of the area.

- Increased economic activities and thus increased incomes.
- Positive contribution to the economic growth of the country through steady and reliable power supply for the industries or factories.

8.4 ENVIRONMENTAL MONITORING PLAN

The National Environment Management Authority through the District Environment Officer (DEO) of Kampala shall enforce the national environmental quality standards to which the developer is required to follow. The DEO will maintain close links with UETCL, the company that will be contracted to develop the plant and other relevant agencies like DWD including all project stakeholders.

8.4.1 Environmental monitoring programme

The monitoring programme is aimed at establishing the framework within which the developer's environmental activities should proceed during the construction of the thermal-power plant. Various activities that are to be undertaken immediately upon the completion of this study including those before and during the project implementation are highlighted in
Table 8.1

Table 8.1. Environmental Management and Monitoring

CONSTRUCTION PHASE			
ISSUE/CONCERN	MANAGEMENT MEASURES	MONITORING	RESPONSIBILITY
Air Quality Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or access route.	Implement good site practices, including: • maintaining equipment in good running condition • protecting friable material with a barrier, vegetation, or windscreen • covering friable material during transportation enforcing a 35 km/hr speed limit on dirt roads suppressing dust on roads using water sprays	Regular checks by the DEO Kampala and UETCL Environment Officer to ensure implementation of good site practices by contractors. Maintenance of a public complaints registry.	UETCL
Noise Excessive noise/disturbance at closest residential or sensitive receptor.	Ensure that all vehicles and construction equipment have properly functioning silencers or mufflers.	Regular checks by the DEO Kampala and the UETCL Environment Officer to ensure implementation of noise management practices by contractors. Maintain liaison with the public including systematic recording of complaints.	UETCL

Human Sanitary Waste Potential for impairment of surface water quality and spread of disease vectors.	Provide appropriate numbers of toilets and hand-washing stations at the work site. Train construction employees on sanitation practices	Regular checks by DEO Kampala and the UETCL Environment Officer to ensure implementation of sanitation requirements. Periodic inspection by DEO of operational status of on-site sewage facilities.	UETCL
Solid Waste Localized impairment of air quality during burning of solid non oil contaminated waste on-site	Implementation of Good Site Practices consisting of: • systematic collection and protected-storage on site • a waste management program consisting of reduction, reuse and recycling of materials • burning of waste as a last resort and only when disposal impractical only dry, clean-burning material (wood, cardboard, paper, dry vegetable material) to be burned	Regular checks by the DEO Kampala and the UETCL Environment Officer to ensure implementation of waste management practices.	UETCL

Other Waste Contamination from spillage or disposal of fuels, lubricants, oils and solvents on the construction site.	Contractors to recover all liquid wastes (used oil, drained hydraulic fluid, spent solvents, etc.) in sound, labelled containers. Wastes to be stored in weather-protected areas having secondary containment for spills. Prohibition on dumping of any contaminating material into the environment, including waste oils Storage and routine handling of fuels, lubricants and other potentially contaminating substances in a weather-protected area having secondary containment for spills. Implement spill prevention procedures and a spill contingency plan. Have available on site all equipment and materials required to execute a clean-up. All wastes recovered during cleanup operations to be collected and stored in labelled and secure containers for subsequent disposal by on-site high incineration	Regular checks by the DEO Kampala and the UETCL Environment Officer to ensure implementation of waste management practices. Regular checks by the DEO Kampala of waste storage area. Contractors report all spills greater than 5 litres to the UETCL site supervisor. UETCL will notify the appropriate Ugandan and Kampala agencies of any reportable spills.	UETCL UETCL
Traffic Community disturbance and potential hazard.	Provide safety training for truck drivers. Contractors to implement safety programme (signs, speed restrictions, lights on trucks, truckload restrictions, equipment inspections (brakes, horn, etc).	Periodic inspection of vehicle safety equipment. UETCL Environment Officer and DEO Kampala to investigate and report upon all spills associated with the project.	UETCL

Occupational Health and Safety Hazards Safety and well being of on-site personnel.	Implement UETCL Health and Safety Plan and require contractors and sub-contractors to comply with the plan and with Ugandan health and safety requirements.	Regular checks by UETCL to ensure implementation of site safety procedures. UETCL to review the monthly site safety reports.	UETCL
OPERATION PHASE			
Air Quality Increased ground level concentrations of NO_X, SO_X, and particulate matter.	Utilise for e.g. Wärtsilä engines with advanced combustion control technology. Operate the Plant on either diesel or HFO of 1.9% or lower sulphur content	Six monthly monitoring of meteorological conditions and ground level concentrations of NO_2, SO_2 and PM for the lifetime of the project. Monitoring of plant stack emissions, using direct and surrogate methods.	UETCL
Noise Noise levels at nearby receptors.	Plant should be in an acoustically insulated powerhouse, and layout should direct noise away from the settled area. Exhausts and air intakes should be equipped with silencers to reduce the noise level at source by about 35 dB (A).	Measure noise levels at Commissioning and annually thereafter.	UETCL/NEMA
Sanitary Waste Spread of disease vectors. Odours.	Provision septic tanks for Safe disposal of on-site sewage.	Periodic checks of facility by District Health Inspectors and UETCL Environment Officer to ensure continuing proper functioning.	UETCL

Solid Waste			
Uncontaminated and oil contaminated waste	Implementation of Good Site Practices consisting of: • Systematic collection and protected-storage on site A waste management program consisting of reduction, reuse and recycling of materials.	Periodic checks by UETCL environmental officer to ensure that on-site waste management procedures are followed.	UETCL
Other Waste			
Release of sludge, waste oil, hydraulic fluid, paint, solvents, and similar materials into the environment.	Dumping or burial of any potentially contaminating waste product will be strictly prohibited.	Ongoing program to ensure proper training of personnel who operate systems to treat hydrocarbon wastes.	UETCL
	Dumping or burial of any potentially contaminating waste product will be strictly prohibited.		
	All oil-contaminated drainage from the power house floor pits; fuel unloading areas; and fuel, lubricating oil and used oil storage tank areas should flow to a sump from which it has to be pumped to an oily water settling tank. Oily-water separating from sludge in the sludge storage tanks should flow to the oily-water settling tank.	Periodic maintenance and inspection of environmental systems to ensure continuing proper operation.	UETCL
	Water separated from oil in the oily-water settling tank should be pumped to a sludge treatment unit, with the oil residue returned to the sludge tank. The sludge treatment unit should consist of two settling tanks where oil in water emulsions are broken down using a flocculent chemical and a pH adjuster, and two filter tanks where the separated water is passed through carbon. The water released to the environment from the carbon units should meet the World Bank criterion of 10 mg/l of oil and grease for discharge to the environment.	Monitoring of discharged treated water to verify compliance with guidelines.	UETCL

Accidental Spills Fuel spills or other contaminating waste.	Areas where significant oil spillage could occur (e.g., couplings of fuel unloading systems) should be protected by a spill interception structure, which drains back to a sump where the spillage can be recovered. UETCL should develop a facility-specific "Spill Prevention, Control, and Contingency Plan", outlining plant environmental design features; spill prevention and control procedures; and an oil spill contingency plan. The format of the plan will conform to the generic "Spill Prevention, Control, and Contingency Plan" developed by the generator manufacturer or similar facilities world-wide. During mobilisation materials and equipment required to respond to the various types of potential spill incidents will be identified and procured as part of the process of developing the spill contingency plan.	Periodic (6 monthly) monitoring of water discharged to surface drains to ensure that criteria are being met and that systems are operating as per specifications. Montly testing and checks of spill response readiness, and emergency response equipment and material.	UETCL/DWD

Health and Safety Health and well-being of on-site personnel	Design and implement a comprehensive occupational health and safety program that addresses all aspects of worker health and safety relevant to the operation of a power plant. Develop a facility-specific safety manual based on internationally accepted 'best practice'. Implement medical examinations of all employees to establish the health baseline of new employees at the time of hiring. Regularly reassess each employee's health and physical conditions, including hearing acuity.	The UETCL Safety Officer and safety committee should monitor and report upon health and safety conditions within the plant on an ongoing basis. Ongoing monitoring of employee health and hearing acuity status.	UETCL
ENVIRONMENTAL, HEALTH AND SAFETY MONITORING PROGRAMME			
ISSUE/CONCERN	MONITORING METHOD	MEASURED PARAMETER	FREQUENCY OF MEASUREMENT
Air Quality (Emissions)			
SO_X	Stack Emissions	Calculated from sulphur content in Fuel using ISO/CD 8178-1, or principally similar method.	On Commissioning and annually thereafter.
	Fuel Quality	Analysis of sulphur content in Fuel provided by independent analysis under the Fuel Supply Agreement (FSA).	Testing of each fuel shipment received and at least 4 random samples per year.

NO_X	Stack Measurements	Measured using EPA Method 7E – Determination of nitrogen oxides from stationary sources. Instrumental analyser method, or principally similar method.	
	Engine Operations	Engine fuel injection timing and charge air-cooling water temperature.	Recorded continuously by Plant data-loggers.
PM	Stack Measurements	Measured using ISO 9096: Stationary source emissions – Determination of particulate material in gas-carrying ducts. Manual gravimetric method, or similar method.	On Commissioning and annually thereafter.
	Fuel Quality	Analysis of ash content in Fuel provided by independent analysis under the Fuel Supply Agreement (FSA).	Testing of each fuel shipment received and at least 4 random samples per year
Ambient Air Quality			
SO_2 and NO_2	Continually analysed at agreed location	24 hour and annual averages	For life of project – transfer of monitoring programme to NEMA
PM	High Volume Sampler at agreed location	24 hr averages	For life of project – transfer of monitoring programme to NEMA
Climatic Conditions	Automatic meteorological recording station or obtained from Kampala	Wind speed and direction, temperature, humidity	For life of project – transfer of monitoring programme to NEMA

Other Issues			
Plant Noise	Measuring Plant at 100% full load operation using an integrating noise analyser.	Time averaged measurements at receptors outside the Plant boundary	On Commissioning and annually thereafter.
Social Concerns	Nomination of a Community Liaison Officer for the Plant	Comments from community	At the beginning of construction and as required thereafter.
Occupational Health and Safety	Reporting of accidents, incidents, and safety breaches.	Safety report and statistics	Monthly for life of project – including construction
Water Quality	Automatic continual analysis	• PH	On Commissioning and continually thereafter
	Grab samples of discharge from oily water treatment unit.	Oil and grease	On Commissioning and quarterly thereafter
	Grab samples taken for laboratory analysis from oily water treatment unit.	• Total suspended solids Total chromium, copper, iron and zinc	Quarterly for life of project

RESPONSIBILITIES AND DURATION OF MONITORING AND MITIGATION ACTIVITIES			
Activity	**Estimated Duration and Timing**	**Monitoring**	**Mitigation**
1. SO_x, NO_x, and PM Emissions	• On commissioning and continually thereafter	Contractor during Commissioning and O&M Operator thereafter	Contractor during Commissioning and O&M Operator thereafter
2. Ambient Air Quality	• For six months prior to start-up, on commissioning, and continuously thereafter	UETCL Power Company	UETCL Power Company
3. Noise Emissions	• Prior to start-up, on commissioning and annually thereafter	Contractor during Commissioning and O&M Operator thereafter	Contractor during Commissioning and O&M Operator thereafter
4. Waste Water Emissions	• On commissioning and continually thereafter	Contractor during Commissioning and O&M Operator thereafter	Contractor during Commissioning and O&M Operator thereafter
5. Adoption of Environmental Policy	• At commencement of construction and ongoing thereafter	UETCL Power Company with the Contractor up to Commissioning and with O&M Operator thereafter	N/A
6. Employee Environmental Training	• As part of EPC and O&M mobilisation and as needed thereafter	EPC Contractor and O&M Operator	N/A
7. Assignment of Community Relations Officer	• At start of construction and as needed thereafter.	UETCL Power Company	N/A
8. Maintenance of Operations Manuals	• As part of O&M mobilisation and as needed thereafter.	O&M Operator	N/A
9. Occupational Health and Safety Monitoring	• At start of construction and ongoing thereafter.	UETCL Power Company with the Contractor up to Commissioning and with O&M Operator thereafter	N/A
10. Noise Emissions	• Prior to start-up, on commissioning and annually thereafter	Contractor during Commissioning and O&M Operator thereafter	Contractor during Commissioning and O&M Operator thereafter
11. SO_x, NO_x, and PM Emissions	• On commissioning and continually thereafter	Contractor during Commissioning and O&M Operator thereafter	Contractor during Commissioning and O&M Operator thereafter
12. Ambient Air Quality	• For six months prior to start-up, on commissioning, and continuously thereafter	UETCL Power Company	UETCL Power Company

13. Noise Emissions	• Prior to start-up, on commissioning and annually thereafter	Contractor during Commissioning and O&M Operator thereafter	Contractor during Commissioning and O&M Operator thereafter
14. Waste Water Emissions	• On commissioning and continually thereafter	Contractor during Commissioning and O&M Operator thereafter	Contractor during Commissioning and O&M Operator thereafter
15. Adoption of Environmental Policy	• At commencement of construction and ongoing thereafter	UETCL Power Company with the Contractor up to Commissioning and with O&M Operator thereafter	N/A
16. Employee Environmental Training	• As part of Contractor and O&M mobilisation and as needed thereafter	Contractor and O&M Operator	N/A
17. Assignment of Community Relations Officer	• At start of construction and as needed thereafter.	UETCL Power Company	N/A
18. Maintenance of Operations Manuals	• As part of O&M mobilisation and as needed thereafter.	O&M Operator	N/A
19. Occupational Health and Safety Monitoring	• At start of construction and ongoing thereafter.	UETCL Power Company with the Contractor up to Commissioning and with O&M Operator thereafter	N/A

Activity	Estimated Duration and Timing	Approximate Cost (US$)
1. Assignment of a senior manager responsible for environmental management	• At start of construction, and ongoing for the life of the project.	Included as part of project development and operations costs
2. Assignment of a senior manager responsible for environmental management	• At start of construction, and ongoing for the life of the project.	Included as part of project development and operations costs
3. Preparation of TPC Health and Safety Plan	• Already issued to EPC and O&M contractors and included in contract documents. To be updated as necessary for the life of the project.	Included as part of project development and operations costs
4. Preparation and Implementation of TPC Spill Prevention, Control and Contingency Plan	• At start of O&M mobilisation, and up-dated as necessary for the life of the project.	Included as part of project development and operations costs
5. Assignment of a senior manager responsible for environmental management	• At start of construction, and ongoing for the life of the project.	Included as part of project development and operations costs
6. Preparation of TPC Health and Safety Plan	• Already issued to Contractor and O&M contractors and included in contract documents. To be updated as necessary for the life of the project.	Included as part of project development and operations costs
7. Preparation and Implementation of TPC Spill Prevention, Control and Contingency Plan	• At start of O&M mobilisation, and up-dated as necessary for the life of the project.	Included as part of project development and operations costs
8. Implementation of UETCLSafety Manual	• At start of O&M mobilisation, and up-dated as necessary for the life of the project.	Included as part of project development and operations costs

9. SO_x, NO_x, and PM Emissions Monitoring	• Direct exhaust gas analysis for NOx and PM on commissioning and annually thereafter • Sulphur emission measurements using ISO/CD8178-1 on commissioning and annually thereafter • Fuel quality testing quarterly and for each new batch • Continuous engine efficiency monitoring	$20,000 per year
10. Ambient Air Quality Monitoring	• On commissioning and then ongoing for the life of the project	
11. Noise Monitoring	• on commissioning and annually thereafter for the life of the project	
12. Waste Water Monitoring	• At plant start-up and ongoing thereafter for the life of the project	
13. Adoption of Environmental Policy	• At start of construction and then ongoing for the life of the project	Included as part of project development and operations costs
14. Employee Environmental Training	• As part of O&M mobilisation and ongoing as needed	Included as part of training costs
15. Assignment of Community Relations Officer	• At start of construction, as part of O&M mobilisation, and ongoing as needed	Included as part of project development and operations costs
16. Modification of Operations Manual	• As part of O&M mobilisation and as necessary thereafter	Included in O&M contract costs
17. Occupational Health and Safety Monitoring	• On start of construction and ongoing thereafter for the life of the project	Included as part of construction and operations contracts
Total Estimated Costs	**$20,000**	

9.0 CONCLUSION AND RECOMMENDATION

The EIA is an important basis for making a meaningful decision on whether a planned project should be implemented or not. An EIA should conclude with a "yes" or "No" towards implementation of a project, and a "yes" stating clearly under which conditions and requirements should the project be implemented.

A range of criteria should be put forward as the basis for the conclusion in the EIA, including:

- Is there a need for the project?
- Have various alternatives for meeting the need been considered?
- Is the project environmentally, socially and economically acceptable?

In the case of the proposed thermal-power plant at Mutundwe in Kitaluuzi zone, there is a strong justification for its construction largely due to increased power rationing that has been caused by a considerable drop in the water levels of Lake Victoria. The project is likely to have minimal negative impacts on the environment. However, the few identified significant potential negative impacts can be mitigated.

The study therefore recommends that the project be implemented as soon as possible while the Developer implements mitigation measures recommended by the EIA Team. The Developer is thus charged with the responsibility of all the measures recommended by the study in order to ensure and maintain the environmental quality of the area.

10. PUBLIC CONSULTATION

Throughout all the stages of the EIA, the study team sought public opinion/views on environmental and social aspects of the thermal-power plant at Mutundwe. The methods used included Focus Group Discussions (FGDs) using structured questions to guide the discussions.

10.1 Consultation with community and stalk holders

Public consultation with the affected people living within 100m radius of the project site has been carried out. This included FGDs and Key Informant Interviews. Community views and opinion of the key informants on the on going project have been noted. In addition, a total of 16 households within 100m radius from the project site were consulted through the use of household questionnaires. Areas of discussion and interviews included socio-economic and environmental issues of the project. Brief discussions of some of the issues are highlighted below.

Socio- economic

There are about 16 households living within 100m zone of the project site. These people were mainly landlords and derived their income from rent. Most of the houses in the zone are permanent with very few temporary structures. Shanty structures do not exist around the project site. However, a few households (about 15%) practiced subsistence farming (sweet potatoes beans, cassava, matooke), brick making and petty trade (hawker, retail traders, motorbike hires).

Expectation of the people

Most people consulted are excited about the project though others have mixed feelings. Those excited believe that power is coming nearer to them and thus will become cheaper.

The minutes of a Consultative Meetings that was carried out in Mutundwe

Present at the above meeting were the following members.

1. Hellen Naigaga
2. Leonora Nassanga
3. Karyesubula Tadeo
4. Nabazirwa Dorothy
5. Ibrahim Muyombya
6. Kibuka Alozius

7. Nsubuga Godfrey
8. Lwanga Andrew
9. Sandra Nanka
10. Musoke Joseph
11. Muyanja Roberto

Venue: Mutundwe Village in the northern wing of the UETCL substation at the LC1 Chairman's home.

Date: 18/01/2006

Agenda:

1. Briefing from the EIA study Team Leader
2. Issues of Environmental and social concern arising from the briefing
3. A.O.B
4. Conclusion

Minute 1. Briefing from the Team leader. The Team Leader Ms. Aisu Elizabeth started by welcoming all the participants to the consultative meeting. She informed members on the purpose of the meeting.

She further highlighted to the participants issues to be discussed during the meeting that included the following:

- creation of awareness about the project in the area;
- identification of potential impacts of the project; and
- obtaining recommendations.

Minute 2. During the meeting the following potential impacts of the project were identified. These included both positive and negative impacts.

Positive impacts

- increase of electricity supply in the area;
- creation of jobs in the area;
- increasing the value of the area; and
- providing market for the local produces.

Negative impacts

- increase of noise in the area;

- possibility of emissions pollution the with its associated adverse health effects; and
- the possibility of resettlement due to future need for expansion of the plant.

The participants agreed upon the following recommendations.

- provision of adequate devices to control noise within acceptable national standards; and
- utilization of appropriate technology to limit or control emissions to acceptable levels.

Minute 3. A.O.B The community members promised to corporate with the developer. They showed willingness to work with the developer.

Minute 4 Conclusions. The Team Leader thanked the participants and assured them that their concerns would be put under consideration during the project development. Finally, the LC I Chairman of the village thanked both the EIA Team and participants and wished them a safe journey back home.

APPENDICES

APPENDIX 1: REFERENCES

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The Daily Monitor Newspaper, May 2nd, 2005. Article titled " Cheeye, Bumba clash over thermal project". Monitor Publications. Kampala, Uganda.

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WB (World Bank) 1998. Pollution and Abatement Handbook; thermal power: Guidelines for New plants. The World Bank. Washington D.C.

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WB (World Bank) 1999c. Good Practices 4.01: Environmental Assessment. World Bank, Washington, D.C.

WCED (World Commision on Environment and Development) (1987). *The Brundtland Report: Our Common Future.* United Nations.

APPENDIX 2: List of Birds

The list of birds recorded at the proposed 133/32 kV substation at Mutundwe.

Hammercop (*Scopus umbreta*)

Black-headed Weaver (*Ploceus cucullatus*)

Black Kite (*Milvus migrans*)

APPENDIX 3: The list of plants

Eucalyptus grandis
Syzgium cumini (Jambola)
Measopsis emini
Spathodea campanulata (Flame tree)
Mangifera indica (Mango tree)
Coffea robusta (Coffee bush)
Artocarpus heterophyllus (Fenne)
Milicia excelsa (MWule)
Jacaranda minosifolia
Psidium guajava (Guava tree)
Aleurites molucana (Kabaka Nzagala)
Markhamia Lutea

APPENDIX 4: List of persons consulted

NEMA EIA Coordinator Mr. Wasswa
KCC officials
Rubaga Health Inspector Katwere David
Chairman LC I Musoke Joseph

Residents of Kitaluuzi zone Mutundwe Parish

1. Hellen Naigaga
2. Leonora Nassanga
3. Karyesubula Tadeo
4. Nabazirwa Dorothy
5. Ibrahim Muyombya
6. Kibuka Alozius
7. Nsubuga Godfrey
8. Lwanga Andrew
9. Sandra Nanka
10. Musoke Joseph
11. Muyanja Roberto

Uganda Electricity Transmission Company Limited (UETCL)

William Nkemba
Andrew Geno
John Othieno

APPENDIX 5: Terms of Reference

Environmental Assessment for Namanve, Mutundwe and Lugogo Substations New Thermal Power Plants and Resettlement Action Plans for Namanve, Mutundwe and Lugogo Substations New Thermal Power Plants and Environmental Audit of Agrekko Thermal Power Plant

Terms of Reference

Background

1. Uganda experiences an increased shortage of power, as a consequence of low water levels in Lake Victoria. To alleviate the power shortage the UETCL (Uganda Electricity Transmission Company Ltd.) in collaboration with IDA (International Development Association) are planning the construction of a 50 MW thermo-power plants, with Heavy Fuel Oil as fuel, on the premises of the Namanve and Mutundwe substations. Additional land might need to be acquired. Part of this land is the property of UETCL, but is presently used for brick making and annual crops by nearby residents respectively. There is no need for a transmission line.

2. On the premises of the Lugogo substation Agrekko has constructed an emergency 50 MW thermo-power plant under a three year contract. The World Bank will likely finance the capacity payments. For this reason the Agrekko plant needs an Environmental Audit. The TOR for this audit is included in the present ToR.

3. After the contract with Agrekko is finished the UETCL plans the construction of a cheaper thermo-power plant on the premises of the Lugogo substation site. The ToR for the Environmental Assessment for this new thermo-power plant is included in this ToR.

Objectives of the ToR

4. Consultants will be commissioned to prepare the Environmental Assessments (EA) for the new thermo-power plants to be located on the Namanve, Mutundwe and Lugogo substation premises and to carry out an Environmental Audit for the existing Agrekko thermo-power plant located on the premises of the Lugogo substation. The three EAs and the Environmental Audit can be published in one report called EAA. The consultants also need to prepare an abbreviated Resettlement Action Plan (RAP) for the potentially affected people at the impacts

of the project on aspects of the environment (social e.g. human health, human quality of life, biological and physical), and if needed to consider alternative sites for facilities or design mitigation methods for achieving the results expected from the project and propose and fully justify optimal choices that would minimize or avoid potential impacts, and to design an environmental and social management plan (ESMP) to address and mitigate impacts that cannot be avoided. The EAA will also identify measures for environmental enhancement and sustainability that may be desirable to put into place. The ESMP will describe in detail the, mitigation measures to be carried out; the costing, scheduling and organizational capacity required to implement such measures; detailed monitoring process and schedule; and any social and environmental management capacity building and institutional strengthening support that may be required for the responsible institutions involved in the project. A Resettlement Action Plan (RAP) will be prepared, based on the identification of any need for land acquisition, displacement of families or businesses (including squatters), compensation for crops or other income-generating assets and loss of access to income-producing resources. The EAA and RAP will be prepared in accordance with and be fully responsive to IDA's "safeguard" operational policies, notably OP 4.01 (Environmental Assessment) and OP 4.12 (Involuntary Resettlement). Upon acceptance by the client, the documentation will be submitted to IDA in support of the proposed project. The documentation will need to be disclosed in Uganda and in the Infoshop in Washington DC prior to appraisal of the project by the World Bank.

5. The consultant will prepare an EAA, including three Environmental Assessments and one Environmental Audit and a Resettlement Action plan to World Bank safeguard policy standards and environmental and safety guidelines. The current versions of the relevant policies are found at the World Bank website, www.worldbank.org and a full set of Environmental and Safety Guidelines can be found at www.ifc.com. Among the key tasks to be carried out are those, which follow, but the full array of information and analysis that the policies require should be included in the work carried out.

1. Environmental Assessments and Audit

Objectives of the environmental Assessments and Audit

6. The objective of the environmental assessments (EAs) is to determine the environmental impacts on people, on the environment of new thermo-power plant and how to manage these impacts in compliance with World Bank Safeguard

Policies. The consultants should also assess the green house gas emissions of the new power plants.

7. The objective of the environmental audit is to identify present pollution, especially pollution and noise pollution and its potential costs to improve the situation, inadequate environmental management, and occupational health and safety issues in the facilities to be financed and to determine the need for remedial actions necessary to bring these facilities into compliance with World Bank Safeguard Policies and to recommend actions to improve and strengthen environmental, health and safety management at the plant.

Scope of Work

8. The consultant will for the Environmental Assessments carry out following at the Namanve, Mutundwe and Lugogo substations sites:

- Establish an appropriate baseline for environmental, social, health and safety issues. The consultants should establish among others a baseline for air and noise quality in the project area and assess impacts of air pollution and noise in the project area and develop a simple air quality monitoring program;
- Preparation of an oil spill emergency plan;
- Establish an inventory of greenhouse gas emissions and abatement plan;
- Identify environmental, health (e.g. HIV/AIDS) and safety impacts of the new investments during construction and operation;
- Prepare analysis of alternatives, e.g. various sites for new thermo-power plant, including the no object alternative. The selected site should take economic, technical, social and environmental parameters into consideration;
- Identify hazardous chemicals used during construction and operation;
- Develop draft environmental regulations for the electricity sector (if not existing), including inter alia, the monitoring and mitigation of emissions (e.g. air), noise as well as soil and ground water hydrocarbon contamination. The new facilities need to comply with existing Ugandan legislation and with World Bank Safeguard Policies and Guidelines (Environmental and Safety Guidelines);
- Provide an institutional strengthening plan, prepare an Environmental and Social Management Plan (ESMP), identify responsibilities and costs for its implementation;
- Carry out a public consultation on the draft Environmental Assessment and Audit Reports with affected people, interested people and local NGOs. The public consultation should be a separate chapter in the EA report, while minutes of the public consultation meetings need to be presented in an annex (when were

meetings held, who attended, major concerns, how addressed in documentation, etc.).

9. The Environmental Assessments and Audit will be carried out in two phases:

Phase I: Meetings and Review

10. There will be initial briefing meetings between the consultant and UETCL's management and relevant staff, as well as relevant government representatives.

11. With UETCL's assistance, the consultant will (a) gather and review all existing relevant in-house documentation, including compliance records; (b) study available historical information; and (c) perform visual inspections of the sites to be financed.

12. The consultant will review Uganda's relevant existing and pending environmental legislation, standards, and permits, as well as the country's occupational health and safety legislation. In conjunction with this national legislation, the consultant will also review the relevant policies of the World Bank and its environmental, health and occupational health and safety guidelines, including the Pollution Prevention and Abatement Handbook.

Phase II: Setting Priorities

13. The consultant will for the Environmental Audit carry out the following at the Lugogo site:

- Identify all environmental (e.g. air and water emissions, hazardous wastes, etc.) and occupational health and safety concerns related to both, past and ongoing activities in the facilities to be financed;
- Visit areas where practices of waste management, storage and the use of dangerous substances may have caused contamination (e.g. hydrocarbons pollution);
- Assess hazards or risks of local communities and the adequacy of procedures for warning and emergency responses; consult with community leaders, if appropriate;
- Prepare a prioritized list of concerns (i.e. high, medium, low) related to ongoing activities in the facilities to be financed;
- For both, past and ongoing environmental and health and safety concerns in the facilities to be financed, provide recommendations and cost estimates as to what rehabilitation and clean-up measures are required;
- Review the capacity of Government of Uganda to monitor the execution of the remediation;

- Make recommendations and cost estimates for the implementation of the remediation action plan in the sector should be presented separately for the past and ongoing activities, and in relation to both, Uganda and World Bank policies and standards. (World Bank Safeguard Policies and Guidelines, such pollution prevention and abatement Handbook can be found on www.worldbank.org / development topics / environment and the www.ifc.org). The consultant should develop a Draft Environmental and social Management plan to be discussed with UETCL. Recommendation should also include an indication and cost estimate of training needs in the sector to ensure efficient implementation of the Environment and Social Management Plan;
- Verify which other World Bank Safeguard Policies may apply. The consultants should especially check if the World Bank Involuntary Resettlement Policy is triggered by land acquisition and/ or resettlement (see other part of this ToR).

II. Resettlement Action Plan (RAP)

13. The RAP should be prepared by an experienced resettlement specialist consultant. The resettlement action plan is the instrument by which people, who lose land, physical assts, or rights of access to resources necessary for their income, whether temporarily or permanently, are compensated for their losses and afforded realistic opportunities to increase or at least to restore their incomes and standards of living. It includes both the background information and the analyses necessary for designing an action plan to achieve goals and the action plan it. It will include the following sections:

I. PROJECT INTRODUCTION. This will provide the project description and the overall context and justification for the project. In particular, it will describe each part of the project "footprint", that is, each separate facility, or construction site, including any access roads, quarries or borrow sites, work camp areas, or any other location needed for the project, whether temporary or permanent.

II. MEASURES TO MINIMIZE LAND ACQUISITION AND LOSSES. This section is the "alternatives analysis" for the resettlement plan. It will set out any alternatives that were considered that would reduce or eliminate social impacts, and show how the alternatives chosen minimize the acquisition of property and other assets that people will suffer.

III. LEGAL BACKGROUND. This section will review the national and legal background to land taking and resettlement, and current practices, including any standard organizational frameworks that are relevant to this sector or project. It will compare laws, entitlements, eligibility and practices of the government with those required under World Bank Operational Policy on Involuntary Resettlement (OP4.12). It will review any gaps perceived between the national policies and those of the World Bank, and it show how both national and World Bank policies can be implemented within the project. It will recommend resolution methods for any contradictions that may be seen to be significant.

IV. CENSUS AND SOCIO-ECONOMIC SURVEYS. This section will provide the results of ethnographic information, enumerations and socio-economic surveys carried out to establish the baseline data against which both impacts and the eventual adequacy of compensation, and recovery of incomes and, living standards, can be measured.

V. PROJECT IMPACTS. This section will describe the types of project activities during both construction and operation, and will specify the types and seriousness of impacts on the affected people at each site of project activities.

VI. RESETTLEMENT POLICIES AND ENTITLEMENTS. Here the policies to be applied on two major issues will be set out. A section on eligibility will discuss what types of people will or will not qualify for measures under the project. It will discuss the "cut off date" set up, after which new arrivals in the project area will be not to be eligible for project benefits. A section on entitlements will describe (possibly different types of) compensation or other compensatory measures. A matrix format, showing people and forms of compensation will summarize the eligibility and types of compensation that will be included in the implementation plan. A section on how inventories of losses will be done, and how assets lost will be evaluated, will also be included.

VII. RESTORATION OF INCOMES AND STANDARDS OF LIVING. This section will demonstrate how policies to be applied, and the settlement and other compensatory measures to be implemented, will

meet the objectives of the plan and the policy. If such measures include any plans to provide training, investment resources, outreach programs, or other special activities as means toward restoring incomes and standards of living, they will be described in this section. The plans to provide alternatives sites and/or house construction will also be in this position.

VIII. INSTITUTIONAL ARRANGEMENTS. This section will include descriptions of the organizations and interaction by which the resettlement action plan will be carried out. It will fully describe the process which implementation will take place.

IX. PUBLIC PARTICIPATION. This section will show how the affected people have been consulted in the overall process of planning for their displacement, and how they will participate in the future. It will describe any committees or other bodies in which they have participated or will participate. An annex will give the details of consultations held before and during RAP planning, including dates of meetings and attendance at each. It will demonstrate that people were fully involved and understood the actions that would be undertaken during implementation.

X. COMPLAINTS AND GRIEVANCES. This part will describe mechanisms by which people can register objections to activities undertaken during the planning and implementation of the project, and the mechanisms for redressing grievances. It will show how these actions will be accessible to ordinary affected people, and will ensure a process that is fair and equitable, with an option for recourse to formal judicial systems if project mechanisms fail.

XI. MONITORING AND EVALUATION. Set out the plans for monitoring performance of the Resettlement Action Plan and evaluating its effectiveness. Name the institutions, which will be involved in this process.

XII. BUDGET. Give a detailed budget for the implementation of the resettlement activities, with notes on the control and flow of funds. Identify the sources of different of funds, as the World Bank cannot always pay for land or for cash transfers, including compensation.

XIII. TIMETABLE. Using standard formats, set out the timetable for resettlement implementation. Show how it is integrated into the timetable of physical works, show that no one loses assets or is forced to move before he or she has been compensated and, if relevant, is able to move to the permanent new site.

XIV. ANNEXES. Possible annexes may include those on: legal review (law by law); detailed description of occupation of land traversed and to be affected; statistics on those affected; inventories of losses, or templates for inventories to be carried out later; statistics on temporary land occupation; statistics on permanent land acquisition; affected structures; the record of consultation meetings; a list of report and people seen or involved in the preparation of the RAP; and a map of the sites involved and the project area.

Reporting Requirements

15. The consultant will prepare three draft environmental assessments and audit report (could be one volume) after 5 weeks. Comments by the Government and the World Bank should be sought. Comments by the Ugandan Government and the World Bank should be integrated to produce the final report, which should be finished after the contract period of 6 weeks in total. The report should be written in English, and should include and Executive Summary in English. The reports should contain relevant maps and photographs. The draft report will be finalized only after approval by the Government of Uganda and the World Bank.

16. The report should, if necessary, develop a prioritized remediation plan and an Environmental and Social Management Plan and its costs, define the institutional responsibilities for the implementation of these plans and a time frame for its execution; define the roles and responsibilities of the agencies in the monitoring and evaluation of clean-up and for regular follow-up, such as monitoring of air, noise, water emissions and production and management of hazardous waste products.

Environmental Assessment and Audit and Resettlement Team Skills

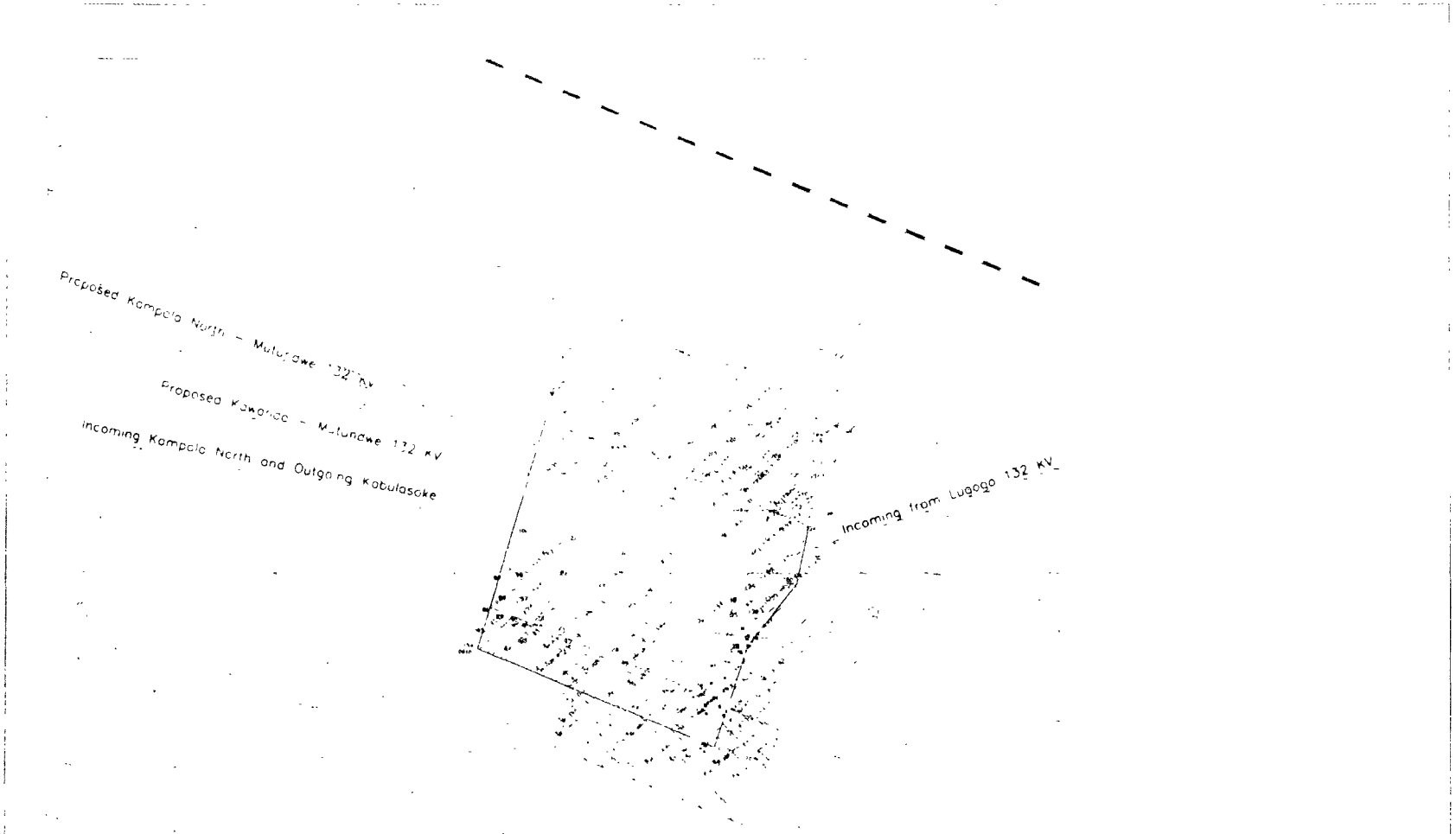
17. An international environmental assessment and/or audit specialist, and one or two local consultants should have at least 10 years of relevant international competence in preparing environmental impact assessments and in preparing environmental auditing. The international specialist should have experience in air

quality measurements and monitoring. The environmental team should possess the necessary auditing/assessment skills as well as in depth knowledge of the environmental aspects of the electricity and water sectors. The team should also include one social scientist with at least 10 years of experience in the preparation of resettlement action plans. The team should be fluent in English, and work experience in Africa would be desirable.

Budget and Timetable

18. This assignment should require a total of 4.5 man months, and should be accomplished within 6 weeks after mobilization of the consultants.

APPENDIX 6: Map of Project Area



KEY

EXISTING LINE

PROPOSED LINE

2.385 ACRES EXISTING LAND

[illegible] ACRES LAND TO BE ACQUIRED

UGANDA ELECTRICITY TRANSMISSION
COMPANY LIMITED
P.O.BOX 7625 KAMPALA

[illegible] THERMAL POWER PLANT AT MUTUNDWA

Approved By:

Drawn By: NS

Date: July 2008