E1319
VOL. 4

Uganda Electricity Transmission Company Limited

Environmental Impact Statement for the Proposed Kiira Thermal Power Plant

DRAFT FINAL REPORT

By

EMA Consult limited

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MARCH 2006

TABLE OF CONTENTS

Acknowledgements

The Environmental Impact Assessment Team for the proposed construction of emergency thermal-power plant near the Kiira Hydroelectric Power Dam, Jinja 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 Jinja District 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
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
MSDS	Material Safety and Data Sheet.
MW	Megawatt
Mwh	Megawatt – hour
MSDS	Materials and Safety Data Sheet
NEMA	National Environment Management Authority
NEMP	National Environment Management Policy
NGO	Non-Governmental Organization
NO_2	Nitrogen dioxide
PM	Particulate Matter
SO_2	Sulphur dioxide
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 100 MW thermo-power plant near the existing 200 MW hydro power plant at Kiira in Jinja in order to meet the increasing power demand in the country. The Company had proposed UEGCL Construction Observation Point owned by Jinja Municipal Council as one of the possible sites for the contruction of the thermal power plant. Also proposed as an alternative site to the Construction Observation Point is the Spencon Yard, under the leasehold of Spencon Company, located to the south of the dam. Of the two proposed sites, the Contruction Observation Point was assessed by the EIA Team to be environmentally feasible for the construction of the 100 MW thermal power plant.

This Environmental Impact Assessment (EIA) provided information on the potential negative and positive environmental and social impacts of the project. 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. Recommendations for the mitigation of the potential negative impacts and enhancement of the positive ones were made by the Study Team.

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

Project Description

The Kiira Thermal-Power Project will comprise 100 MW auto Engine-Driven diesel power plant that will be constructed near the existing Kiira hydropower plant. The recommended site, which will involve acquiring new land belonging to the Jinja Municipal Council, is the Construction Observation Point located to the east of the Victoria Nile River close to the Kiira Hydropower Station. The site is already classified as industrial although few settlements and petty commercial 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 Kiira hydropower station.

Project Setting

The required 3.5 acre piece of land will be acquired from the Construction Observation Point in Kimaka A Village located less than 1 Km to the east of Kiira Hydropower Station. The site is devoid of settlements and will not require any more opening of an access road since one already exists.

Project Impacts

The potential 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 of 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. For example, during the construction phase, many people are expected to move into the area in search for employment. Consequently, there is a likelihood of social disruption, spread of diseases, particularly HIV/AIDS, and road accidents. 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 as well as the quality of water in the Victoria Nile River and drinking water of the surrounding community.

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

1.0 INTRODUCTION

1.1 BACKGROUND

In Uganda, power demand is increasing at 8% (an equivalent of 24 MW per year) due to economic growth. According to the Electricity Regulatory Authority (ERA), the inability to generate extra power to meet this demand has led to insufficient electricity supply that has contributed to constant load shedding (The New Vision, 2006). This is evident as electricity consumption in the evening is about 350 MW yet the country generates only 250 MW, leaving a shortage of 125 MW during the evening hours. 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 reduced the hydro electricity generation in the country.

Power generation at both the Nalubaale 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 100 MW thermo-power plant near Kiira hydropower station in Jinja. Three and half acres of land is needed for the construction of the power plant. Uganda Electricity Transmission Company Ltd has identified two possible areas from which land is to be acquired. One possibility is the piece of land referred to as the 'Construction Observation Point' located in Kimaka A village belonging to the Jinja Municipal Council. This piece of land is located to the east of the existing Kiira Dam and is currently being used as an Observation Point by the Uganda Electricity Generation Company Limited (UEGCL). Another is the land located to the south of the dam, presently under the leasehold of Spencon which will be called as 'Spencon Yard'. Uganda Electricity Transmission Company intends to acquire one of these sites for the development.

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 the likely consequences of development actions thereby assisting them in making environmentally and socially 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 ultimately making development efforts more environmentally and socially 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.

1.2 THE EIS REPORT

The EIS is for the construction of a thermal-power plant near the 200 MW Kiira hydropower station in Jinja District. It 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 management and monitoring plan to ensure compliance.

Structure

The structure and format of the report are in conformity to both the local and international guidelines (i.e., NEMA EIA guidelines and the World Bank Source Book) for the structure of an EIS.

The main sections are as outlined:

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

Chapter 1: This chapter describes the EIS 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.

References

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

1. List of birds recorded near Project site.
2. List of persons consulted.
3. Ambient Noise Levels, Kimaka Village.
4. 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 ESIA for the proposed 100 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 one 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 Kiira 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 Jinja Municipal authorities and Spencon Company for the 3.5 acre piece of land it requires for the construction of the thermal-power plant. The EIA Team consulted both parties 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. Jinja Municipal Authority and Spencon Company will have to be consulted 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 priorities 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. The Kiira thermal power project is expected to generate wastes which have be disposed of in accordiance with the regulations.

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.

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 Kiira 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, etc.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 Kiira.

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 Jinja District Administration (Jinja Municipal Council)

The Kiira thermal power project is located in Jinja District. The district's top administration includes the Local Council Five (LC V) Chairman, 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- Jinja is expected to monitor the Environmental Management Plan drawn by EIA Team.

3.0 PROJECT DESCRIPTION

The Kiira Thermal-Power Project comprises 100 MW auto Engine-Driven diesel power plant to be constructed at the existing Kiira hydropower plant location. The proposed sites, which will involve acquiring new land, are in the vicinity of Victoria Nile River close to the Kiira and Nalubaale hydropower stations in Jinja. The proposed sites are already classified as industrial although some settlements and commercial activities exist. Construction is expected to begin in the middle of 2006.

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.

3.1 THE THERMAL-POWER PLANT

The proposed thermal-power plant will be installed on one of the two sites but most likely at the Construction Observation Point site located in Kimaka A village referred to as the Observation Point by UEGCL (see section 7.0 on analysis of alternatives). Currently, UETCL is holding negioations to acquire this site.

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 100 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. 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), sulphur 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 Jinja Municipal Council.

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.

Civil works

These will involve the following activities:

- Site levelling 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

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.

3.3.3 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 Jinja District were used. It is unlikely that the data from the sites will vary from the average data from the district because the project area belongs to the Lake Victoria Climatic Zone. This zone is characterised by small variations of climatic parameters throughout the year. The rainfall pattern is distinctly bimodal, with peaks occurring in March-May and again in September-November. Average annual rainfall is in the range of 1200mm to over 1500mm depending on the location.

The mean annual temperatures are 20.7°C, while the mean annual maximum and minimum temperatures are 26.6°C and 15.1°C respectively.

4.1.2 Ambient air quality

There were no previous air quality measurements taken at the proposed sites although they are located in an industrial area. Table 4.1 shows air quality measurements taken at the sites and the national standards.

Table 4.1. Baseline Air Quality and the Uganda National Standards For Emissions of Ambient Air

	Pollutant	Baseline at Sites	Averaging Time for Ambient Air	Standard for Ambient Air (NEMA)	Standard for Emission (Point Sources) (NEMA)
Greenhouse gases	Carbon dioxide	500 ppm	8hr	5000 ppm	NA
	Nitrogen oxides (NO_X)	ND	24hr 1 year Arithmetic mean	0.10 ppm	300mg/Nm^3
	Carbon monoxide	3.6 ppm	8hr	9.0 ppm	NA
	Suphur dioxide	ND	24hr	0.15 ppm	400mg/Nm^3

Note: NA = Not Available.
ND = Not Detected

4.1.3 Noise

The areas proposed for the construction of the 100 MW thermal power plant are classified as industrial although pockets of residential 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 60 dB (A) and 50 dB (A) for day and night respectively.

Measurements of the ambient noise levels were conducted at several points at Kimaka A Village and the results are included in Appendix 3 of this report.

4.1.4 Water Resource

Twenty percent (20%) of Jinja district is covered by surface water with Lake Victoria contributing the largest volume and to a smaller extend river Kiko. The closest water sources to the project sites are the Victoria Nile River and the Kiira Canal. The Kiira Canal is part of River Nile created by Power IV Project.

Water quality tests were carried out for the Victoria Nile River and tap water from the communities in the surrounding project sites. The results apply to both sites since the two sites are supplied from the same water source. Tests results are indicated in table 4.3 below:

Table 4.3. Water quality measurements and the national standard

Parameters	**Units**	**Water from Victoria Nile**	**Construction Observation Point (Tap water)**	**National Standards For potable water**
WS	--	C-371	C-372	
pH	--	6.56	6.20	**6.5-8.5**
Temperature	^{0}C	24.8	24.8	**NS***
Total Suspended Solids	mg/L	5	2	**0**
Iron (Total)	mg/L	0.045	0.091	**0.30**
Chromium	mg/L	0.01	0.00	**0.05**
Copper	mg/L	0.13	0.09	**1.00**
Oil and Grease	mg/L	0.61	0.00	**0.00**

*Not Specified

4.2 BIOLOGICAL ENVIRONMENT

4.2.1 Vegetation

The two sites have been extensively modified by human activities. The Construction Observation Point site was once used for dumping the soil removed from the construction of the Kiira Dam extension while the Spencon Yard site is currently being used as a workers' camp and equipment yard.

4.2.2 Wildlife

As noted above, the proposed project sites are highly modified by human activities that there is no wildlife of major conservation concern in these areas. These sites are small in size and lie in the middle of already developed areas. However, both sites; the Construction Observation Point and Spencon Yard are separated by Kiira canal that is part of the Victoria Nile system. There are fish in the river, bird species associated with fresh water like the

Long-tailed Cormorant (*Phalacrocorax africanus*), Pink-banked Pelican (*Pelecanus rufescens*), African Darter (*Anhinga rufa*), Pied Kingfisher (*Ceryle rudis*), Marabou Stork (*Leptoptilos crumeniferus*) and Grey Heron (*Ardea cinerea*). Other species of animals associated with fresh water could also easily be encountered in the river system. Therefore, the Nile system is still ecologically important to the area.

4.3 SOCIAL ENVIRONMENT

The location of the study area on the Highway linking the capital City Kampala to the main port of Mombasa in Kenya coupled with the construction of the Nalubaale (previously Owen Falls) Dam, over the last 50 years, has brought significant changes to the area. Easy access and the availability of power resulted in rapid industrialization leading to high-density settlements. Jinja Municipality including the proposed project sites has been classified as industrial.

4.3.1 Spencon Yard site

This site is in between the Victoria Nile River and the Kiira canal and thus, has no settlements nearby.

4.3.2 The Construction Observation Point site

The Construction Observation Point site was formerly a stone quarry prior to its use as a dumping ground during the Kiira Dam extension. It belongs to Jinja Municipal Council and according to the Municipality; it is earmarked for both residential and industrial purposes. The surrounding Village (Kimaka A) has 200 households with a population of 800 people living within 100 m radius. Currently, there are about 30 temporary and semi permanent housing units in the area. There is an access road to the site that requires improvement. The village has two primary schools and a Grade II health centre.

Over 70% of the population derive their livelihood from petty trade while the rest are employed in the formal sector or nearby factories. A FGD held with the community revealed that on average most of the employees earn less than a dollar per day.

4.3.3 Health and Safety

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. The possible mitigation measures identified for the significant negative impacts are presented in the next chapter.

5.1 NEGATIVE IMPACTS

Issue/Concern	Site	Potential Impacts	Assessment
A. Pre-Construction Phase			
Air Quality	Construction Observation Point.	Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or haul route could reduce or contaminate air quality.	**INSIGNIFICANT**
	Spencon yard.	Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or haul route could reduce or contaminate air quality.	**INSIGNIFICANT**
Noise	Construction Observation Point.	Noise/disturbance at closest residential or sensitive receptor.	**INSIGNIFICANT**
	Spencon yard.	Noise/disturbance at closest residential or sensitive receptor.	**INSIGNIFICANT**
B. Construction Phase			

Ecological Impact 1. Change of land use	Construction Observation Point	Modified land. Formerly earth dumping ground during the excavation of Kiira Dam canal. No flora or fauna of conservation concern.	**INSIGNIFICANT**
	Spencon yard.	Modified land. Currently yard for the equipment and machinery of Spencon. No flora or fauna of conservation concern.	**INSIGNIFICANT**
2. Contamination of the Victoria Nile River and the canal.	Construction Observation Point	During construction, oil spills could be a major source of contamination to the canal and subsequently the Victoria Nile if not properly mitigated and managed.	Impacts are likely to be **LOW** as oil/fuels will not be stored on site.
	Spencon yard.	During construction, oil spills could be a major source of contamination to the canal and subsequently the Victoria Nile if not properly mitigated and managed.	Impacts are likely to be **LOW** as oil/fuels will not be stored on site.
3. Vegetation	Construction Observation Point	Modified land. Formerly earth dumping ground during the excavation of Kiira Dam canal. Ground surface is rocky with minimal flora. Soil erosion could result due to construction activities but this can be mitigated.	**NO IMPACT** since there is no vegetation at the site.
	Spencon yard	Modified land. Currently yard for the equipment and machinery of Spencon. Site is devoid of vegetation or flora.	**NO IMPACT** since there is no vegetation at the site.
4. Wildlife	Construction Observation Point	Modified land due to human activities. No wildlife or birds were identified.	**NO IMPACT**

	Spencon yard.	Modified land due to human activities. No wildlife or birds were identified.	**NO IMPACT**
5. Noise	Construction Observation Point	Intermittent noise will be generated by the construction machinery and equipment during the construction phase.	**INSIGNIFICANT** both on site and offsite. Can be mitigated on site.
	Spencon yard.	Intermittent noise will be generated by the construction machinery and equipment during the construction phase.	**INSIGNIFICANT** both on site and offsite Can be mitigated on site.
6. Dust	Construction Observation Point	During the construction phase, dust will be eminent due to site preparation that involves excavation and the movement of both earth and trucks.	**SIGNIFICANT** but short-term and can be mitigated
	Spencon yard.	During the construction phase, dust will be eminent due to site preparation that involves excavation and the movement of both earth and trucks.	**SIGNIFICANT** but short-term and can be mitigated
7. Air Quality	Construction Observation Point	Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or haul route.	**INSIGNIFICANT,** short-term, localised effects on air quality, primarily in relation to fugitive dust. Can be mitigated.
	Spencon yard.	Exhaust emissions from haulage vehicles and generator sets and from fugitive dust in the immediate vicinity of the site or haul route.	**INSIGNIFICANT**, short-term, localised effects on air quality, primarily in relation to fugitive dust. Can be mitigated.

8. Solid wastes	Construction Observation Point	Solid wastes will be generated during the construction and operation phases of the thermal power plant. These will comprise non-oil contaminated wastes materials; excavated earth; oil contaminated solid wastes and tank bottom sludge. These wastes contain residual fuel or oil that pose a major hazard to the environment particularly the Victoria Nile River if not carefully disposed of.	The impacts are likely to be **INSIGNIFICANT** if good site practices are implemented.
	Spencon yard.	Solid wastes will be generated during the construction and operation phases of the thermal power plant. These will comprise non-oil contaminated wastes materials; oil contaminated solid wastes and tank bottom sludge. These wastes contain residual fuel or oil that pose a major hazard to the environment if not carefully disposed of.	The impacts are likely to be **INSIGNIFICANT** if good site practices are implemented
9. Oil spills and leakages	Construction Observation Point	Spills from routine maintenance, leakages from fuel tanks, overfilling or perforations on the tanks, disposal of lubricants, oils and solvents on the construction site can cause direct discharge of oil into the Victoria Nile or the Kiira canal leading to water contamination.	Escape of hydrocarbons or other spilled contaminants into the larger environment is expected to be limited to levels well below those that could cause **SIGNIFICANT** adverse environmental effects.

	Spencon yard.	Spills from routine maintenance, leakages from fuel tanks, overfilling or perforations on the tanks, disposal of lubricants, oils and solvents on the construction site can cause direct discharge of oil into the Victoria Nile or the Kiira canal leading to water contamination.	Escape of hydrocarbons or other spilled contaminants into the larger environment is expected to be limited to levels well below those that could cause **SIGNIFICANT** adverse environmental effects.
10. Traffic	Construction Observation Point	Community disturbance and potential hazard	Accidents are expected to be infrequent, but cannot be ignored.
	Spencon yard.	Community disturbance and potential hazard	Accidents are expected to be infrequent, but cannot be ignored.
Socio-economic Impacts			
11. Loss of agricultural land	Construction Observation Point	There is no farming activity taking place on the land. However, the land belongs to Jinja Municipal Council, thus UETCL has to lease the land.	**NO IMPACT**
	Spencon yard.	There is no farming activity taking place on the land. Land still has the leasehold of Spencon Company. UETCL has to acquire this land from Spencon Company.	**NO IMPACT**
12. Effects on Cultural Property	Construction Observation Point	No known archaeological, historical, palaeontological, religious, traditional or cultural, burial and unique sites of cultural importance has been identified nor reported in this area.	**NO IMPACT**

	Spencon yard.	No known archaeological, historical, palaeontological, religious, traditional or cultural, burial and unique sites of cultural importance has been identified in this area.	**NO IMPACT**
13. Human Sanitary Waste	Construction Observation Point	Potential for impairment of surface water quality and spread of disease vectors.	**INSIGNIFICANT** and can be mitigated
	Spencon yard.	Potential for impairment of surface water quality and spread of disease vectors.	**INSIGNIFICANT** and can be mitigated
14. HIV/AIDS	Construction Observation Point	The spread of HIV/AIDS was identified as a key public health concern. Serious concern has been expressed to the extent that the high prevalence of HIV/AIDS in Uganda has often been exacerbated through the presence of construction workers, truck drivers and prostitutes attracted to construction sites.	**INSIGNIFICANT** and can be mitigated
	Spencon yard.	The spread of HIV/AIDS was identified as a key public health concern. Serious concern has been expressed to the extent that the high prevalence of HIV/AIDS in Uganda has often been exacerbated through the presence of construction workers, truck drivers and prostitutes attracted to construction sites.	**INSIGNIFICANT** and can be mitigated

15. Population Influx	Construction Observation Point	There is a likelihood of a slight population influx in search of employment during the construction period; such an influx is likely to have negative socio-economic impacts that include pressures on existing natural resources and infrastructure.	Population influx will be temporal, thus impact **INSIGNIFICANT**
	Spencon yard.	There is a likelihood of a slight population influx in search of employment during the construction period; such an influx is likely to have negative socio-economic impacts that include pressures on existing natural resources and infrastructure.	Population influx will be temporal, thus impact **INSIGNIFICANT**
16. Occupational Health and Safety Hazards (on site personnel)	Construction Observation Point	Risks and hazards from machinery, equipment or chemicals to workers during the construction.	**INSIGNIFICANT** and can be mitigated
	Spencon yard.	Risks and hazards from machinery, equipment or chemicals to workers during the construction.	**INSIGNIFICANT** and can be mitigated

C. Operation Phase

1. Traffic	Construction Observation Point	Community disturbance and potential hazard	Accidents are expected to be infrequent, but cannot be precluded. Impacts are **INSIGNIFICANT**
	Spencon yard.	Community disturbance and potential hazard	Accidents are expected to be infrequent, but cannot be precluded. Impacts are **INSIGNIFICANT**

2. Electrocution	Construction Observation Point	Deaths onsite from electrocution will be very rare but cannot be precluded.	Impacts are **INSIGNIFICANT** and can be mitigated.
	Spencon yard.	Deaths onsite from electrocution will be very rare but cannot be precluded.	Impacts are **INSIGNIFICANT** and can be mitigated.
3. Noise at nearby receptors	Construction Observation Point	Noise from the generators is expected to be continuous throughout the operation phase.	**SIGNIFICANT** but can be mitigated
	Spencon yard.	Noise from the generators is expected to be continuous throughout the operation phase.	**SIGNIFICANT** but can be mitigated
4. Air quality	Construction Observation Point	Exhaust emissions from generator sets.	**SIGNIFICANT** but can be mitigated
	Spencon yard.	Exhaust emissions from generator sets.	**SIGNIFICANT** but can be mitigated
5. Fire Accidents	Construction Observation Point.	Fire accidents are expected to be very rare but cannot be ignored.	**INSIGNIFICANT** but can be mitigated
	Spencon yard.	Fire accidents are expected to be very rare but cannot be ignored.	**INSIGNIFICANT** but can be mitigated
6. Accidental oil spills	Construction Observation Point.	Escape of hydrocarbons or other spilled contaminants into the larger environment particularly the Victoria Nile River could cause significant adverse environmental effects	**SIGNIFICANT** but can be mitigated

	Spencon yard.	Escape to hydrocarbons or other spilled contaminants into the larger environment particularly the Victoria Nile River could cause significant adverse environmental effects	**SIGNIFICANT** but can be mitigated
7. Solid wastes	Construction Observation Point	In appropriate disposal of used fuel/oil filters, oilcans, oil contaminated towels, rags, etc. or burning on site could lead to water contamination and air pollution from particulates and gases respectively.	**SIGNIFICANT** but can be mitigated
	Spencon yard.	In appropriate disposal of used fuel/oil filters, oilcans, oil contaminated towels, rags, etc. or burning on site could lead to water contamination and air pollution from particulates and gases respectively.	**SIGNIFICANT** but can be mitigated
8. Sanitary wastes	Construction Observation Point	Improper disposal of wastes e.g. domestic or human wastes could lead to spread of disease or odours.	**INSIGNIFICANT**
	Spencon yard.	Improper disposal of wastes e.g. domestic or human wastes could lead to spread of disease or odours.	**INSIGNIFICANT**
9. Health and Safety (on site)	Construction Observation Point	Employees may suffer hearing impairment or chronic health problems from exposure to toxic chemicals.	**SIGNIFICANT** but can be mitigated
	Spencon yard.	Employees may suffer hearing impairment or chronic health problems from exposure to toxic chemicals.	**SIGNIFICANT** but can be mitigated

10. Aesthetic and scenic qualities	Construction Observation Point	The thermal-power plant structures will **NOT** change the pre-existing and scenic qualities of the project area.	**NO IMPACT**
	Spencon yard.	The thermal-power plant structures will **NOT** change the pre-existing and scenic qualities of the project area.	**NO IMPACT**

5.2 POSITIVE IMPACTS

There is likely to be an immediate positive impact resulting from the construction of the emergency power plant. This will reduce load shedding consequently boosting development in the area and the country at large.

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.

6.0 MITIGATION MEASURES

The purpose of impact mitigation is to look for alternative and better ways of implementing the proposed project or associated 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. Consequently, this section of the EIS presents mitigation measures against the impacts identified. The matrix on the following pages gives the impacts, their effects, the mitigation measures and responsibility.

Table 6.1. Mitigation Measures and Estimated Costs

ISSUE/CONCERN	POTENTIAL IMPACTS	MITIGATION MEASURES	RESPONSIBILITY
Pre-construction phase			
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	UETCL/Contractor
Noise	Noise/disturbance at closest residential or sensitive receptor.	Ensure that all vehicles and construction equipment have properly functioning silencers or mufflers.	UETCL

Construction phase			
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

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 • 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 safety requirements.	UETCL
Operation and Maintenance Phase			
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	(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	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). Workers should be provided with earmuffs to protect them from excessive noise.	UETCL/Contractor
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 contaminate surface and ground water.	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 proof and properly labelled containers.	UETCL
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/Contractor

Health and Safety	Improper Health and Safety measures or facilities can lead to hearing impairment or chronic health problems to the workers.	The employees should strictly follow UETCL Health and Safety Manual. Safety gears against noise and chemical should be worn by personnel while on duty.	UETCL
Electrocution	Possibility of death to the workers	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.	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.

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 the thermal power plant, there are three choices to make regarding the site, the power plant or generator type including fuels. In respect to site, three alterantives have already beeen proposed by the UETCL as mentioned earlier in the report. The assessments and recommendations made by the EIA Team regarding the site, generator types and fuels are presented below.

In preceeding sections three categories of alterative options that include the project site, generator and fuel types have been analysed by the EIA Team. Considering each alternative option separately, the following conclusions were drawn.

7.1 SITES

Considering the two sites: Construction Observation Point and Spencon Yard, the following observations were made:
Both sites have the following in common:

(i) the required size of land (3.5 acres) for the construction of the 100 MW thermal power plant including its associated infrastructure;
(ii) are close to both the Kiira and Nalubaale Hydropower Stations for easy evacuation of power on to the existing power grid;
(iii) have good access roads.
(iv) Both are close to the Victoria Nile River.

However, the two sites differ in the following:

(i) Construction Observation Point site has few settlements nearby while the Specon site has no settlements.
(ii) Construction Obversation Point site belongs to Jinja Municipal Council, while Spencon Yard site is under the lease hold of Spencon Company.

Based on the above observations The Spencon Yard should have been the preferred

option but its closeness (separated by a fence) from the canal makes this water highly vulnerable to oil pollution in case of any accidental oil spill. Following this, the preferred option for the construction of 100 MW thermal power plant is the Construction Observation Point. Although it has few settlements near by, the direction of the prevailing wind, in a northwest direction, away from the settlements will aid in the mitigation of the noise and emissions impacts. However, actual construction of the Thermal Plant should should be 200 m away from the Victoria Nile River bank (NEMA, 2000).

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 poses, 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 the 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 generators are likely to be installed: one using light diesel or heavy fuel oil. The differences between the two types of generators are summarised 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 60 dB (A) and 50 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 the sites have already been earmarked for industrial development and would eventually be used for some other developments anyway. Moreover, the construction of 100 MW is in national interest to alleviate a short fall of 125 MW that currently can not be generated at Nalubaale and Kiira hydropower stations because of a sharp drop in water level of Lake Victoria. The three proposed sites are also located near existing power grids that makes it easy for power evacuation ultimately 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 Jinja 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 EIA 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.

8.1 NEGATIVE IMPACTS

- Increased traffic and thus traffic related accidents.
- Occupational hazards among workers (Electrocution).
- Fire Accidents
- Emissions leading to air, water and soil pollution.
- Noise.
- Solid wastes (used fuel/oil filters, cleaning towels, gaskets, oil and fuel containers, etc).
- Liquid wastes (oil spills, wastewater, etc).

8.2 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.

8.3 ENVIRONMENTAL MONITORING PLAN

The National Environment Management Authority through the District Environment Officer (DEO) of Jinja 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.

8.3.1 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**
Site proximity to the Victoria Nile River	Construction should start 200m away from the Victoria Nile River bank	No structure should be put within the 200m specified	DEO Jinja
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 Jinja and UETCL Environment Officer to ensure implementation of good site practices by contractors. Maintenance of a public complaints registry.	UETCL
Noise 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 Jinja 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 Jinja 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 Jinja 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 Jinja and the UETCL Environment Officer to ensure implementation of waste management practices. Regular checks by the DEO Jinja of waste storage area. Contractors report all spills greater than 5 litres to the UETCL site supervisor. UETCL will notify the appropriate Ugandan and Jinja 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 Jinja 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 is to be strictly prohibited.	Ongoing program to ensure proper training of personnel who operate systems to treat hydrocarbon wastes.	UETCL
	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. 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	Periodic maintenance and inspection of environmental systems to ensure continuing proper operation. Monitoring of discharged treated water to verify compliance with guidelines.	

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 worldwide. 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 Jinja	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 Contractor and O&M mobilisation and as needed thereafter	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

*Operation and Maintenance

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 UETCL Health and Safety Plan	• To be issued to Thermal Plant 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
4. Preparation and Implementation of UETCL 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 and Implementation of UETCL 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
7. 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
8. 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
9. Ambient Air Quality Monitoring	• On commissioning and then ongoing for the life of the project	

10. Noise Monitoring	• on commissioning and annually thereafter for the life of the project	
11. Waste Water Monitoring	• At plant start-up and ongoing thereafter for the life of the project	
12. 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
13. Employee Environmental Training	• As part of O&M mobilisation and ongoing as needed	Included as part of training costs
14. 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
15. Modification of Operations Manual	• As part of O&M mobilisation and as necessary thereafter	Included in O&M contract costs
16. 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**	

***Operation and Maintenance**

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 the project should 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 the Construction Observation Point, 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 UETCL implements mitigation measures recommended by the EIA Team in order to ensure and maintain the environmental quality of the area.

10. PUBLIC CONSULTATIONS

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 Kiira. The methods used included Focus Group Discussions (FGDs) using structured questions to guide the discussions.

10.1 CONSULTATION WITH COMMUNITY AND STAKEHOLDERS

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 less than 100m radius from the project site were also 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

The surrounding Village (Kimaka A) has 200 households with a population of 800 people living within 100 m radius. Currently, there are about 30 temporary and semi permanent housing units in the area. There is an access road to the site that requires improvement. The village has two primary schools and a Grade II health centre.

Over 70% of the population derive their livelihood from petty trade while the rest are employed in the formal sector or nearby factories.

Expectation of the people

Although there is no evidence of possible lose of services by the community around the project area, the community expressed fear of living near the tanks and generators just in case of fire outbreak. However, the overall expectation is positive as community members viewed the project to be a source of employment and power.
Present at the above meeting were the following members:

No	Name	Age	Sex	Occupation
1.	Mrs Ndugwa	44	F	Housewife
2.	Tusungwire Johnson	35	M	Electrician

3.	Asimwe Frank	40	M	Driver/Mechanic
4.	Nakato Sarah	35	F	Housewife
5.	Kenganzi Immaculate	21	F	Housewife
6.	Odhiambo George	30	M	Landlord/LC1 Sec. For Defence
7.	Ndungwa Faustine	47	M	Self employed
8.	Nakamya Irene	22	F	Housewife
9	Neube Sarah	23	F	Housewife
10.	Nakato Mega	23	F	Housewife
11.	Achan Agnes	15	F	Student
12.	Kyalisima Florence	30	F	Housewife
13.	Auma Monica	30	F	Tea girl
14.	Angello Safari	48	M	Peasant
15.	Kuya Phillip	67	M	Preaching

Venue: Kimaka A Village at the home of the LC1 Secretary for Defence.

Date: 21/02/2006

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 Conclusion: The Team Leader thanked the participants and assured them that their concerns would be put under consideration during the project development. Finally, the LC 1 Secretary for Defence of the village thanked both the EIA Team and participants and wished them a safe journey back home.

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APPENDICES

Appendix 1. List of Birds

The following bird species were recorded at the proposed Kiira thermal power site.

1. Long-tailed Cormorant (*Phalacrocorax africanus*)
2. Pink-banked Pelican (*Pelecanus rufescens*)
3. African Darter (*Anhinga rufa*)
4. Pied Kingfisher (*Ceryle rudis*)
5. Marabou Stork (*Leptoptilos crumeniferus*)
6. Grey Heron (*Ardea cinerea*).

Appendix 2: List of persons consulted

Uganda Electricity Transmission Company Limited (UETCL) and NEMA Officials

William Kyemba (UETCL)
Andrew Omalla Geno (UETCL)
John Othieno (UETCL)
EIA Coordinator – NEMA

Local leaders

Kimaka A Village LC1 Secretary for Defence - Odhiambo George

Community members-Kimaka A Village

1.	Mrs Ndugwa	Housewife
2.	Tusungwire Johnson	Electrician
3.	Asimwe Frank	Driver/Mechanic
4.	Nakato Sarah	Housewife
5.	Kenganzi Immaculate	Housewife
7.	Ndungwa Faustine	Self employed
8.	Nakamya Irene	Housewife
9	Neube Sarah	Housewife
10.	Nakato Mega	Housewife
11.	Achan Agnes	Student
12.	Kyalisima Florence	Housewife
13.	Auma Monica	Tea girl
14.	Angello Safari	Peasant
15.	Kuya Phillip	Preaching

Appendix 3: Ambient Noise Levels

Construction Observation site, Kimaka A Village

Night noise levels

Time: 5:00 am-6:00 am

LOCATION	Noise levels dB(A) Min	Max	Leq
Maka homestead boundary			
AES Security	35.0	43.0	41.0
Mid point	34.1	48.0	42.0
Papco Boundary	34.8	47.1	40.1
PAPCO Side			
Mark stone NO. 9	34.1	42.7	42.3
Mid-point	36.7	41.6	42.2
End	37.8	42.1	41.9
Dam SIDE			
Corner Pipe	34.9	41.7	41.6
Mid Point	33.7	39.7	40.1
Pylons	34.8	39.6	39.9
AES SITE			
Pylons	34.8	39.8	40.1
Mid Point	33.6	40.4	40.1
AES Security	35.6	46.0	40.1
Middle of site (tree)	33.2	36.1	35.6

10:00 -11:00 pm

LOCATION	Noise levels dB(A) Min	Max	Leq
Maka homestead boundary			
AES Security	34.1	48.6	44.1
Mid point	35.1	47.3	44.8
Papco Boundary	34.1	46.2	41.6
PAPCO Side			
Mark stone NO. 9	34.6	45.2	41.4
Mid-point	33.9	41.7	40.2
End	32.6	39.2	39.1
Dam SIDE			
Corner Pipe	33.7	37.6	37.1

Mid Point	33.2	37.4	37.1
Pylons	32.9	38.6	36.9
AES SITE			
Pylons	32.8	37.9	36.7
Mid Point	32.5	37.1	36.1
AES Security	33.9	44.1	42.1
Centre of site	33.2	34.8	33.8

Day noise levels

Time: 6:00-8:00 am.

LOCATION	Noise levels dB(A) Min	Max	Leq
Maka homestead boundary			
AES Security	33.1	51.6	47.1
Mid point	36.1	52.2	52.9
Papco Corner	35.6	51.6	51.1
PAPCO Side			
Mark stone NO. 9	33.6	49.1	47.4
Mid-point	33.6	45.5	45.7
End	34.8	44.3	45.5
Dam SIDE			
Corner Pipe	35.1	45.6	44.8
Mid Point	35.4	44.9	44.3
Pylons	35.6	49.6	43.1
AES SITE			
Pylons	35.7	49.6	43.2
Mid Point	35.3	48.1	47.1
AES Security	33.4	51.6	47.1
Middle of site tree	33.2	39.4	37.3

8:00-10:00 am

LOCATION	Noise levels dB(A) Min	Max	Leq
Maka homestead boundary			
AES Security	39.1	52.5	50.1
Mid point	40.3	57.1	54.3
Papco Boundary	39.6	52.1	51.4
PAPCO Side			
Mark stone NO. 9	39.7	53.1	50.9
Mid-point	38.7	52.4	52.6
End	40.1	53.7	53.8
Dam SIDE			
Corner Pipe	40.6	55.7	53.7
Mid Point	38.6	53.1	52.7
Pylons	40.1	57.2	54.3
AES SITE			
Pylons	40.3	56.7	53.9
Mid Point	37.6	54.7	52.6
AES Security	39.6	52.7	50.2
Middle of site	34.1	39.7	37.7

10:00 -12:00 noon

LOCATION	Noise levels dB(A) Min	Max	Leq
Maka homestead boundary			
AES Security	37.1	54.6	54.4
Mid point	38.1	58.3	56.9
Papco Boundary	40.1	53.3	52.4
PAPCO Side			
Mark stone NO. 9	40.1	53.5	52.3
Mid-point	37.1	54.7	54.5
End	40.1	54.9	55.2
Dam SIDE			
Corner Pipe	37.6	55.6	53.3
Mid Point	41.2	50.1	50.1
Pylons	39.7	51.2	50.1
AES SIDE			

Pylons	39.7	51.3	50.1
Mid Point	37.4	50.2	50.1
AES Security	37.1	54.6	54.4
Middle of site tree	34.7	38.9	38.0

12:00 -2:00 pm

LOCATION	Noise levels dB(A) Min	Max	Leq
Maka homestead boundary			
AES Security	39.4	52.1	47.1
Mid point	45.1	55.6	53.3
Papco Boundary	42.1	53.6	52.1
PAPCO Side			
Mark stone NO. 9	41.7	53.6	51.9
Mid-point	39.6	52.1	50.7
End	40.1	50.2	50.1
Dam SIDE			
Corner Pipe	41.6	53.2	50.1
Mid Point	42.3	55.6	53.4
Pylons	41.6	55.9	54.2
AES SITE			
Pylons	41.2	54.9	54.1
Mid Point	40.1	52.6	52.9
AES Security	39.4	52.7	47.3
Middle of site (tree)	38.4	45.1	39.9

2:00-4:00 pm

LOCATION	Noise levels dB(A) Min	Max	Leq
Maka homestead boundary			
AES Security	45.6	55.1	87.1
Mid point	48.6	59.6	60.1
Papco Boundary	47.3	58.3	58.1
PAPCO Side			
Mark stone NO. 9	47.7	58.1	57.8
Mid-point	42.1	54.5	54.1

End	42.1	54.6	54.1
Dam SIDE			
Corner Pipe	41.1	58.1	54.5
Mid Point	42.1	54.5	54.1
Pylons	42.1	54.6	54.1
AES SITE			
Pylons	40.1	54.5	53.1
Mid Point	39.8	53.4	53.1
AES Security	44.9	55.1	57.1
Centre of site (tree)	37.9	42.1	39.7

4:00-6:00 pm

LOCATION	**Noise levels dB(A)**		
	Min	**Max**	**Leq**
Maka homestead boundary			
AES Security	46.3	57.8	57.4
Mid point	48.1	60.1	59.4
Papco Boundary	47.1	59.2	58.6
PAPCO Side			
Mark stone NO. 9	47.1	58.7	58.4
Mid-point	44.1	56.4	55.1
End	43.1	55.9	54.6
Dam SIDE			
Corner Pipe	44.1	55.7	54.3
Mid Point	40.1	55.3	53.9
Pylons	41.6	56.0	54.0
AES SITE			
Pylons	41.6	52.3	51.6
Mid Point	41.2	59.4	52.3
AES Security	45.9	56.9	56.3
Centre of site (tree)	38.6	42.6	39.8

6:00-8:00 pm

LOCATION	Noise levels dB(A)		
	Min	Max	Leq
Maka homestead boundary			
AES Security	40.1	61.2	59.4
Mid point	45.1	64.2	62.1
Papco Boundary	42.6	58.4	58.3
PAPCO Side			
Mark stone NO. 9	42.4	57.9	57.7
Mid-point	41.0	55.1	53.2
End	38.6	51.6	47.6
Dam SIDE			
Corner Pipe	37.6	48.4	46.6
Mid Point	35.6	48.1	46.1
Pylons	33.2	42.6	41.1
AES SITE			
Pylons	34.2	41.7	41.1
Mid Point	34.2	40.1	39.8
AES Security	40.1	61.2	59.4
Centre of site (tree)	35.8	39.8	37.6

8:00-10:00 pm

LOCATION	Noise levels dB(A)		
	Min	Max	Leq
Maka homestead boundary			
AES Security	38.1	58.9	55.4
Mid point	45.1	61.2	57.1
Papco Boundary	40.1	46.3	46.1
PAPCO Side			
Mark stone NO. 9	40.1	45.2	44.7
Mid-point	38.1	41.2	40.1
End	37.6	39.7	38.4
Dam SIDE			
Corner Pipe	36.9	38.6	37.7
Mid Point	35.6	38.1	36.9
Pylons	35.2	38.1	36.4

AES SITE			
Pylons	35.2	37.3	36.1
Mid Point	38.1	57.1	55.1
AES Security	38.1	57.1	55.1
Centre of site (tree)	33.2	35.6	34.9

Appendix 4: Map of the Project Area