EMERGENCY POWER PROJECT (EPP)

ENVIRONMENTAL AUDITS OF THERMAL POWER PLANTS AND POWER CO-GENERATING UNITS

DRAFT REPORT

Directorate of Corporate Planning and Research
Environment Unit
P. O. Box 9024
Dar es Salaam

April, 2004
EXECUTIVE SUMMARY

1.0 Introduction
The Government of Tanzania has applied to IDA for an Emergency Power Generation Project which is currently under preparation. Three options are being assessed to assist TANESCO in meeting its emergency power generation needs:

1. Incremental Fuel for Existing Thermal Power Plants: Imported fuel to run Ubungo-Songas and Tegeta/IPTL.

2. Emergency Power Plants (EPPs): capacity payments and fuel costs for 30MW of new short term, leased emergency power generation to be installed at the existing Ubungo Power Plant facility, and would be fuelled by gas.

3. Auto-generator Fuel and Capacity Payments: up to 30 MW of existing (domestic) auto-generation capacity which include 18x 1 MW plant to be leased from the Geita gold mines and to be installed at TANESCO’s existing generation site at Mwanza, and about 10 private sector auto-generators who will be providing power to the grid.

It is a requirement that all World Bank investments must comply with World Bank Safeguard Policies and environmental guidelines as presented in the Pollution Prevention and Abatement Handbook (1998) and IFC environmental guidelines. Hence this environmental audit was required.

2.0 Objectives of the Audit

The objectives of this environmental audit were:

- To determine the environmental liabilities of the Nyakato (Mwanza), Tegeta and Ubungo facilities to the Tanzanian government
- To establish the need for remedial actions necessary to bring the power plant facilities into compliance with the World Bank Safeguard policies and environmental guidelines with the objective of protecting the health of workers and the general public living in the area as well as to protect the environment.

3.0 Methodology and approach

The environmental auditing was achieved through following approach:

- Review of relevant documents and preparation of audit framework, criteria and checklist
- Site visits (Mwanza, Songas Ubungo and Tegeta-IPTL)
- Findings evaluation and Report writing
4.0 Major Audit findings

4.1 Mwanza Nyakato site
The facility will comply with the World Bank standard after resolving the observed weaknesses and short comings in the following areas:

- There was a problem of waste materials (scrap metals from old machine parts, wire pieces, old transformers etc,) on the site which needed to be removed or disposed off to make the power plant clean.
- The existing interceptor was not working properly, it needs maintenance. Storm water flows into the interceptor making waste fuels and oil to over flow. As a result the waste fuel and oil contaminate the soil down the drainage system.
- Oil spill is not a big problem at the site as the plant has a designated area for lubrication storage and any spills can be collected for safe disposal. However, improvement in handling the waste oil is required to all employees and casual labours working with waste oil. Oil drops from the machines; oil wastes from trenches must be collected and safely disposed.
- There is small regular fuel spills at the fuel unloading bay pollute the nearby soil.
- Fuel and Oil effluents coming from the power house are collected in a pit which has no interceptor to separate water from oil and fuel. This pit has become a source of soil pollution at the power plant. A second interceptor is needed for that matter.
- Some of the old transformers dumped at the yard have oil leakages which contaminate the soil. Construction of transformer storage bay is needed to prevent transformer oil from polluting the soil.
- No emergency plans exist at the plant in case of fire, major accident or major oil spills. There is a need to prepare an emergency response plan.
- Fire fighting equipment is inadequate needs to be added.
- Working area environment especially the control room needs to be improved by replacing broken down window air condition units with new ones.
- Working procedures and instructions are missing. Need to be prepared and be available to workers.
- Training for people working in the power plant is lacking. There is a need to provide training on work procedures, health and safety matters, hazardous material handling and emergency preparedness and response.
- Monitoring of environment at the power station is absent. There is a need to prepare an environmental management and monitoring plan.
- Noise level measurements show high noise levels exceeding 85dB outside the power station. Hence there is a risk of hearing impairment if ear protective gears are not used.
- Some of the signs are missing e.g. no smoking, slippery floor, etc. (risk of injury and safety)
- Some of the trench slabs and pit lids are missing such that the pits and trenches pose a safety risks at night or in case of emergency. There is a need for urgent replacement of lost or broken lids and slabs.
- First aid kit is not equipped and lack essential drugs.
- Some of the old transformers stored at the site have oil with traces of PCBs of less than 50 ppm. This calls for proper attention, proper handling and appropriate storage of these transformers.
- No proper place to dispose or store oil or fuel contaminated substances such as used oil filters, oil soaked clothing etc. There is a need to construct a designated area to store or treat the oil contaminated substances before safe disposal.
- Limited clean up of contaminated soil is required to remove all soils that have been contaminated and replace with clean soil.
4.2 Ubungo- Songas site

Major Findings
The facility complies with the World Bank in many aspects. However the audit found the following weaknesses:

- Traces of oil leakage from LM6000 units and ABB GT10 turbines were observed during the audit which might be washed to the drainage system and pollute the environment.
- The facility still applies R22 refrigerant in chillers

4.3 Tegeta IPTL Site

Major Findings
The facility complies with the World Bank guideline. However the following weaknesses were observed:

- Environmental responsibility issue: As per organization chart provided, the facility does not have a person assigned with environmental issues though; there is a person responsible with safety issues. Environmental issues is the responsibility of every employee
- Emergency Plan issue: in spite the fact that emergency cases are being taken care of by Knight Support fire brigade, emergency communication flow chart with relevant personnel and other institutions was missing or not shown

5.0 Recommendations:
The following are recommended in the order of high concern and high priority to the lower concern low priority:

5.1 MWANZA FACILITY

5.1.1 High Concerns - High Priority:

Recommendation A.1.1.6: Implement the proposed EMP (appended)

Recommendation A.2.1.2:
(a) Construct appropriate storage area for the old and new transformers and arrange safe disposal of old transformers
(b) Impart environmental awareness and knowledge to employees working in the power house compound and risks they pose for their careless handling of hazardous substances such as waste oil or fuel
(c) Supply additional fire fighting equipment
(d) Construct the containment slab and oil stained waste storage area to prevent further soil and water contamination
(e) The power station management should identify all unwanted materials and scrap materials and contact TANESCO's Board of Survey to countercheck the materials and dispose all unwanted scraps.
**Recommendation A.2.1.7:** Prepare an emergency plan including line of communications and regularly hold a drill to check whether it works as intended.

**Recommendation A.4.1:** Drill two bore holes and measure water quality regularly to check whether there is underground contamination.

**Recommendation A.4.2:** Repair existing water oil separator and construct the second interceptor for power house effluents and regularly check whether they are performing as intended.

**Recommendation A.5.1.1:** Check the performance of the interceptors regularly and have a plan to empty the separator pits. Improve awareness of proper handling of collected oil and fuel waste. If possible arrange and contract with a certified waste oil disposal company to deal with waste disposal.

**Recommendation A.5.1.3:** Construct appropriate area to store and treat the oil and grease contained filters and clothing before disposal.

**Recommendation A.5.1.4:** Construct a storage area for transformers and safely dispose unwanted ones. Raise awareness to other workers that do not know the health risks of PCBs materials.

**Recommendation A.6.1.1:** Remove the contaminated soil and replace with uncontaminated soil.

**Recommendation A.8.1:** Repair the control room air conditions and fix them again or replace with new ones.

**Recommendation A.8.2:** Re-equip the First Aid Kits with essential drugs as required.

**Recommendation A.8.6:** There is an urgent need to replenish the lost or broken lids and slabs to avoid risks of injury or death.

5.1.2 Medium concern: medium priority

**Recommendation A.1.1.5:** Although the facility has no formalized EMS, it should review its environmental performance regularly to identify problem areas and inform management when necessary.

**Recommendation A.1.1.7:** The Power Plant Engineer (SE) should assign environmental responsibility to every head of sub-sections Electrical, Auto diesel, fitting and warehouse who will report to him regularly on environmental issues at the power station. He should join environmental responsibility to people dealing with health and safety issues.

**Recommendation A.2.1.4:** Since the power station is old and the financial implications of installing noise silencers or barriers only quality maintenance of machines should be maintained and noise personal protective gears should be strictly enforced.

**Recommendation A.2.2:** Prepare instructions to control a contractor working on the compound on all behaviours that will impact the environment. Otherwise before the contractor is awarded
the contract s/he should submit his work plan proposal that include how the environment is going
to be protected during the course of project execution

Recommendation A.7: Have a program of carrying out regular acoustic surveys especially when
installing new equipment and post signs warning people of the high noise levels

Recommendation A.8.3: Prepare and distribute simple Environmental, Safety and Health
guidelines for employees in a known language

Recommendation A.8.4: Avail and implement training programs to workers on the issues health
and safety and on job training

5.1.3 Low concern lower priority

Recommendation A.1.1.1: TANESCO has to develop an EMS suitable to its activities or adopt
ISO 14000 in order to improve environmental performance.

Recommendation A.1.1.4: Training unit at Head Office should plan and implement regular
environmental awareness and knowledge to employees working in Power stations

Recommendation A.2.1.5: Start to keep record for facility own use and performance
improvements

Recommendation A.2.1.8: Regular inspections should also include environmental and health
checks and not only safety

Recommendation A.8.5: Prepare working procedures and safety instruction which must be
rehearsed

5.2 SONGAS –UBUNGO

5.2.1 High Concern High Priority

Recommendation B.4.1: Remove the contaminated soil and replace with good soil as soon as
construction works are completed. Also the facility should consider putting monitoring boreholes
at the site to monitor underground water contamination.

Recommendation B.5.1.1: Phase out R22 as per the EMP requirement.

5.2.2 Medium Concern –Medium Priority

Recommendation B.2.1.1: install as planned the electronic monitoring devices to check quality
of discharged effluents particularly the limit of oil and grease which is limited to 10 ppm
(Tanzanian limit levels)

Recommendation B.2.1.2: Additional labelling, warning and instruction, preferably in a known
language, should be posted in hazardous substances storage areas for safety and proper
handling.
Recommendation B.2.1.7: hold regular drills to check whether the emergency response plans work as intended

Recommendation B.7: Post warning signs in all areas with high noise levels.

5.2.3 Low concern Low priority

Recommendation B.1.1.1: Consider registering for ISO 14,000 standard certification in the future.

5.3 IPTL- Tegeta

5.3.1 High concern - high priority

Recommendation C.1.1.6: Facility should appoint a person to be responsible with environmental affairs and be a leader in implementing ISO 14,000 standard certification as stipulated in Wärtsila's Policy

Recommendation C.2.1.1: find out why oil and grease content levels is so high in water discharges compared to WB levels.

Recommendation C.2.1.6: Consider inclusion of Health and safety monitoring in EMP

Recommendation C.2.1.7: Prepare clear emergency communication flow chart with all relevant individuals and institutions. Then post them in a visible place and circulate to all work sections. Additionally old regular drills to check whether the emergency response plans work as intended

5.3.2 Medium concern - medium priority

Recommendation C.1.1.1: Facility should formalize the EMS based on ISO 14,000 standard certification as stipulated in Wärtsila's Policy.

Recommendation C.2.1.2: Consider having a decontamination area of hazardous substances and chemicals in case someone gets contaminated.

Recommendation C.2.2: consider having a system of controlling or ensuring that all contractors working on facility premises observe and protects environment and abide by Wartsila's health and safety requirements.

Recommendation C.7: Facility has to include acoustic surveys in the EMP program.

Recommendation C.8.1: Complete work procedures and instructions and train the workers

6.0 REMEDIATION COSTS
The remediation costs are estimated to be 36,220,850/= and monitoring costs 5,500,000/= annually (for details see the EMP attachment):
Acknowledgement

We would like to thank Directorate of Corporate Planning and Research and Directorate of Projects for resources and facilitation of this Environmental audit study.

Assistance rendered by TANESCO Regional Manager Mwanza and his staff is highly acknowledged.

Cooperation and assistance rendered by Songas Limited and IPTL Management and Wärtsilä Tanzania Limited is highly appreciated.
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<tr>
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<th>Description</th>
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<tbody>
<tr>
<td>BICO</td>
<td>Bureau of Industrial Cooperation</td>
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<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
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<td>CFCs</td>
<td>Chlorofluorocarbons</td>
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<td>EAA</td>
<td>Environmental Audit and Assessment</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EMP</td>
<td>Environmental Management Program (Plan)</td>
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<td>EMS</td>
<td>Environmental Management System</td>
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<td>EPP</td>
<td>Emergency Power Project</td>
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<td>ESAMP</td>
<td>Environmental and Social Assessment Management Plan</td>
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<td>IDA</td>
<td>International Development Agency</td>
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<td>IDO</td>
<td>Industrial Diesel Oil</td>
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<td>IPTL</td>
<td>Independent Power Tanzania Limited</td>
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<tr>
<td>kV</td>
<td>kilo Volts</td>
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<tr>
<td>MW</td>
<td>Mega Watts 1,000,000 Watts</td>
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<td>NEMC</td>
<td>National Environment Management Council</td>
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<td>NEP</td>
<td>National Environmental Policy</td>
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<td>OHSMS</td>
<td>Occupational Health and Safety Management System</td>
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<td>PCBs</td>
<td>Polychlorinated biphenyls</td>
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<tr>
<td>PEP</td>
<td>Provisional Environmental Permit</td>
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<tr>
<td>POPs</td>
<td>Persistent Organic Pollutants</td>
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<tr>
<td>PPA</td>
<td>Power Purchase Agreements</td>
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<tr>
<td>PPM</td>
<td>Part per million</td>
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<td>SE</td>
<td>Station Engineer</td>
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<tr>
<td>SHE</td>
<td>Safety Health and Environment</td>
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<tr>
<td>TANESCO</td>
<td>Tanzania Electric Supply Company Limited</td>
</tr>
<tr>
<td>VPO</td>
<td>Vice President's Office</td>
</tr>
<tr>
<td>WB</td>
<td>The World Bank</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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Enclosures:

AA: Preliminary Hydrogeological Investigations, Photo documentation (plates)
BB: Measurement of Baseline Environmental Information at Mwanza Power Station
CC: Proposed Environmental Management Plan (EMP)
DD: Remediation requirement cost breakdown
Chapter 1

Introduction

1.0 Background
The Government of Tanzania has applied to IDA for an Emergency Power Generation Project which is currently under preparation. The following are the options that are being assessed to assist TANESCO in meeting its emergency power generation needs:

(i) Incremental Fuel for Existing Thermal Power Plants: imported fuel to run the two existing thermal power plants - at the Ubungo (up to 120MW) and Tegeta/IPTL (100MW) Power plant facilities, at outputs exceeding non-drought generation levels (i.e. fuel costs incurred to offset the impact of the drought). It should be noted that with regard to the Tegeta power plant, IDA is reviewing the possibility of purchasing kWh output in accordance with the PPA, instead of fuel.

(ii) Emergency Power Plants (EPPs): capacity payments and fuel costs for 30MW of new short term, leased emergency power generation required to compensate for the reduced hydropower output which is the result of drought. The EPP would be installed at the existing Ubungo Power Plant facility, and would be fuelled by gas. An EIA and Environmental audit has already been carried out at this project site for the Songas facilities, under Credits 3569-TA and 2497-TA.

(iii) Auto-generator Fuel and Capacity Payments: capacity charges and fuel costs for up to 30 MW of existing (domestic) auto-generation capacity to augment the leased capacity noted in (ii) above. This will include 18x 1 MW plant to be leased from the Geita gold mines and to be installed at TANESCO’s existing generation site at Mwanza, and about 10 private sector auto-generators who will be providing power to the grid e.g.,(the sugar, mining and tobacco industries, etc.).

The aspects of the proposed Emergency Power Generation Plan for this proposed Environmental Audit have included: (a) Incremental power generation from the Ubungo and Tegeta Power plants as noted in (i) above; and (b) auto generation from the Geita 18x1MW gensets at TANESCO’s Mwanza facilities, which forms part of (iii) above.

It is a requirement that all World Bank investments must comply with World Bank Safeguard Policies and environmental guidelines as presented in the Pollution Prevention and Abatement Handbook (1998) and IFC environmental guidelines. For this work the following guidelines and policies will be applied: Thermal Power Rehabilitation, Occupational Health & Safety, PCBs, General Environmental Guidelines and Monitoring, Environmental Assessment (OP 4.01), and Natural Habitat (OP 4.04) because of potential oil pollution.
1.2 Objectives of the Audit

The objectives of this environmental audit were:

- To determine the environmental liabilities of the Nyakato (Mwanza), Tegeta and Ubungo facilities to the Tanzanian government
- To establish the need for remedial actions necessary to bring the power plant facilities into compliance with the World Bank Safeguard policies and environmental guidelines with the objective of protecting the health of workers and the general public living in the area as well as to protect the environment.

1.3 Scope of Work

The environmental audit which took place between 27th March to 8th April 2004 focused on the existing Ubungo-Songas and Tegeta-IPTL Thermal Power Plant sites and Nyakato Power Station (TANESCO facility) in Mwanza where the 18x1MW gensets from the Geita Gold Mines will be installed.

1.4 Methodology and approach

The auditors used the following approach:

1.4.1 Review of relevant documents:
We reviewed all relevant available in-house documents including IPTL Environmental Monitoring Program, Songas Environmental and Social Assessment and Management Plan (ESAMP) and EIA reports for Ubungo-Songas, Tegeta-IPTL and Nyakato-TANESCO Mwanza project sites. We also reviewed existing environmental and occupational health and safety legislation and standards. Finally we reviewed relevant environmental policies and guidelines of the World Bank including the Pollution Prevention and Abatement Handbook standards

1.4.2 Site visit
During the site visit we had brief meetings with relevant staff at Ubungo, Tegeta, and Mwanza power plant facilities followed by the visual inspections. We gathered evidence through:

- Physical inspection of the facilities;
- Examination of selected environmental administrative and operating records;
- Interviews and discussions with facility management and staff and some people living in a neighbourhood;
- Verification of procedures, instructions and equipment in place designed to help the facilities apply and adherence to:
  - Existing environmental laws, regulations, and World Bank standards
  - Occupational health and safety standards
  - Corporate, Sectoral, government and World Bank policies and procedures
  - Good environmental and safety management practices
  - Facility’s own environmental management plans (EMP)
The aspects audited are grouped in the following categories:

- General environmental management;
- Air pollution management;
- Water pollution management;
- Waste management practices;
- Hazardous materials management;
- Groundwater and soil contamination control;
- Occupational health and safety management; and
- Noise management

For the Mwanza site the audit team contracted Bureau of Industrial Cooperation (BICO) of the University of Dar es Salaam to conduct air quality measurement, noise level measurement, soil and water contamination measurement. Also a limited PCB identification was conducted by visual inspection and using Dextil PCB screening test kit. The team utilized the expertise of the geologist from Research and Investigations unit (TANESCO) to do a geological survey that will help to establish underground water monitoring boreholes.

1.4.3 Evaluation and Report writing

The obtained information from previous phases helped in evaluation of the audit findings and to:

- prepare a prioritized list of concerns (i.e. high, medium, low) related to past and ongoing activities in the power plants;
- make recommendations and when applicable provided cost estimates for the implementation of any remediation action plan deemed necessary to comply with IDA's safeguard policies;
- prepare an Environmental Management Plan for TANESCO's Mwanza site;
- compile the findings and finalize the report writing.

1.5 Report format

This environmental audit report comprises of three chapters. Chapter one provide the introduction of the project to be financed by the World Bank, scope and methodology for conducting the audit. Chapter two provides the environmental audit framework and chapter three provides the Audit findings and the recommendations for remedial action required to bring the facility into compliance with the WB guidelines and other applicable obligations. Chapter three also provides a prioritised list of concern. The report has an executive summary and appendices.

Chapter three is formatted in such a way that audit findings can be easily referenced to both recommendation and the response from facility's management in the following order:

1.5.1 Audit opinion

The audit opinion section contains the auditors' opinion of the facilities overall environmental performance with respect to regulatory, corporate environmental
requirements (EMP) or WB guidelines and describes the main strengths of its environmental management practices.

1.5.2 Audit findings

The audit finding section is focused on exceptions to:

- Regulatory requirements (identified as "Regulatory"),
- Standard or guidelines requirements ("WB")
- Company's corporate environmental policy or EMP requirements (identified as "Company Policy" or "EMP"),
- The auditor's view of good environmental management practices (identified as "Good Management Practice" = GMP).

Findings are prioritised as follows:

<table>
<thead>
<tr>
<th>Priority</th>
<th>Description</th>
<th>Action</th>
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<tbody>
<tr>
<td>&quot;A&quot;, i.e., high priority, for regulatory findings</td>
<td>EMP or WB guideline to be solved or remediated as soon as possible</td>
<td></td>
</tr>
<tr>
<td>&quot;B&quot;, i.e., medium priority, for company policy findings</td>
<td>to be solved within one year</td>
<td></td>
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<tr>
<td>&quot;C&quot;, i.e., low priority, for GMP findings</td>
<td>to be solved within 1-2 years</td>
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1.5.3 Audit findings format

1. Environmental topic description and indication of strengths of the environmental management practice

2. [Name of finding category] [i.e., Regulatory, WB standard, Company policy, or EMP]

   [Finding description - describes weaknesses related to corporate requirements]

3. Recommendation: (every non compliance finding is provided with a recommendation)

4. Management response: (actions/measures planned by management and date of completion if any)
CHAPTER 2

FRAMEWORK FOR ENVIRONMENTAL AUDIT

Any development activity has the potential to impact negatively or positively to the environment and society. A major national challenge is how to maintain sustainable development without destroying the environment. One of the useful tools is the Environmental Audit and Assessment (EAA) which provides an opportunity of knowing the deficiencies thus initiate actions for improvement in environmental performance.

It is a condition of the Tanzania Government, World Bank and the donor community that all new major projects undertake environmental and social impact assessment. For the facility improvement or rehabilitation projects an environmental audit to identify and address all concerns raised by the project before its implementation is required.

2.1 Tanzanian requirement

In Tanzania each Ministry is responsible for the environmental aspects of all projects under its jurisdiction. The office of the Vice President (VPO) has an overall role in environmental issues. The National Environment Management Council (NEMC) advises the Government on environmental issues and reviews the environmental aspects of the project. Upon its satisfaction of the project on environmental viewpoint the NEMC issues the environmental permit (clearance). Currently there is no legislation dealing with the environment although such legislation is in the final preparation and review.

2.1.1 Environmental review

TANESCO through the Ministry of Energy and minerals needs to apply for environmental approval (Environmental Permit) from NEMC. Upon submitting the Environmental Impact and Audit Statement, the NEMC will review the document and issue a Provisional Environmental Permit (PEP) when the document is approved and accepted.

2.1.2 The National Environmental Policy (NEP 1997)

The National Environmental Policy seeks to provide the framework for making fundamental changes that are needed to bring environmental considerations into the mainstream of decision making. It also seeks to provide policy guidelines, plans and gives guidance to the determination of priority actions, and provides for monitoring and regular review of policies, plans and programmes.

The policy among other environmental issues, it insists on prevention and control of land, water, vegetation and air degradation which constitute our life support systems. Also requires protection of biological diversity of unique ecosystem.
2.1.3 Sectoral Environmental Policies
The following sectoral policies highlight the obligation of any developer on the issue of environmental protection and conservation.

2.1.3.1 National energy Policy (2003)
The energy policy of February 2003 insists on the need to consider environment in its totality. Issues such as energy production (construction of electricity facilities, their operation and maintenance), procurement, distribution, and utilization systems should be done in an environmentally sound manner.

2.1.3.2 Water policy (1991).
The policy recommended the integrated water resources management, of which the water resources shall be conserved and water pollution should be avoided. The relevancy of this policy to this audit study is the need for the project to avoid any spills, wastes or any harmful substances that may cause water pollution of any kind during its implementation, operation and decommission.

2.1.4 Environmental Legislation Frameworks
The following Acts also provide a frame work for this environmental audit in Tanzania's perspective.

2.1.4.1 Water Utilisation Act (1974); amended in 1981
The Act establishes a central Water Board with the authority to regulate use of water, control water pollution, and formulate standards for effluents and stream quality and granting of discharge consents. The 1981 amendments include Standards for Receiving Waters based on their classification (Category 1, 2 or 3). The Act provides standards for Temperature, pH, organic substances and inorganic substances, oil and grease, etc. The standard allows the maximum limit of 10 ppm of any discharges of oil and grease to receiving waters. Any discharge of oil and grease in excess of 10 ppm must be treated before being discharged.

2.1.4.2 The Land Act, 1999
One of the fundamental principles of this Act is to ensure that land is used productively and that any such use complies with the principles of sustainable development. Although it does not provide standard value, the implication of this Act to the Emergency Power Project environmental audit is that the land should be left in a state where others could use it when the project activities come to an end.

The Act established the National Environment Management Council (NEMC). The relevance of this Act to this environmental audit is the recognition of NEMC as the legitimate body in advising the government on all matters relating to the environment and formulating policy on environmental management; pollution control; developing EIA
guidelines; formulation of proposals for legislation in the area of the environmental issues and recommends their implementation by the Government. NEMC issues a Provisional Environmental Permit (PEP) when it is satisfied that the project meets country environmental requirements.

2.2 International agreements on environment
Tanzania has also committed herself to a number of international agreements on environment and development. The relevant international agreements to this environmental audit include:
- Convention on Biological Diversity (CBD), adopted in May 1992. The aim of this convention was on developing national strategies for the conservation and sustainable use of biological diversity.
- The climate change convention, adopted in May 1992. The major aim of this convention is to combat the global warming by reducing emission of green house gases.
- Convention concerning Protection of Workers against Occupational Hazards in the Working Environment due to Air pollution, Noise and Vibration, adopted in 1977. The aim of this convention is to ensure safe working environment for workers.
- Basel Convention on transboundary movements of hazardous wastes and environmentally sound management of hazardous wastes.
- Stockholm convention on Persistent Organic Pollutants (POPs). The convention calls for all countries to properly manage the pollutants such as Polychlorinated biphenyls (PCBs) and advises restrictions on the marketing, use and disposal of PCBs.

2.3 The World Bank
The World Bank, through the International Development Agency (IDA) and the IFC has Safeguard Policies and environmental guidelines of which a lender need to comply. The tables below summarize important aspects of these policies and guidelines which do apply to this Emergency Power Project:

### Table 2.1 Relevant World Bank operational Policies and Directives

<table>
<thead>
<tr>
<th>WB Policy/Directive</th>
<th>Description of requirement</th>
<th>Status and comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP 4.01: Environmental Assessment</td>
<td>Requires Environmental Impact Assessment for all projects to be funded by the World Bank Group to ensure that they environmentally sound and sustainable</td>
<td>Applicable: EIA was not a requisite at the time of construction of Mwanza power plant (1975-78) hence EIA document was not available. However for the SONGAS and IPTL power plants EIAs were carried out</td>
</tr>
<tr>
<td>OP 4.04: Natural Habitat</td>
<td>Aims to promote and support natural habitat conservation, protection, maintenance, and improved land use. Insist on precautionary approach to natural resource management to ensure</td>
<td>Applicable: Required to control oil pollution on land (soil) and water and any behaviour that will affect natural habitat or degrade the land which can be used for other purpose</td>
</tr>
</tbody>
</table>
opportunities for environmentally sustainable development

<table>
<thead>
<tr>
<th>OD 4.30/OP4.12: Involuntary Resettlement</th>
<th>Aims to minimize the involuntary resettlement whenever possible. Resettlement Action Plan (RAP) is needed to reduce impacts to those who will be displaced by the project</th>
<th>Not applicable: the Emergency Power Project will not involve peoples' resettlement</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPN 11.03: Cultural Property</td>
<td>This policy aims to ensure that cultural properties are preserved and protected to avoid their elimination</td>
<td>Not Applicable: No any cultural property does exist on concerned sites where Emergency Power Project is involved</td>
</tr>
</tbody>
</table>

Table 2.2 Pollution prevention and Abatement Handbook Guidelines
(Important aspects from the guidelines pertaining to EPP)

<table>
<thead>
<tr>
<th>Guidelines considered:</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Thermal power: Rehabilitation of existing power plant</td>
<td></td>
</tr>
<tr>
<td>2. Electric Power :Transmission and Distribution</td>
<td></td>
</tr>
<tr>
<td>3. Polychlorinated Biphenyls (PCBs)</td>
<td></td>
</tr>
<tr>
<td>4. Occupational Health and Safety Guidelines</td>
<td></td>
</tr>
<tr>
<td>5. Environmental Monitoring and</td>
<td></td>
</tr>
<tr>
<td>6. General Environmental guidelines</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thermal Power: Rehabilitation of Existing Plants</th>
<th>Requires Environmental Audit : to identify environmental problems and recommend cost-effective measures that would improve the plant's environmental performance and WB guidelines compliance</th>
<th>Applicable to this EPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Air quality</td>
<td>Emission levels should not exceed the limit</td>
<td></td>
</tr>
<tr>
<td>• SPM</td>
<td>Require acceptable procedure</td>
<td></td>
</tr>
<tr>
<td>• Sulphur oxide (SOx)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Nitrogen oxide (NOx)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Carbon dioxide (CO₂)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Benzene</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Asbestos</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solid waste</th>
<th>Require acceptable procedure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Disposal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquid Wastes</th>
<th>Require acceptable procedure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Disposal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water quality</td>
<td>Requires discharges to be treated to acceptable levels before release to water bodies</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>• pH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• BOD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• TSS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• TDS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Oil and grease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Phenol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Hardness</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spills and spill controls</th>
<th>Requires to have equipment, a system or procedures in place to control spillage</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Oil spills</td>
<td></td>
</tr>
<tr>
<td>• Fuel spills</td>
<td></td>
</tr>
<tr>
<td>• Other Hazardous materials</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emergency plan</th>
<th>Requires to have a plan or a system to deal with emergency cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Spills</td>
<td></td>
</tr>
<tr>
<td>• Fire</td>
<td></td>
</tr>
<tr>
<td>• Accidents</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workers safety and occupational health</th>
<th>Requires to have a good working environment and protection against health and safety risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Noise levels</td>
<td></td>
</tr>
<tr>
<td>• Good ventilation</td>
<td></td>
</tr>
<tr>
<td>• Protective equipment</td>
<td></td>
</tr>
<tr>
<td>• Good lighting</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Training</th>
<th>Requires to have a knowledgeable workforce to reduce health and safety risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Work procedures</td>
<td></td>
</tr>
<tr>
<td>• Health and safety procedures</td>
<td></td>
</tr>
<tr>
<td>• Hazardous material handling</td>
<td></td>
</tr>
<tr>
<td>• Risks to health and safety</td>
<td></td>
</tr>
<tr>
<td>• Emergency preparedness and response</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Requires to have a monitoring system in place</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Water quality</td>
<td></td>
</tr>
<tr>
<td>• Ambient air quality</td>
<td></td>
</tr>
<tr>
<td>• Soil contamination</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record keeping</th>
<th>Requirement as a proof of compliance, easy of reference, review performance, etc</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Permits</td>
<td></td>
</tr>
<tr>
<td>• Monitoring reports</td>
<td></td>
</tr>
<tr>
<td>• Work instructions</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Power Transmission and Distribution (additional issues not covered above)</th>
<th>Not Applicable for EPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCBs transformer oils</td>
<td>Requires phasing out PCBs containing equipment and appropriate storage and disposal</td>
</tr>
<tr>
<td>• PCB transformers not to be installed</td>
<td></td>
</tr>
<tr>
<td>• PCB Oil should be phased out</td>
<td></td>
</tr>
<tr>
<td>• Safe disposal of PCB oil</td>
<td></td>
</tr>
<tr>
<td>Equipment with Chlorofluorocarbons (CFCs) or Halon</td>
<td>Requires phasing out CFCs containing equipment and appropriate storage and disposal</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
| - equipment with CFCs should not to be installed  
- equipment with CFCs should be phased out  
- Safe disposal of equipment with CFCs |  |
| Storage of liquid fuels, raw and in process materials, solvents, wastes: to prevent spills, to prevent soil contamination and to prevent ground and surface water contamination.  
- Containment  
- Dikes  
- Berms | Requires to have in place a means to control or avoid soil and water contamination in case of spillage |
| Work place Air quality  
- Monitor workplace air quality for air contaminants  
- Ensure good ventilation  
- Maintenance of air quality control equipment, protective respiratory equipment  
- Ensure protective equipment are used by employees whenever exposure levels of fumes, solvents and other materials exceed threshold limits | Requires to have in place acceptable working environment, and obligation of the employer to provide all necessary personal protective gears (PP) to employees and enforce the use when required to |
| Work place Noise  
- Noise control equipment  
- Maintenance of equipment  
- Use of protection gears when noise level exceeds 85 dBA | Requires the employer to provide acceptable working environment |
| Other physical Agents  
- Safe working area (absence of radiation, magnetic fields)  
- Monitor regularly for radiation and field levels and equipment integrity (Protective shields, lockouts) | Requires the employer to provide safe working environment |
| Electrocution  
- Strict procedure for de energizing before working on electrical equipment  
- Training of personnel for safety procedures | Requires employer to provide safe working area and provide knowledge to avoid personal injury or death |
<p>| Work in confined Spaces | Requires instructions and safety measures are available and followed |
| Polychlorinated Biphenyls (PCBs) |  |
| Labelling | Requires all hazardous substances to be labelled for identification |
| Monitoring for any leakage | Requires good management in handling PCBs containing equipment to avoid health risks when transporting, storage, disposal and fire incidents |</p>
<table>
<thead>
<tr>
<th>Occupational Health and Safety Guidelines</th>
<th>Security</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical factors in the workplace</strong></td>
<td>Requires to have more than one access in case of emergencies</td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Signage</strong></td>
<td>Requires signage in all dangerous areas, exits, etc.,</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Ventilation and temperatures</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fire detection and fire fighting</strong></td>
<td>Requires the employer to install and provide enough fire fighting equipment</td>
</tr>
<tr>
<td><strong>Cleaning</strong></td>
<td></td>
</tr>
<tr>
<td><strong>First Aid</strong></td>
<td>Requires the employer to provide and equip the first aid kits</td>
</tr>
<tr>
<td><strong>Welfare facilities</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Personal protective equipment:</strong></td>
<td></td>
</tr>
<tr>
<td>* eye and face,</td>
<td></td>
</tr>
<tr>
<td>* head</td>
<td></td>
</tr>
<tr>
<td>* hearing</td>
<td></td>
</tr>
<tr>
<td>* hand</td>
<td></td>
</tr>
<tr>
<td>* respiratory</td>
<td></td>
</tr>
<tr>
<td>* leg and body</td>
<td>Obligation of the employer to provide PP to reduce health and safety risks</td>
</tr>
<tr>
<td><strong>Drinking water</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient factors in the workplace</strong></td>
<td>Requirement as above</td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Illumination, light radiation and reflections</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hazardous materials</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Biological agents</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Ionisation radiation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Training and documentation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Training (materials, equipment and tools; hazards in operations and how to control; risks to health; exposure prevention; hygiene; protective equipment and clothing; incidents and accidents)</strong></td>
<td>Requires as above</td>
</tr>
<tr>
<td><strong>Monitoring and Reporting guidelines</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Safety features</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Ambient working environment</strong></td>
<td></td>
</tr>
<tr>
<td><strong>OHS-indicators</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Performance Monitoring</strong></td>
<td>Optional</td>
</tr>
<tr>
<td><strong>OHSMS organization</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Policy</strong></td>
<td></td>
</tr>
</tbody>
</table>

TANESCO'S Environmental Unit, April 2004
**Organization**
- Responsibility and accountability
- Competence and training
- Documentation
- Communication

**Planning and implementation**
- OHS audit,
- Objectives, system planning, development and implementation,
- Hazard prevention and control measures, management of change,
- Emergency prevention, preparedness and response,
- Procurement,
- Contracting

**Evaluation**
- Performance monitoring and measurement
- Investigation of work related injuries, ill health, diseases and accidents
- Audits
- Management review

**Action for improvement**
- Safety inspection, testing and calibration
- Surveillance of the working environment
- Surveillance of workers health
- Training

**Accidents and Diseases monitoring**
Requires monitoring of abnormal changes of accidents and diseases

**Guidelines**

<table>
<thead>
<tr>
<th>General Environmental Guidelines</th>
<th>Emission Guidelines</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Air emissions</td>
<td>Ambient Air quality</td>
</tr>
<tr>
<td></td>
<td>Liquid effluents</td>
<td>Quality of discharges to the water bodies</td>
</tr>
</tbody>
</table>

**Hazardous Material and Wastes**
- Storage
- Labelling
- Handling
- Fire prevention

**Solid wastes**
- Handling
- Disposal

<table>
<thead>
<tr>
<th>Ambient Noise</th>
<th>day</th>
<th>night</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>55 dB</td>
<td>45 dB</td>
</tr>
<tr>
<td>Industrial</td>
<td>70 dB</td>
<td>70 dB</td>
</tr>
</tbody>
</table>

**Monitoring**

<table>
<thead>
<tr>
<th>Ambience Air quality</th>
</tr>
</thead>
</table>

**Requirement is as above**

*Songas has ESAMP in place*

*IPTL has a Monitoring programme*

*Mwanza site need to prepare EMP*
| Solid waste |  |
Chapter 3

AUDIT FINDINGS, RECOMMENDATIONS AND MANAGEMENT RESPONSE

3.1 Mwanza Nyakato site

The Environmental audit for the Mwanza site took place between 27 and 31 March 2004.

3.1.1 Site setting

Nyakato Power Station commissioned in 1978 is located about 7 km from the city centre along the Mwanza-Musoma main road. The power station had an installed capacity of 18 MW from four generator sets each 4.5 MW. However, capacity was reduced to 12.5 MW after one machine failed during commissioning. The current power availability is only 7 MW. During the time of Environmental audit only one generator was in operational producing 3.5 MW. The facility is connected to the National Power Grid. Presently the facility has a workforce of 16 people. The plant is owned and operated by TANESCO.

Besides the power house, the facility has above surface fuel storage tanks (Industrial Diesel Oil - IDO), lubrication oil area, electrical workshop, Mechanical workshop, office block, warehouse, switchyard, control room and TANESCO employee housing adjacent to the grid substation.

3.1.2 Findings and Recommendations

A. General Environmental Management

The environmental management and auditing is centralized at TANESCO Head office. TANESCO has no formalized Environmental Management System (EMS) though it is in the process of establishing one. Although TANESCO has the environmental unit, it does not have its own budget to carry out its environmental plans.

<table>
<thead>
<tr>
<th>Priority rating: B</th>
</tr>
</thead>
</table>

A.1.1. Environmental management and responsibilities

(GMP, Company Policy)

1. The environmental management system is not comprehensive and is not formalised
2. Tracking of existing and imminent environmental legislation is not systematically done
3. Environmental issues are not managed by plans and target setting
4. The facility has no plans for training and education on environmental awareness and knowledge.
   All training issues are arranged at head office Dar es Salaam
5. The facility has no periodic review of environmental performance
6. The facility has got no EMP
7. The facility has not assigned anybody the responsibility of environmental affairs
Recommendation A.1.1.1: TANESCO has to develop an EMS suitable to its activities or adopt ISO 14000 in order to improve environmental performance.

Recommendation A.1.1.2: establish TANESCO's EMS that will tracking environmental legislation

Recommendation A.1.1.3: Establish TANESCO's EMS

Recommendation A.1.1.4: Training unit at Head Office should plan and implement regular environmental awareness and knowledge to employees working in Power stations

Recommendation A.1.1.5: Although the facility has no formalized EMS, it should review its environmental performance regularly to identify problem areas and inform management when necessary

Recommendation A.1.1.6: Implement the proposed EMP (appended)

Recommendation A.1.1.7: The Power Plant Engineer (SE) should assign environmental responsibility to every head of sub-sections Electrical, Auto diesel, fitting and warehouse who will report to him regularly on environmental issues at the power station. He should join environmental responsibility to people dealing with health and safety issues.

Comment A.1.1: The facility needs to have and implement the EMP in order to meet the minimum WB requirement.

Management responses:

Facility

A.2 General Environmental Management of the Facility

The facility has above surface fuel tanks such that any leakage of the fuel will be detected. The facility is also equipped with water oil/fuel separator though at present one is not enough and it is not performing as it is supposed to work. Lubrication storage area is concreted to prevent soil contamination. Fuel tanks have a retaining wall to retain fuel in case of spillage accident. The facility has storm water drainage system and power house drainage system; however some of the storm water goes into the interceptor (water-oil separator). There have been efforts to maintain the generating units as required but spare parts are sometimes not available.
A.2.1 Environmental Regulatory compliance

(WB guidelines, Priority A)

1. Emission guidelines: The facility had no historical emission levels. The measurements presented here were taken during the auditing of the facility and only one engine was running. The facility is also located in industrial area where the emission from other industries might have influenced the results (see appendices for site map)

a) Air quality levels

<table>
<thead>
<tr>
<th></th>
<th>WB/WHO levels</th>
<th>Measured levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPM (µg/m³)</td>
<td>120</td>
<td>Not measured</td>
</tr>
<tr>
<td>Sulphur oxide (mg/m³)</td>
<td>60</td>
<td>32.04</td>
</tr>
<tr>
<td>Nitrogen oxide (mg/m³)</td>
<td>400</td>
<td>76.8</td>
</tr>
<tr>
<td>Carbon dioxide (mg/m³)</td>
<td>0.09</td>
<td>0.54</td>
</tr>
<tr>
<td>Carbon monoxide (mg/m³)</td>
<td>60</td>
<td>91.8</td>
</tr>
<tr>
<td>Hydrocarbons (mg/m³)</td>
<td>160</td>
<td>Not measured</td>
</tr>
<tr>
<td>Lead</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Asbestos</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Note: The values given are the worst case scenario taken at stack outlet-joint. Other measurements show the levels to be zero up to 1PPM (see attachment on air quality measurement)

1PPM SO₂ = 2.67 mgSO₂/m³
1PPM NO₂ = 1.92 NO₂/m³

b) Quality of discharged water from the interceptor

<table>
<thead>
<tr>
<th></th>
<th>WB/WHO levels</th>
<th>Sampled levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6-9</td>
<td>7.4</td>
</tr>
<tr>
<td>BOD (mg/l)</td>
<td>100</td>
<td>Not measured</td>
</tr>
<tr>
<td>TSS (mg/l)</td>
<td>150</td>
<td>30</td>
</tr>
<tr>
<td>Cr (mg/l)</td>
<td>1.0</td>
<td>Not measured</td>
</tr>
<tr>
<td>SO₄ (mg/l)</td>
<td>15</td>
<td>Not detected</td>
</tr>
<tr>
<td>Oil and grease (mg/l)</td>
<td>20</td>
<td><strong>Not measured</strong></td>
</tr>
<tr>
<td>Phenol (mg/l)</td>
<td>5.0</td>
<td>Not measured</td>
</tr>
<tr>
<td>Cl (mg/l)</td>
<td>1.0</td>
<td>189.94</td>
</tr>
<tr>
<td>TKN (mg/l)</td>
<td>50</td>
<td>14.18</td>
</tr>
<tr>
<td>Conductivity (µS/cm)</td>
<td>150</td>
<td>229</td>
</tr>
</tbody>
</table>

2. Hazardous material and wastes:

(a) The storage of oil drums and fuel have containment that do not allow spillage to contaminate soil or surface and groundwater. However, storage of old transformers which may have traces of PCBs is not properly done and some transformers were leaking.

(b) No labelling is done at site. Identification follows manufacturers' instructions on the container itself
(c) Handling of hazardous material and particularly waste oil seems to have a problem. Several places were observed to have contaminated by oil or fuel spillage.

(d) Although fire extinguishers are present, they are not enough to contain large incident of fire.

(e) Although some areas are equipped to control and prevent oil or fuel spills, some areas need to be redesigned to provide spill control mechanism. The areas include waste collection point and oil separator pit behind the power station (see plate 21).

3. Solid wastes:
   - Solid wastes in particular scrap metals have not been properly kept. Some are inside the power house some are located outside and some behind the warehouse.
   - In spite of having a body within TANESCO (The Board of Survey) that deals with issue of disposal of unneeded items including scrap metals, there is a problem still of disposing scrap metals at Nyakato Power station

4. Ambient noise: Measurements are presented in report by BICO which is herewith appended. However, the results show that they are on high side above 70 dB even at distance of 100m from the power station and just out side the power station the levels are at 95 dB. All these measurements are day time measurements which are not expected to change significantly during the night time. These values exceed the World Bank limit in industrial area which puts the limit at 70 dB for both day and night.

5. Record keeping:
The facility engineer admitted keeping record on accident incidents in the monthly report sent to Head Office, although no evidence was shown to the auditors. Other records such as air emissions, effluents discharges, spills and fire incidents have no records at the site.

6. Monitoring: monitoring plan and monitoring report
   The facility has no monitoring plan to monitor air quality, discharged water quality, soil contamination or solid and liquid waste

7. Emergency Plan:
The facility has no emergency response plan in case of spills, fire or major accidents.

8. The regular inspections are mainly done for safety reasons

Recommendation A.2.1.1:
   (a) The air emission levels are within the range acceptable by the WB. However, regular measurement preferably two times a year should be planned.

   (b) The quality of discharged water particularly the limit of oil and grease which is limited to 10 ppm (Tanzanian limit levels) should be measurement regularly (monitored)

Recommendation A.2.1.2:
(a) Construct appropriate storage area for the old and new transformers and arrange safe disposal of old transformers
(b) Additional labelling and warning or instruction should be posted in storage areas for safety and proper handling
(c) Impart environmental awareness and knowledge to employees working in the power house compound and risks they pose for their careless handling of hazardous substances such as waste oil or fuel
(d) Supply additional fire fighting equipment
(e) Construct the containment slab and oil stained waste storage area to prevent further soil and water contamination

Recommendation A.2.1.3:
(a) Empty the designated area for storing scrap materials (currently the area is almost full of unwanted electrical wastes) and use it to store solid waste waiting for disposal.

(b) The power station management should identify all unwanted materials and scrap materials and contact TANESCO’s Board of Survey to countercheck the materials and dispose all unwanted scraps.

Recommendation A.2.1.4: Since the power station is old and the financial implications of installing noise silencers or barriers only quality maintenance of machines should be maintained and noise personal protective gears should be strictly enforced.

Recommendation A.2.1.5: Start to keep record for facility own use and performance improvements

Recommendation A.2.1.6: Adopt and implement the EMP (appended)

Recommendation A.2.1.7: Prepare an emergency plan including line of communications and regularly hold a drill to check whether it works as intended

Recommendation A.2.1.8: Regular inspections should also include environmental and health checks and not only safety

Comment A.2.1: Apart from having EMP needs to rectify some of deficiencies highlighted above in order to meet minimum requirement.

Management response A.2:

A.2.2 Contractor control
(WB)
The facility has no any policy or instructions designed to control contractors' environmental behaviour working on its compound.
**Recommendation A.2.2:** prepare instructions to control a contractor working on the compound on all behaviours that will impact the environment. Otherwise before the contractor is awarded the contract s/he should submit his work plan proposal that include how the environment is going to be protected during the course of project execution.

**Management response A.2.2:**

### A.3 Air Pollution Management

There is no any mechanism to control SOx, NOx, CO2, CO and smoke except to maintain quality maintenance though getting all spares is expensive and hard to get.

#### A.3.1 Identification and evaluation of air emissions
(Policy, WB)

The facility knows its air emission source to be the generation units and industries around the plant may influence the air quality of the compound. However, no documentation is done.

**Recommendation A.3.1:** Avail machine spare parts at appropriate time to maintain quality maintenance

**Management Response A.3.1:**

### A.4 Water Pollution Management

The facility has oil separator unit. However, storm water drainage system allows some water to go to this interceptor causing the interceptor to overflow whenever it rains. In addition, there is no plan in place to empty the intercepted oil or fuel from the interceptor. Spilled fuel collecting channel at fuel unloading bay are blocked and another temporary container has been buried nearby. Effluents from the power station are collected in one pit that is not connected to the interceptor. Emptying waste fuel/oil from this pit is required regularly but no disposal area is available

#### A.4.1 Meeting Internal and External Demands
(WB, Water policy and Standards requirement) Priority A

The facility has no monitoring system to ensure that surface and underground water is not contaminated
Recommendation A.4.1: Drill two bore holes and measure water quality regularly to check whether there is underground contamination.

Recommendation A.4.2: Repair existing water oil separator and construct the second interceptor for power house effluents and regularly check whether they are performing as intended.

Comment A.4: To meet minimum WB requirement implement recommendation A.4.2 and plan for recommendation A.4.1

Management Response A.4:

A.5 Waste Management

The facility has requested for the incinerator from Head Office for the purpose of incinerating solid and some liquid waste including slugs. Also it has a system of giving waste oil to people in need of oil for timber treatment. The facility has also a plan to sell the waste oil to the industries for reuse in boilers.

A.5.1 Meeting Internal and External Demands

(WB guidelines-Requirement to manage waste to prevent spills, contamination, poisoning etc. for the health of environment and its ecosystem, Meeting Demands: PCB Management Program, Meeting Demands: CFC Management Program)

1. Apart from relying on performance of the interceptor, there is little effort to prevent oil pollution at the facility through proper handling of collected oil and fuel waste. Disposal mechanism of waste oil is not well defined.

2. There is inadequate facility or equipment to store waste oil/fuel and collection (emptying separator pits is not systematically done). In spite of the demand of waste oil by local people there is no clear system of collecting this waste oil.

3. The facility has a system of selling empty containers (normally drums) hence no empty container problem. However, there is no appropriate area to store or dispose the oil and grease contained filters or clothing. Secondary containment for some of the equipment that may cause oil contamination are missing.

4. The old transformers, which some of them are suspected to have traces of PCBs (the tested sample showed one transformer to contain PCB of less than 50 PPM) are just lying at the compound and some of them are leaking (see plate 25). At the same time some of the workers do not know the risks of PCB substances.

Recommendation A.5.1.1: Check the performance of the interceptors regularly and have a plan to empty the separator pits. Improve awareness of proper handling of collected oil and fuel.
waste. If possible arrange and contract with a certified waste oil disposal company to deal with waste disposal.

Recommendation A.5.1.2: Design a clear system of emptying separator pits and safely dispose the waste oil or give away for reuse by local people.

Recommendation A.5.1.3: Construct appropriate area to store and treat the oil and grease contained filters and clothing before safely disposal.

Recommendation A.5.1.4: Construct a storage area for transformers and safely dispose unwanted ones. Raise awareness to other workers that do not know the health risks of PCBs materials. Additionally identify (test kit) and segregate all transformers with suspected cases.

Management Response A.5:

A.6 Soil and groundwater Contamination Control

Interceptors and containment in place but need to be checked frequently if they perform as intended. Awareness is needed for cleaners and maintenance workers.

A.6.1 Identification of potential contamination risks and opportunities for prevention (EMP, WB)

1. Soil contamination was observed in some areas behind the power station, fuel unloading bay and down the channel of discharged water from the interceptor.

2. Awareness of employees or people cleaning the drainage trenches about the risk of soil and ground water contamination seem to be small as some of the contamination has been caused by mishandling of the fuel and waste oil.

Recommendation A.6.1.1: Remove the contaminated soil and replace with uncontaminated soil.

Recommendation A.6.1.2: Raise awareness of employees and other people handling waste oil or oil containing materials about the risk of soil contamination and how to properly handle oil and fuel.

Management Response A.6.1:

A.7 Noise Management

The facility provides personal protective gears to workers working inside the power station.

The facility does not have a program to carry out regular acoustic surveys in work places and neighbourhood and no warning signs have been posted to alert and remind people to put on their protective gears.
Recommendation A.7: Have a program of carrying out regular acoustic surveys especially when installing new equipment and post signs warning people of the high noise levels

Management Response A.7:

A.8 Occupational health and Safety

The facility has the first aid kit, provides personal protective gears and lighting is sufficient. There is a system of checking if employees put on their protective gears and uniforms.

1. At the time of this auditing, the control room ventilation was poor and needed the air condition units to work again.

2. The First Aid kit was lacking essential medication and equipment and needed to be reequipped

3. Clear instructions and penalties to employees violating safety requirement were missing

4. Training programs for workers on the issues of health and safety were not available though good safety practices were partially implemented.

5. Working procedure and safety instructions were not available

6. Some of the trench slabs and pit lids are missing such that the pits and trenches pose a safety risks at night or in case of emergency.

Recommendation A.8.1: Repair the air conditions and fix them again or replace with new ones

Recommendation A.8.2: Re-equip the First Aid Kits with essential drugs as required

Recommendation A.8.3: Prepare and distribute simple guidelines for employees in a known language

Recommendation A.8.4: Avail and implement training programs to workers on the issues health and safety and on job training

Recommendation A.8.5: Prepare working procedures and safety instruction which must be rehearsed

Recommendation A.8.6: There is an urgent need to replenish the lost or broken lids and slabs to avoid risks of injury or death

Management Response E.8:
A.9 People participated in the Audit process:

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Mwanza - Nyakato Power Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Title</td>
</tr>
<tr>
<td>Ngalula D. Mifuko</td>
<td>Station Engineer</td>
</tr>
<tr>
<td>Theodori Jesa</td>
<td>Technician</td>
</tr>
<tr>
<td>John Lazimah</td>
<td>Environmental Auditor - TANESCO Environmental Unit</td>
</tr>
<tr>
<td>Learnard Kassana</td>
<td>Geologist- TANESCO Geology unit</td>
</tr>
<tr>
<td>Dr. Enock Masanja</td>
<td>BICO- University of Dar es Salaam, CPE Dpt.</td>
</tr>
</tbody>
</table>
3.2 Ubungo–Songas site

The Environmental audit for the Ubungo site took place April 5-6, 2004.

3.2.1 Site setting

The Ubungo Power Plant is located at Ubungo in an area of relatively flat to gently rolling terrain. The area has also other companies around and TANESCO employees housing. The facility consists of four gas turbine generators with a total capacity of 112 MW—two 18.5 MW ABB GT-10 gas turbines installed in 1994 and two 37.5 MW GE-LM6000 gas turbine generators installed in 1995. Currently the turbines use Jet A fuel and construction is underway to convert the units to use natural gas from Songo Songo. The facility owned by Songas is connected to the National Power Grid.

The site has four power houses (each turbine set is treated as separate power house), fuel storage tanks (Jet A), workshop, office block, a warehouse, control room and a switchyard. The facility plans to add two more units soon.

3.2.2 Findings and Recommendations

B.1 General Environmental Management

The facility has an Environmental Management Plan and has Safety, Health and Environment department headed by a Manager. The facility has also adopted Safety, Health and Environment standard (Songas SHE-Standard) since January 2004.

B.1.1 Environmental management and responsibilities

(EMP, SHE-Standard, Company Policy) Priority rating: B

1. The facility has no EMS but is having SHE-Standard and ESMP in place
2. Tracking of existing and imminent environmental legislation is systematically done
3. Environmental issues are managed by plans and target setting- MOTTO
4. The facility has training programme and education on environmental awareness, health and safety knowledge. Copies of the training programme were availed to the auditors
5. The facility conducts periodic review of environmental, safety and health performance
6. The facility has assigned environmental, health and safety responsibilities to every employee championed by Manager (SH&E) and the General Manager

Comment B.1.1: The facility has got all mechanisms to implement acceptable environmental management thus complies with WB requirements

Recommendation B.1.1.1: Consider registering for ISO 14,000 standard certification in the future.
Management responses:

Facility

B.2 General Environmental Management of the Facility

The facility has above surface fuel tanks such that any leakage of the fuel may be early on detected. The facility is also equipped with water oil/fuel separators and plans to install hydrocarbon electronic detectors between the waste water discharge point and separators to give an alarm to the operators whenever the hydrocarbons (oil/fuel) exceed the limit value. Any equipment potential to cause oil contamination such as transformers and fuel tanks have been contained and have retaining walls to prevent soil and ground water contamination. These containments are connected with interceptors to hold any spillage. The facility monitors air emission and liquid effluents coming from the power station.

B.2.1 Environmental Regulatory compliance (WB guidelines, SHE, ESMP) Priority A

1. Emission guidelines: The facility has historical emission levels as follows:

a) Air quality levels as taken from the Air Quality Dispersion Modelling Analysis for Ubungo Power Plant (December 2003)

<table>
<thead>
<tr>
<th></th>
<th>WB/WHO levels</th>
<th>Measured levels 24-Hour (Jet A)</th>
<th>Future case 24-Hour (gas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPM (µg/m³)</td>
<td>120</td>
<td>Not given</td>
<td>Not given</td>
</tr>
<tr>
<td>Sulphur oxide (µg/m³)</td>
<td>150</td>
<td>12.1</td>
<td>0.043</td>
</tr>
<tr>
<td>Nitrogen oxide (µg/m³)</td>
<td>150</td>
<td>21.9</td>
<td>7.7</td>
</tr>
<tr>
<td>Carbon dioxide (mg/m³)</td>
<td>0.09</td>
<td>Not given</td>
<td>-</td>
</tr>
<tr>
<td>Carbon monoxide (mg/m³)</td>
<td>60</td>
<td>Not given</td>
<td>-</td>
</tr>
<tr>
<td>Hydrocarbons (mg/m³)</td>
<td>160</td>
<td>Not given</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: The values are lower than the World Bank requirement

b) Quality of discharged water from the interceptor

<table>
<thead>
<tr>
<th></th>
<th>WB/WHO levels</th>
<th>Sampled levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6-9</td>
<td>Songas has a permit to discharge waste water to Ubungo River after meeting quality level requirement</td>
</tr>
<tr>
<td>BOD (mg/l)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>TSS (mg/l)</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Cr (mg/l)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>SO₄ (mg/l)</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Oil and grease (mg/l)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Phenol (mg/l)</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Cl (mg/l)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>TKN (mg/l)</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Conductivity (µS/cm)</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>
2. Hazardous material and wastes:

(a) The facility store hazardous substances in a special designed room. Also is equipped with specific area for washing and showering in case of body contamination.

(b) Identification follows manufacturers' instructions on the container. Additional labelling is not done because final arrangement is not yet known.

(c) Handling of hazardous material and particularly waste oil follows specific instructions. Disposal specialist has been contracted to dispose solid and liquid waste.

(d) The facility is well equipped to combat fire incidences. Moreover, it has a contract with Knight Support fire brigade.

3. Solid wastes:

- The facility has a system of segregating solid wastes (e.g. wood from plastics) and has contracted another company to handle the wastes for safe disposal

4. Ambient noise: In 2003 six measurements were taken around the power plant. The values ranged between 50 dB and 80 dB. Compared to WB requirement of 70 dB for industrial settings the average is within the acceptable levels. Personal protective gears (ear morphs and ear plugs) are provided to workers and visitors entering the facility.

5. Record keeping:

The facility keeps necessary records such as accident incidents, air emissions, etc.

6. Monitoring: monitoring plan and monitoring report

The facility has a monitoring plan for air quality, water pollution, noise pollution, waste and health and safety.

7. Emergency Plan:

The facility has an emergency communication flow chart with relevant institutions. Also Songas SHE-Standard has instructed EP&R in their facility for all emergencies spills, fire or accidents.

8. The regular inspections are done for safety, health and environmental reasons.

Comment B.2.1: The facility complies with ESMP and Songas SHE-Standard thus meets the minimum requirement of the WB guidelines.

Recommendation B.2.1.1: install as planned the electronic monitoring devices to check quality of discharged effluents particularly the limit of oil and grease which is limited to 10 ppm (Tanzanian limit levels)

Recommendation B.2.1.2: Additional labelling, warning and instruction, preferably in a language known language, should be posted in hazardous substances storage areas for safety and proper handling.
**Recommendation B.2.1.7:** hold regular drills to check whether the emergency response plans work as intended

**Management response B.2.1:**

B.2.2 Contractor control
(WB, EMP, Songas-SHE)

The facility has a policy and a system designed to control contractors' environmental behaviour working on its compound. The auditors were shown instructions and correspondences to prove that

**Comment B.2.2:** the facility complies with EMP thus meets minimum requirement of the WB guidelines.

**Management response B.2.2:**

B.3 Air Pollution Management

Air quality Modelling Analysis for SOx and NOx were performed with stark parameters (height, exhaust velocity and diameter) to determine concentration and receptor distances

B.3.1 Identification and evaluation of air emissions
(EMP, WB)

The facility knows its air emission source to be four stacks from four turbines, two standby generators and TANESCO generators.

**Comment B.3.1:** The air quality modelling also considered the emission from TANESCO generators, still results were below the WB limit values. Hence the facility meets the minimum requirement of the WB guidelines.

**Management Response B.3.1:**

B.4 Water Pollution Management
The facility has three oil separator units and has contained all pollution potential sources. The facility plans to install an electronic detection device in the ongoing construction works.

B.4.1 Meeting Internal and External Demands
(WB, Water policy and Standards requirement)

Traces of oil leakage from LM6000 units and ABB GT10 turbines were observed during the audit which might be washed to the drainage system thus polluting the environment (see plate 28).

Recommendation B.4.1: Remove the contaminated soil and replace with good soil as soon as construction works are completed. Also the facility should consider putting monitoring boreholes at the site to monitor underground water contamination.

Management Response B.4:

B.5 Waste Management

The facility has a known system of waste collection and disposal. It is also encouraging waste paper minimization. The appointed contractor collects solid and liquid wastes for safe disposal. The plant is almost new (1994/5) thus no transformer is suspected to contain PCBs. However, the facility still applies R22 refrigerant in chillers

B.5.1 Meeting Internal and External Demands
Priority A
(WB guidelines-Requirement to manage waste to prevent spills, contamination, poisoning etc. for the health of environment and its ecosystem, Meeting Demands: PCB Management Program, Meeting Demands: CFC Management Program)

1. According to discussion held the facility applies R22 and ammonia refrigerants

Recommendation B.5.1.1: Phase out R22 as per the EMP requirement.

Comment B.5.1: To comply with the WB guideline need to phase out R22. Otherwise the facility fulfils other requirements on waste management.

Management Response B.5.1:

B.6 Soil and groundwater Contamination Control

The facility has interceptors and containment in place. Instructions to prevent soil and water contamination are given to maintenance workers.
B.6.1 Identification of potential contamination risks and opportunities for prevention (EMP, WB)

*Comment B.6.1:* The facility knows all sources of soil and groundwater contamination, has contracted a specialist to handle and dispose all hazardous materials and has also imparted the knowledge to employees working in maintenance and fuel storage then, the likelihood of preventing soil and groundwater contamination is great. The facility fulfils the WB and EMP requirement.

*Management Response B.6.1:*

B.7 Noise Management

The facility has a program to carry out regular acoustic surveys in work places and neighbourhood and provide and enforce the use of personal protective gears.

No warning signs were seen or observed posted to show areas of high noise that need more attention and must use earplugs.

*Recommendation B.7:* Post warning signs in all areas with high noise levels.

*Management Response B.7:*

B.8 Occupational health and Safety (WB, EMP) Priority A

The facility has provided first aid kits, personal protective gears and working instructions. Also it enforces strictly the use of personal protective gears (Boots, uniforms, head helmets and earmuffs). The facility provides proper working tools and offers training. Working environment is good with sufficient lighting. Training programs include safety, working in confined areas, rescue procedures, etc. Accidents are reported and cases are reviewed to improve safety.

*Comment B.8:* The facility fulfils EMP and thus meets the minimum WB requirement on occupational health and safety

*Management Response B.8:*

TANESCO’S Environmental Unit, April 2004
B.9 Impact on the Community
(EMP) Priority A

Local people to benefit from available employment

The facility employs both local and few internationals for smooth operation of the plant

Comment B.9: The facility fulfils EMP requirement

B.10 People participated in the Audit process:

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Ubungo -Songas Power Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Title</td>
</tr>
<tr>
<td>Venant Rwennyagira</td>
<td>Safety, Health and Environment Manager - Songas</td>
</tr>
<tr>
<td>Phil Mason</td>
<td>Safety, Health and Environment -Songas</td>
</tr>
<tr>
<td>Randy Hanninen</td>
<td>Site construction Superintendent -Songas Ubungo P/P</td>
</tr>
<tr>
<td>John Lazimah</td>
<td>Environmental Auditor- TL - TANESCO Environmental Unit</td>
</tr>
<tr>
<td>Joackim Joseph</td>
<td>Environmental Auditor- TANESCO Environmental Unit</td>
</tr>
</tbody>
</table>
3.3 Tegeta- IPTL site

The Environmental audit for the Tegeta -IPTL site took place in April 7-8, 2004.

3.3.1 Site setting

Independent Power Tanzania Limited (IPTL) is located in Tegeta area about 25 kilometres North of Dar es Salaam, 1.4 km off Bagamoyo road. The plant covers about 8 hectares of land and has the installed capacity of 103 MW from fuel oil fired diesel generating power plant. The plant became commercially operational in January 2002. The average energy generation per annum stand at 852,400 MWh with 96% availability. The facility operated by Wärtsilä Tanzania Limited is owned by IPTL. The electricity generation varies from month to month depending on the National Power Grid demand.

The site has tank farms, workshop, office block, a warehouse, control room, a switchyard for power export to TANESCO grid via three 132kV/11kV interface transformers and residential houses.

3.3.2 Findings and Recommendations

C.1 General Environmental Management

<table>
<thead>
<tr>
<th>The facility has an Environmental Monitoring programme for discharged effluents (waste water), air quality and soil quality. The Wärtsilä group of companies of which Wärtsilä Tanzania Limited (IPTL facility) is affiliated has Environmental Policy and directive based on ISO 14,001 standard. Therefore, Wärtsilä's Environmental management is based on ISO 14,001 Standard.</th>
</tr>
</thead>
</table>

C.1.1. Environmental management and responsibilities (EMP, Company Policy)  

Priority rating: B

1. The facility does not have a formalized EMS in place as required by the Wärtsilä policy
2. Tracking of existing and imminent environmental legislation is systematically done
3. Environmental aspects are managed by plans and target setting to comply with WB guidelines as shown in biannual monitoring report
4. The facility has training programmes and education on environmental awareness, health and safety and knowledge. Exchange programmes with other Wärtsilä facilities do exist
5. The facility conducts periodic review of environmental, safety and health performance
6. As per organization chart provided, the facility does not have a person assigned with environmental issues. However, there is a person responsible with Safety issues and environmental issues are responsibility of every employee

Comment C.1.1: The facility has got all mechanisms to implement acceptable environmental management thus meets the minimum requirement of the WB and Wärtsilä's policy
**Recommendation C.1.1.1:** Facility should formalize the EMS based on ISO 14,000 standard certification as stipulated in Wärtsilä's Policy.

**Recommendation C.1.1.6:** Facility should appoint a person to be responsible with environmental affairs and be a leader in implementing ISO 14,000 standard certification as stipulated in Wärtsilä's Policy

**Management responses C.1.1:**

**Facility**

**C.2 General Environmental Management of the Facility**

The facility has above surface fuel tanks such that any leakage of the fuel may be early on detected. The facility is also equipped with water oil/fuel separator and has install hydrocarbon electronic detectors between the waste water discharge point and separators to give an alarm to the operators whenever the hydrocarbons (oil/fuel) exceed the limit value. Equipment potential to cause oil contamination such as transformers and fuel tanks have been contained and have retaining walls to prevent soil and ground water contamination. These containments, fuel unloading bay and service areas are connected to oil/water separator unit to separate oil or fuel with water before the water is discharged to Tegeta river. The facility has a mission statement stating that "IPTL power plant will generate power in an environmentally responsible manner and will comply with all applicable laws and regulations".

**C.2.1 Environmental Regulatory compliance**

(*WB guidelines, EMP, Wärtsilä Policy*)

Priority A

1. Emission guidelines: The facility has historical emission levels as follows:

   a) Air quality levels as taken from the Air Quality Monitoring report (Sept/Oct. 2003)

<table>
<thead>
<tr>
<th></th>
<th>WB/WHO levels</th>
<th>Measured levels 24-Hour (Jet A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPM (µg/m³)</td>
<td>120</td>
<td>315</td>
</tr>
<tr>
<td>Sulphur oxide (mg/m³)</td>
<td>60</td>
<td>45.3</td>
</tr>
<tr>
<td>Nitrogen oxide (mg/m³)</td>
<td>400</td>
<td>Not detected</td>
</tr>
<tr>
<td>Carbon dioxide (mg/m³)</td>
<td>0.09</td>
<td>Not detected</td>
</tr>
<tr>
<td>Carbon monoxide (mg/m³)</td>
<td>60</td>
<td>Not detected</td>
</tr>
<tr>
<td>Hydrocarbons (mg/m³)</td>
<td>160</td>
<td>&lt; 3</td>
</tr>
</tbody>
</table>

*Note: The value of Suspended Particulate Matters (SPM) is higher than the World Bank requirement. However it was agreed that other factories around the facility (Wazo cement factory and Kunduchi quarries) might have contributed to this value.*
b) Quality of discharged water

<table>
<thead>
<tr>
<th></th>
<th>WB/WHO levels</th>
<th>Sampled levels directly below discharge point March- May 2003</th>
<th>Sampled levels directly below discharge point Sept- Oct 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6-9</td>
<td>8.2</td>
<td>6.7</td>
</tr>
<tr>
<td>BOD (mg/l)</td>
<td>100</td>
<td>12.4</td>
<td>12.70</td>
</tr>
<tr>
<td>TSS (mg/l)</td>
<td>150</td>
<td>116</td>
<td>35</td>
</tr>
<tr>
<td>Cr (mg/l)</td>
<td>1.0</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>SO₄ (mg/l)</td>
<td>15</td>
<td>10.21</td>
<td>28.00</td>
</tr>
<tr>
<td>Oil and grease (mg/l)</td>
<td>20</td>
<td>312</td>
<td>Not measured</td>
</tr>
<tr>
<td>Phenol (mg/l)</td>
<td>5.0</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Cl (mg/l)</td>
<td>1.0</td>
<td>36.87</td>
<td>579.82</td>
</tr>
<tr>
<td>TKN (mg/l)</td>
<td>50</td>
<td>4.34</td>
<td>7.00</td>
</tr>
<tr>
<td>Conductivity (μS/cm)</td>
<td>150</td>
<td>410</td>
<td>2020</td>
</tr>
</tbody>
</table>

Note: the levels of oil and grease 312 mg/l exceed the WB limit of 20 mg/l. However, the levels of conductivity exceeded the WB limit because of salinity caused by the presence of chlorides in the form of potassium and sodium chlorides. The reasons were accepted.

2. Hazardous material and wastes:

   (e) The facility store hazardous substances in a special designed cold room with ventilation. However lacks the decontamination area.

   (f) Identification follows manufacturers' instructions on the container. In addition, additional labelling is done in the store room walls and shelves.

   (g) Handling of hazardous material and particularly waste oil follows specific instructions. NEMC approved the service of Petroleum Management Solution contractors to dispose waste oil from the IPTL plant.

   (h) The facility is well equipped to combat fire incidences and has smoking restrictions. Besides, it has a contract with Knight Support fire brigade.

3. Solid wastes:
   - The facility has contracted another company to handle the wastes for safe disposal.

4. Ambient noise: Measurement taken on 13th January 2002 at full load at eight different locations around the power plant indicated the values between 43 dB and 59 dB day time and 39 dB and 54 dB at night. Compared to WB requirement of 70 dB for industrial settings the average is within the acceptable levels. Personal protective gears (ear morphs and ear plugs) are provided to workers and visitors entering the power house. Noise warning signs are in place in areas of high noise levels.

5. Record keeping:
   The facility keeps necessary records such as accident incidents, emissions, and spills.

6. Monitoring: monitoring plan and monitoring report
   The facility has a monitoring plan for air quality, water pollution and soil contamination. However, it does not have a monitoring system for health and safety.
7. Emergency Plan:
The facility has prepared emergency procedure manuals for spills and is preparing manuals for
fire procedure. Currently fire emergencies are being taken care of by Knight Support fire
brigade. Emergency communication flow chart with relevant personnel and institutions was not
shown.

8. The regular inspections are done for safety and for environmental reasons (EMP, Boiler
inspections, chain, factory, transformers and fire manual inspections)

Comment C.2.1: The facility complies with EMP and Wärtsilä Policy and meets the minimum WB
requirement and guidelines

Recommendation C.2.1.1: find out why oil and grease content levels is so high in water
discharges compared to WB levels.

Recommendation C.2.1.2: Consider having a decontamination area of hazardous substances and
chemicals in case someone gets contaminated.

Recommendation C.2.1.6: Consider inclusion of Health and safety monitoring in EMP

Recommendation C.2.1.7: Prepare clear emergency communication flow chart with all relevant
individuals and institutions post and circulate to all sections. Additionally old regular drills to
check whether the emergency response plans work as intended

Management response C.2.1:

C.2.2 Contractor control
(WB, GMP) Priority B

The facility has no policy and system designed to control contractors' environmental behaviour
working on its compound.

Recommendation C.2.2: consider having a system of controlling or ensuring that all contractors
working on facility premises observe and protects environment and abide by Wartsila's health
and safety requirements.

Management response C.2.2:
C.3 Air Pollution Management

To control levels of air quality pollutants the facility ensures the quality of fuel used and implement good preventive maintenance program for the machines and equipment.

C.3.1 Identification and evaluation of air emissions
(EMP, WB, Wärtsilä Policy)

The facility knows its air emission sources and does measurement twice a year.

Comment C.3.1: The facility fulfills the EMP thus meets the minimum requirement of the WB guidelines.

Management Response C.3.1:

C.4 Water Pollution Management

The facility has oil/water separator unit and has contained all contamination pollution potential sources. Oily water and waste water are treated before release. The facility has under ground and surface water sampling points.

C.4.1 Meeting Internal and External Demands
(WB, EMP, Water policy and Standards requirement)

Comment C.4.1: The facility fulfills the requirement of the EMP and has necessary equipment to ensure that oil and grease levels in discharged water are within the required levels. The facility need to find out and document other polluters that influence the levels of oil and grease in the samples taken to ensure total compliance with the water policy requirement and WB/WHO guideline and standard. Otherwise by visual inspection the facility complies with WB guidelines.

Management Response C.4:

C.5 Waste Management

The facility has appointed safety and health officer responsible for waste disposal. The facility was installed in 1997 thus no transformer is suspected to contain PCBs. Transformer Manufacturer indicates the transformers contain mineral oil. The facility treats oily and waste waters. Also the facility is equipped with sludge system and sludge tanks which are removed by certified contractor. Solid wastes are collected and disposed by a contractor. Grease and oil stained filters and clothing are incinerated in the incinerator at the site when needed. No equipment at the site uses CFCs such as R12, R22, R502 refrigerants.
C.5.1 Meeting Internal and External Demands

Priority A
(WB guidelines—Requirement to manage waste to prevent spills, contamination, poisoning etc. for the health of environment and its ecosystem, Meeting Demands: PCB Management Program, Meeting Demands: CFC Management Program)

Comment C.5.1: The facility fulfils the requirement thus complies with the WB guideline

Management Response C.5.1:

C.6 Soil and groundwater Contamination Control

All sources of soil and ground water contamination are known thus the facility has spill control procedures, oil water treatment system, sludge treatment unit, and incinerator unit. Instructions to prevent soil and water contamination are given to maintenance workers.

C.6.1 Identification of potential contamination risks and opportunities for prevention (WB, Wärtsilä policy and directive)

Comment C.6.1: The facility fulfils the WB and Wärtsilä policy requirement.

Management Response C.6.1:

C.7 Noise Management

The facility uses silencers, stack and air intake silencers to reduce the noise levels. Warning signs were seen posted to show areas of high noise that need more attention and anybody going to those areas must use earplugs.

Records show that the last acoustic survey of the facility was on January 12th and 13th 2002. Current EMP does not include noise measurements. However, as indicated earlier premises around the power plant noise levels are within acceptable levels below 70 dB.

Recommendation C.7: Facility has to include acoustic surveys in the EMP program.

Comment C.7: The facility fulfils the minimum WB and Wärtsilä policy requirement.

Management Response C.7:
C.8 Occupational health and Safety  
(WB, Wärtsilä Policy)  

The facility has prepared a handbook on safety and health guidelines in dual language (English and Swahili) and distributed to every employee. Also, the facility has first aid kits, provides personal protective gears and working instructions. Safety officer enforces use of personal protective gears (Boots, uniforms and earmuffs). The facility provides proper working tools and offers training. Facility has set a safety day each month to remind everyone’s health and safety responsibility. Assessment judged the working environment as good and acceptable.

Working instructions, procedure and training programs are still in preparations.

Recommendation C.8.1: complete them and train the workers

Comment C.8: The facility meets the minimum WB requirement on occupational health and safety

Management Response C.8:

C.10 People participated in the Audit process:

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>IPTL Power Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Title</td>
</tr>
<tr>
<td>Mr. Parthiban C</td>
<td>General Manager - IPTL - opening meeting</td>
</tr>
<tr>
<td>Mr. Magesvaran Subramaniam</td>
<td>Finance Manager - IPTL - opening meeting</td>
</tr>
<tr>
<td>Mr. Börje A. Johansson</td>
<td>General Manager - Wärtsilä Tanzania Limited</td>
</tr>
<tr>
<td>Mr. Stephan Macharia</td>
<td>Operation analyst and technical writer/EMS/QMS - Wärtsilä Tanzania Limited</td>
</tr>
<tr>
<td>Mr. Fredrick Mungure</td>
<td>Safety Officer - Wärtsilä Tanzania Limited</td>
</tr>
<tr>
<td>Mr. John Lazimah</td>
<td>Environmental Auditor - TL - TANESCO Environmental Unit</td>
</tr>
<tr>
<td>Mr. Joackim Joseph</td>
<td>Environmental Auditor - TANESCO Environmental Unit</td>
</tr>
</tbody>
</table>
CHAPTER 4

CONCLUSION AND RECOMMENDATIONS

The overall conclusion is that Ubungo -Songas and Tegeta-IPTL complies with the World Bank guidelines and the facilities' ESMP and EMP respectively. Only minor improvements are needed as stipulated in chapter 3 and summarized here below. The Mwanza facility is needed to implement the following aspects as soon as possible to make the facility in compliance with the WB requirement:

4.1 MWANZA FACILITY

4.1.1 High Concerns - High Priority:

Recommendation A.1.1.6: Implement the proposed EMP (appended)

Recommendation A.2.1.2:
(a) Construct appropriate storage area for the old and new transformers and arrange safe disposal of old transformers
(b) Impart environmental awareness and knowledge to employees working in the power house compound and risks they pose for their careless handling of hazardous substances such as waste oil or fuel
(c) Supply additional fire fighting equipment
(d) Construct the containment slab and oil stained waste storage area to prevent further soil and water contamination
(c) The power station management should identify all unwanted materials and scrap materials and contact TANESCO's Board of Survey to countercheck the materials and dispose all unwanted scraps.

Recommendation A.2.1.7: Prepare an emergency plan including line of communications and regularly hold a drill to check whether it works as intended

Recommendation A.4.1: Drill two bore holes and measure water quality regularly to check whether there is under ground contamination.

Recommendation A. 4.2: Repair existing water oil separator and construct the second interceptor for power house effluents and regularly check whether they are performing as intended

Recommendation A.5.1.1: Check the performance of the interceptors regularly and have a plan to empty the separator pits. Improve awareness of proper handling of collected oil and fuel waste. If possible arrange and contract with a certified waste oil disposal company to deal with waste disposal

Recommendation A.5.1.3: Construct appropriate area to store and treat the oil and grease contained filters and clothing before disposal
Recommendation A.5.1.4: Construct a storage area for transformers and safely dispose unwanted ones. Raise awareness to other workers that do not know the health risks of PCBs materials

Recommendation A.6.1.1: Remove the contaminated soil and replace with uncontaminated soil.

Recommendation A.8.1: Repair the control room air conditions and fix them again or replace with new ones

Recommendation A.8.2: Re-equip the First Aid Kits with essential drugs as required

Recommendation A.8.6: There is an urgent need to replenish the lost or broken lids and slabs to avoid risks of injury or death

4.1.2 Medium concern: medium priority

Recommendation A.1.1.5: Although the facility has no formalized EMS, it should review its environmental performance regularly to identify problem areas and inform management when necessary

Recommendation A.1.1.7: The Power Plant Engineer (SE) should assign environmental responsibility to every head of sub-sections Electrical, Auto diesel, fitting and warehouse who will report to him regularly on environmental issues at the power station. He should join environmental responsibility to people dealing with health and safety issues.

Recommendation A.2.1.4: Since the power station is old and the financial implications of installing noise silencers or barriers only quality maintenance of machines should be maintained and noise personal protective gears should be strictly enforced.

Recommendation A.2.2: Prepare instructions to control a contractor working on the compound on all behaviours that will impact the environment. Otherwise before the contractor is awarded the contract s/he should submit his work plan proposal that include how the environment is going to be protected during the course of project execution

Recommendation A.7: Have a program of carrying out regular acoustic surveys especially when installing new equipment and post signs warning people of the high noise levels

Recommendation A.8.3: Prepare and distribute simple Environmental, Safety and Health guidelines for employees in a known language

Recommendation A.8.4: Avail and implement training programs to workers on the issues health and safety and on job training

4.1.3 Low concern lower priority

Recommendation A.1.1.1: TANESCO has to develop an EMS suitable to its activities or adopt ISO 14000 in order to improve environmental performance.

Recommendation A.1.1.4: Training unit at Head Office should plan and implement regular environmental awareness and knowledge to employees working in Power stations
Recommendation A.2.1.5: Start to keep record for facility own use and performance improvements

Recommendation A.2.1.8: Regular inspections should also include environmental and health checks and not only safety

Recommendation A.8.5: Prepare working procedures and safety instruction which must be rehearsed

4.2 SONGAS -UBUNGO

4.2.1 High Concern High Priority

Recommendation B.4.1: Remove the contaminated soil and replace with good soil as soon as construction works are completed. Also the facility should consider putting monitoring boreholes at the site to monitor underground water contamination.

Recommendation B.5.1.1: Phase out R22 as per the EMP requirement.

4.2.2 Medium Concern -Medium Priority

Recommendation B.2.1.1: install as planned the electronic monitoring devices to check quality of discharged effluents particularly the limit of oil and grease which is limited to 10 ppm (Tanzanian limit levels)

Recommendation B.2.1.2: Additional labelling, warning and instruction, preferably in a known language, should be posted in hazardous substances storage areas for safety and proper handling.

Recommendation B.2.1.7: hold regular drills to check whether the emergency response plans work as intended

Recommendation B.7: Post warning signs in all areas with high noise levels.

4.2.3 Low concern Low priority

Recommendation B.1.1.1: Consider registering for ISO 14,000 standard certification in the future.

4.3 IPTL- TEGETA

4.3.1 High concern -high priority

Recommendation C.1.1.6: Facility should appoint a person to be responsible with environmental affairs and be a leader in implementing ISO 14,000 standard certification as stipulated in Wärtsilä's Policy

Recommendation C.2.1.1: find out why oil and grease content levels is so high in water discharges compared to WB levels.
**Recommendation C.2.1.6:** Consider inclusion of Health and safety monitoring in EMP.

**Recommendation C.2.1.7:** Prepare clear emergency communication flow chart with all relevant individuals and institutions. Then post them in a visible place and circulate to all work sections. Additionally old regular drills to check whether the emergency response plans work as intended.

**Recommendation C.1.1.1:** Facility should formalize the EMS based on ISO 14,000 standard certification as stipulated in Wärtsila’s Policy.

**4.3.2 Medium concern -medium priority**

**Recommendation C.2.1.2:** Consider having a decontamination area of hazardous substances and chemicals in case someone gets contaminated.

**Recommendation C.2.2:** Consider having a system of controlling or ensuring that all contractors working on facility premises observe and protect environment and abide by Wartsila's health and safety requirements.

**Recommendation C.7:** Facility has to include acoustic surveys in the EMP program.

**Recommendation C.8.1:** Complete work procedures and instructions and train the workers.

**5.0 REMEDIATION COSTS**

The cost for remediation and monitoring are as follows (for details see the attachments):
- Construction of new oil interceptor, oil filter incineration area and a trench: 8,100,400/= 
- Removal of oil stained soil and replacement of clean soil: 400,000/= 
- Transformer storage area and adding aggregates at fuel tanks: 17,720,450/= 
- Drilling monitoring boreholes (indicative costs): 10,000,000/= 
- Total costs: 36,220,850/= 

EMP costs annually: 5,500,000/=
Bibliography


SAPP, Draft SAPP Guidelines on the Management of Oil Spills, 2004


Wartsila Tanzania Limited, Operation and Maintenance: A Guide to Safety & Health


Dear Sir,

RE: EMERGENCY POWER GENERATION PROJECT

ToR FOR THE ASSIGNED TASKS AT MWANZA POWER PLANT

We are currently making preparations for the implementation of the Emergency Power Generation Project (EPGP), a project that will also explore generation improvement at the Mwanza Power Plant. The preparatory studies include Environmental Audit to be undertaken by our Environmental Unit.

Referring to earlier verbal communication between Mr. John Lazimah our Environmental unit staff and Dr. Masanja of Chemical and Process Department on 11 March 2003, we need the following services from you:

1. Ambient Air quality measurement: to know the current status of air pollution from existing power plant( 3 points) on the following parameters: Levels of SOx, NOx, CO2, Hydrocarbon and Particulate Matters.

2. Noise level Measurements: Inside and Outside the power house and on the surrounding area where the additional generators will be installed.

3. Soil sampling and contamination testing: Parameters needed include pH, Nitrates, Sulphates, Calcium Carbonate, moisture content, Heavy
metals, and electrical conductivity and the depths at which the samples were taken.

4. Water quality: Surface or underground water in the vicinity of the power plant if any and test the following parameters, pH, oil content, conductivity, TSS, SO4, Cl, Cr, BOD, Phenol, and TKN (total kjeld Nitrogen).

You are also requested to provide us with a brief report on sampling, testing, analysis of the results and interpretation.

We would also like to inform you that this task should be treated as very urgent and results are required by 5th April 2004. The traveling arrangement to Mwanza remains the same i.e. Dar- Mwanza 27/3/2004 and returning date Mwanza - Dar 29/3/2002.

Yours faithfully,

For: TANZANIA ELECTRIC SUPPLY COMPANY LIMITED.

K. R. Abdulla
For: MANAGING DIRECTOR

n.o.o. cc: Deputy Managing Director (GT&E)
Director Projects
Mwanza site project Engineer
# NYAKATO- MWANZA

## PROPOSED ENVIRONMENTAL MANAGEMENT PLAN (EMP)

<table>
<thead>
<tr>
<th>Impact/ Issue</th>
<th>Monitoring Action</th>
<th>Frequency/ Time Frame</th>
<th>Responsible organ</th>
<th>Indicative costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Installation of Additional Generators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Quality</td>
<td>Monitor nuisance of dust during site preparation for new generators</td>
<td>Daily during construction and installation</td>
<td>Contractor/ TANESCO Mwanza</td>
<td>Nil</td>
</tr>
<tr>
<td>Noise</td>
<td>Monitor noise levels dB (A) and any rock blasting should be done during the day</td>
<td>Daily during site preparation</td>
<td>Contractor/ TANESCO</td>
<td>Nil</td>
</tr>
<tr>
<td>Water Pollution and soil contamination</td>
<td>Monitor any unacceptable fuel or oil spills. Monitor storage and any mishandlings</td>
<td>Daily during site preparation</td>
<td>Contractor/ TANESCO</td>
<td>Nil</td>
</tr>
<tr>
<td>Waste Management</td>
<td>Monitor collection and removal of all wastes at the site and dispose them appropriately</td>
<td>Daily during the site preparation and installation</td>
<td>Contractor/ TANESCO</td>
<td>Nil</td>
</tr>
<tr>
<td>Health and Safety of Workers</td>
<td>Monitor the use of personal protective gears, work procedures and injury reporting mechanism Monitor and implement traffic regulations for construction vehicles</td>
<td>Daily during the site preparation and installation of the machines</td>
<td>Contractor/ TANESCO</td>
<td>Nil</td>
</tr>
<tr>
<td>Compliance with laws and regulations</td>
<td>Monitor compliance of applicable permits and regulations. Involve relevant government institutions and agencies (NEMC, City council, Water Authority, Fire department, Police, etc.)</td>
<td>Regularly during the implementation of the PPE</td>
<td>TANESCO</td>
<td>Nil</td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air: plant emissions</td>
<td>Monitor NOx, SOx, CO and Particulate Matter in (mg/l or ppm) to ensure compliance with WB guideline</td>
<td>Biannual</td>
<td>TANESCO/ BICO</td>
<td>2,300,000/=</td>
</tr>
<tr>
<td>Noise Impact</td>
<td>Monitor noise levels dB (A) to ensure compliance with WB guidelines after any major facility maintenance or installation</td>
<td>Biannual</td>
<td>TANESCO/ BICO</td>
<td>240,000/= BICO</td>
</tr>
<tr>
<td>Under ground and surface water Pollution</td>
<td>Monitor any unacceptable fuel or oil spills, storage and any mishandling of hazardous substances Monitor underground water quality parameters at the site and discharges from the interceptor in order to comply with the WB guideline in particular grease and oil levels which should be less than 10 ppm Monitor delivery of oil and fuel to avoid spills, and any water fuel effluents are sent to the separator before discharge to the ground Monitor awareness of employees and ensure that they abide by the principles of environmental protection</td>
<td>Daily, Biannual</td>
<td>TANESCO/BICO</td>
<td>750,000/=</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TANESCO</td>
<td>NIL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TANESCO</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TANESCO</td>
<td>Nil</td>
</tr>
<tr>
<td>Waste Management</td>
<td>Monitor collection and removal of all solid wastes and liquid wastes from the power plant and safely dispose them</td>
<td>Weekly</td>
<td>TANESCO/Contracted body</td>
<td>4,000 x 52 weeks = 208,000/=</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>--------</td>
<td>------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Education and Training</td>
<td>Monitor Power Station TANESCO staff training program to verify compliance with power station training requirements (work procedures, safety issues, emergency preparedness, health risks, environmental awareness, reporting, hot work, working in confined spaces, etc.)</td>
<td>Yearly</td>
<td>TANESCO HQ and TANESCO Mwanza</td>
<td>840,000/=</td>
</tr>
<tr>
<td>Safety and Health of workers</td>
<td>Monitor the provision and use of personal protective gears</td>
<td>Biannually</td>
<td>TANESCO Mwanza and TANESCO HQ</td>
<td>840,000/=</td>
</tr>
<tr>
<td></td>
<td>Monitor implementation of workers health and safety, First Aid Kit and training program</td>
<td>Biannually</td>
<td>TANESCO Mwanza and TANESCO HQ</td>
<td>840,000/=</td>
</tr>
<tr>
<td></td>
<td>Monitor and review occupational injury and illness reporting and response to injury or accidents (injury and accident investigation program)</td>
<td>Biannually</td>
<td>TANESCO Mwanza and TANESCO HQ</td>
<td>840,000/=</td>
</tr>
<tr>
<td></td>
<td>Monitor and review emergency response Plan performance</td>
<td>Biannually</td>
<td>TANESCO Mwanza and TANESCO HQ</td>
<td>840,000/=</td>
</tr>
<tr>
<td>Compliance with Laws, regulations and guidelines</td>
<td>Monitor compliance of all applicable permits and guidelines. Monitor and maintain lines of communication with all relevant government institutions, agencies on issues of environment, water use, health and safety, fire, accidents, etc.</td>
<td>Yearly</td>
<td>TANESCO Mwanza and TANESCO HQ</td>
<td>To be combined</td>
</tr>
<tr>
<td>Decommissioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>Monitor that the land is returned to its original state that would allow other land uses</td>
<td>End of operation phase</td>
<td>TANESCO’s Decommission Engineer</td>
<td>Decommissioning costs</td>
</tr>
<tr>
<td></td>
<td>Monitor that all contaminated soil is removed and replaced with a good soil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor re-vegetation of the land</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wastes</td>
<td>Monitor the removal of all solid and liquid wastes from the site and that they are safely disposed of</td>
<td>End of operation phase</td>
<td>TANESCO’s Decommission Engineer</td>
<td>Decommissioning costs</td>
</tr>
</tbody>
</table>

Total estimated costs for implementing this EMP is 5,475,000/=  These costs are based on the Return air transport costs for two people to Mwanza, Day allowances and sample analysis costs