

**THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF ENERGY AND MINERALS**



THE NATIONAL ENERGY POLICY

February, 2003

ABBREVIATIONS AND ACRONYMS

AU	African Union
CBO	Community Based Organisation
EAC	East African Co-operation
EIA	Environmental Impact Assessment
GDP	Gross Domestic Product
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IPP	Independent Power Producer
KBO	Kagera Basin Organisation
Km	Kilometres
LPG	Liquefied Petroleum Gas
MEM	Ministry of Energy and Minerals
NBI	Nile Basin Initiative
NGO	Non-Governmental Organisation
PV	Photovoltaic
R&D	Research and Development
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SIDA	Swedish International Development Cooperation Agency
TANESCO	Tanzania Electric Supply Company Limited
TAS	Tanzanian Shilling
TOE	Tonne of Oil Equivalent
USD	United States Dollar

TANZANIA FISCAL YEAR

July 1 – June 30

CURRENCY EQUIVALENCE

TAS 1050 ~ USD 1.0 (As of June 2003)

MEASUREMENTS

GWh	Gigawatt-hour	=	1,000,000 Kilowatt-hour
MW	Megawatt	=	1,000 Kilowatts

CONVERSION FACTORS

1 Watt-hour	=	3,600 Joules (J)
1 TOE	=	42.7 Giga Joules (GJ)

Note:

GDP figures are for year 2001 at 1992 prices.

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1. THE ENERGY SECTOR

1.1 Background

1.1.1 Revision of the 1992 National Energy Policy

The first National Energy Policy for Tanzania was formulated in April 1992. Since then, energy sub-sectors as well as the overall economy have gone through structural changes, where the role of the Government has changed, markets have been liberalised and private sector initiatives encouraged. Hence, the policy document has been revised taking into account structural changes in the economy and political transformations at national and international levels.

However, the national policy objective for the development of the energy sector remains *to provide an input in the development process by establishing an efficient energy production, procurement, transportation, distribution, and end-user systems in an environmentally sound manner and with due regard to gender issues.*

The revision has, therefore, focussed on market mechanisms and means to reach the objective, and achieve an efficient energy sector with a balance between national and commercial interests.

An interactive and participatory process between Government, other stakeholders and relevant groups has been necessary as part of the formulation process in order to incorporate views of market actors and energy consumers to address the complex nature of the sector.

Specifically, the revised energy policy takes into consideration the need to:

- (a) have affordable and reliable energy supplies in the whole country;
- (b) reform the market for energy services and establish an adequate institutional framework, which facilitates investment, expansion of services, efficient pricing mechanisms and other financial incentives;
- (c) enhance the development and utilisation of indigenous and renewable energy sources and technologies;
- (d) adequately take into account environmental considerations for all energy activities;
- (e) increase energy efficiency and conservation in all sectors; and

- (f) increase energy education and build gender-balanced capacity in energy planning, implementation and monitoring.

1.1.2 Energy Situation

Domestic energy demand has grown rapidly due to population growth and the increase in economic activities during the last ten years. The estimated total energy consumption is more than 22 million tonnes of oil equivalent (TOE) or 0.7 TOE per capita. Energy consumption in rural areas accounts for about 85% of total national energy consumption.

The energy balance is dominated by biomass-based fuels particularly fuel-wood (charcoal and firewood), which are the main source of energy to both urban and rural areas. Biomass-based fuel accounts for more than 90% of primary energy supply. Commercial energy sources i.e., petroleum and electricity, account for about 8% and 1.2%, respectively, of the primary energy used. Coal, solar and wind account for less than 1% of energy used. Tanzania has a forested area of about 35.5 million hectares of which, around 80,000 hectares are plantation forests, and 70,000 hectares are privately owned.

Other abundant, but so far not fully tapped, indigenous energy sources which could be harnessed to meet the growing energy requirements include; hydropower, coal, natural gas, uranium, solar, wind, and geothermal energy. Hydropower potential is estimated at 4.7 GW, coal reserves are estimated at about 1,200 million tonnes, of which 304 million tonnes are proven. Natural gas is estimated at 45 billion cubic metres of proven reserves.

Tanzania continues to rely on imported petroleum products. Electricity generation is mainly hydro-based, while thermal plants provide electricity for peak loads. Development of natural gas for electricity is ongoing. The dissemination of renewable energy technologies have been limited to the promotion of improved stoves, improved charcoal production techniques, solar, biogas and windmills and to a lesser extent photovoltaics. Initiatives to increase utilisation of coal for electricity generation are being explored.

1.2 Vision and Mission

The Vision of the energy sector is to effectively contribute to the growth of the national economy and thereby improve the standard of living for the entire nation in a sustainable and environmentally sound manner.

The Mission for the energy sector is to create conditions for the provision of safe, reliable, efficient, cost-effective and environmentally appropriate energy services to all sectors on a sustainable basis.

By fulfilling its vision and mission, the energy sector will contribute to social economic development, and in the long-term perspective, poverty eradication.

1.3 Policy Objectives

The national energy policy objectives are to ensure availability of reliable and affordable energy supplies and their use in a rational and sustainable manner in order to support national development goals. The national energy policy, therefore, aims to establish an efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner.

1.4 Overall Framework

1.4.1 Economic Framework

Currently, the population of Tanzania is about 34.6 million people, with an estimated annual population growth rate of 2.9%. About 75% of the population live in rural areas. Agriculture is a major economic sector and a majority of the population is involved in various agricultural activities, mainly subsistence farming. Agriculture accounts for about half of the GDP and over 60% of the export earnings. Manufacturing and mining sectors account for about 8% and 2% of GDP respectively, while commerce accounts for about 12% and transport sector 6%. The annual GDP per capita is estimated at USD 251, which places Tanzania among the poorest countries in the world.

The national economic objectives of the Government in the medium-term, as described in the policy framework paper for 1998/99 – 2000/2001, include among other goals, the gradual increase of economic growth rate to 6% per year. This target is based on the assumption that further improvements in infrastructure and normal weather conditions will allow for an agricultural growth rate of 5 to 6% per year. Investment in newly privatised state-owned companies and new mines are expected to increase growth in manufacturing and mining by 6 - 7% and 20% per year, respectively. Investment will mainly take place in mining, agro-processing and tourism.

1.4.2 Social Framework

Poverty is one of the main problems in Tanzania. Poverty reduction interventions need to be enhanced in order to facilitate income growth through employment and ensure access to basic services and goods by the poor. Poverty reduction programmes aim at economic and social empowerment of the poor and creating an enabling environment for development, through investment in transportation, communications, energy and other economic, social and physical infrastructure.

These interventions are mutually related and activities in all areas of the programme are required for successful poverty reduction to take place.

For the coming decades, the socio-economic challenge for Tanzania is to obtain a robust economic growth, with a positive impact on the whole population. The Government has articulated specific goals for poverty reduction in order to reduce extreme poverty by half, from the current level of 39% to an estimated 19.5% of the population by the year 2010. The overall vision is total poverty eradication by the year 2025.

The main goal of the national development strategies is to improve and sustain the welfare and standard of living of the population. Reforms in the economic sectors aim at taking advantage of private sector participation and letting the State concentrate on policy formulation and overseeing social activities.

The Government's decision to disengage itself from direct production activities will facilitate the provision of more resources to the social services. Greater emphasis will be placed on decentralisation of authority and promotion of community involvement in the provision and management of social services. The private sector involvement in the development and management of education, housing, and health matters, information and broadcasting and energy services is encouraged. As far as the energy sector is concerned, emphasis will be on solutions to meet rural energy needs and increase awareness of, for example, HIV/AIDS problems and impacts, and other social issues within the sector, which will consequently contribute to poverty reduction.

1.4.3 Environmental Framework

The National Environmental Policy of 1997 defines the environmental framework for various sectors, including energy. The objectives of the National Environmental Policy include, among others: sustainability, security, and equitable use of resources to meet the basic needs of present and future generations, without risking health and safety. Another major objective is to prevent degradation of land, water, vegetation and air, which constitute our life support systems, and to conserve and enhance our natural and man-made heritage, including biological diversity of the ecosystem of Tanzania.

The environmental policy also highlights the importance of public awareness and understanding on the essential linkages between environment and development, thus promoting individual and community participation in environmental action.

International co-operation on the environment agenda and expansion of Tanzania's participation and contribution to relevant bilateral, sub-regional, regional, and international organisations and programmes, including the implementation of international treaties are also emphasised in the policy.

1.4.4 Institutional Framework

Proper functioning of the energy sector has to be backed-up by an efficient institutional arrangement. A transparent institutional framework with a clear division of roles and responsibilities is desirable and in line with the global trends of accountability and liberalisation of the economy. In this respect, the role of Government for the energy sector will be to facilitate development, provide stimulus for private investment initiatives, and promote effective regulation, monitoring and co-ordination of the sector.

The ministry responsible for energy supervises the implementation of the energy policy, which is the main guidance for change, backed by legislation and regulation. The ministry will also facilitate mobilisation of resources into areas where market forces fail to ensure adequate energy services.

The roles and relations of the different actors, the ministry, regulators and operators of the sector will be determined by legislation. Through the regulatory functions of the sector, operators will be licensed; markets and performance will be monitored; and necessary regulatory measures will be applied.

2. ENERGY SECTOR CHALLENGES AND STRATEGIES

2.1 Challenges

In order to achieve the overall objectives of economic growth and poverty reduction, there is a need for substantial improvements within the energy sector, both on the demand and supply sides. The following are some of the challenges:

- (a) **Increased electricity supply and distribution:** Generation of electricity is expected to triple during the next twenty years in order to meet the projected increase in demand from industry, agriculture, commerce and the general population. Significant investment has been made during recent years in generation facilities, which will satisfy demand for the next few years. However, in the medium term, there is a need to promote and enhance private investment in electricity generation, transmission and distribution in order to meet the projected growth in demand.
- (b) **Petroleum Development:** A sizeable amount of foreign currency earnings are used to finance petroleum products imports. In addition to gas discoveries, an oil discovery would go a long way towards reducing the petroleum import bill. The challenge is to sustain and increase oil and gas exploration through promotion of private sector participation.
- (c) **Regional interconnection:** Regional and international integration of power systems is essential for Tanzania and its neighbouring countries to reach the projected economic growth. Electricity supply would thereby be more reliable and secure for the benefit of all sectors of the economy.
- (d) **Rural electrification:** Electricity needs to be made available for economic activities in rural areas, rural townships and commercial centres. Rural electrification is, therefore, a case of long-term national interest and a prerequisite for a balanced socio-economic growth for all in Tanzania.
- (e) **Reaching rural households:** Around 80% of the population has very low purchasing power and depends mainly on wood-fuel for cooking and kerosene for lighting, which have negative consequences to the environment and the quality of life, especially to the rural poor. There is scope for improvement in energy supply to the rural population, especially reducing the burden to women, and the reversal of deforestation if energy efficiency is promoted in cooking and lighting. Radical improvement in household energy efficiency has enormous potential benefit for society.

2.2 Strategies

There are fundamental features and considerations, which determine the development directions and structures of the energy sector. The following are some of the key issues to take into account:

- (a) **Market Economy:** In line with the overall economic policy of the country, the market-oriented concept shall apply to the supply of energy products and services. Implicitly, medium and long-term services of independent economic actors should determine allocation of resources. Competition on a fair and equitable basis among independent actors forms the basis for market efficiency.
- (b) **Regulatory Regime:** In order to ensure that the market functions without distortions, there will be an independent regulatory regime for the energy sector. While the institutional framework and the regulatory mandate may vary in the different energy sub-sectors, the regulatory regime will be characterised by its autonomy, transparency, predictability and stability. To safeguard this, the regulatory regime shall be anchored in legislation.
- (c) **National Interest versus Market Forces:** The reliance on market forces in order to achieve the national development objectives of economic growth and poverty reduction is not intended to hinder the role of the state to intervene when and where market forces fail to deliver desired results. Keeping its role as facilitator of an enabling environment for the market, the state shall regulate or deregulate the market in order to enhance the benefits of development for the economically weaker communities and groups. The state needs to unconditionally protect and promote the interests of society as a whole. Thus, the state will apply transparent fiscal (taxes, duties, levies) and non-fiscal (fees, subsidies, concessional credits, guarantees) measures to direct market forces and, when necessary, correct market failures.
- (d) **Regional Co-operation and Trade:** In the Southern African region, there are apparent differences between areas with electric energy production potentials and regions with electricity deficits. Regional interconnection and integration of the power systems are therefore essential for the economies of Tanzania and its neighbouring countries to achieve efficient energy markets. Long-term decisions must therefore be based on regional energy considerations.
- (e) **Energy Conservation and Efficiency:** Economic development correlates strongly with energy consumption and energy independence. The utilisation of energy is related to exploitation of natural resources and of life supporting elements such as water and forests. Efficient use of energy is therefore a necessary condition for sustainable economic development. Energy conservation and efficiency issues should, therefore, be high priorities of the Government.

- (f) **Environmental Management:** Crosscutting all energy sub-sectors and all relevant sources of energy are the environmental impacts of energy exploration, production, distribution and consumption. Environmental impacts and hazards shall be addressed by rigorous environmental management regimes on all energy activities and by applying the economic instruments for changing market behaviour. This will discourage any use of environmentally unsound energy technologies (energy inefficiency, unclean practices).
- (g) **Gender Issues (Social Role of Women and Men):** Inferior energy practices, particularly among poor households in rural and semi-urban areas, are mainly affecting women. The search, collection, and use of fuel-wood are associated with heavy and often low-productive time-consuming work, mainly performed by women. It also represents a serious health hazard through smoke and carbon dioxide generated by application of inferior stoves/fuel types. The energy policy, therefore, introduces an institutional focus on improvements of rural and semi-urban energy practices in order to reduce women workload and to involve them in the problem solving and decision-making processes on energy issues. Women are under represented on the supply side of commercial energy. The involvement of women at all levels of the sector shall, therefore, be prioritised to better utilise available potential competence and capacity. Training and incentives for increased female participation as decision-makers at all levels need to be encouraged.
- (h) **Financial and Fiscal Implications:** The energy sector represents a substantial part of the national economy. The Government shall balance between the use of the energy sector for revenue generation and the need for affordable energy by limiting the impact of high taxes, levies and other duties on energy production costs. This balance could include strict cost pricing in markets of major energy products, as well as the requirement of the sector for subsidies, incentives and other costs, which need to be covered within the sector itself or by the national state budget. The cost of energy represents a significant part of the total cost structure of companies. Consequently, it affects the competitiveness of products in domestic as well as export markets. Cost effectiveness in the production and supply of energy may be achieved through continued opening up and liberalisation of energy markets and further introduction of competition at all levels of the sector. The elimination of cross-subsidisation from large energy consumers to households and other smaller consumers will go a long way towards improving product competitiveness at the market place.
- (i) **Appropriate Technologies:** There is a broad range of technological alternatives to be applied within the energy sub-sectors. Extensive research and development have been made both in Tanzania and internationally. Consideration needs to be on the application of appropriate technologies that are affordable, environmentally sound and well adapted to local needs. There is a need to scale up, and thereby, commercialise some of the technologies already in place in Tanzania. Furthermore, research and ongoing pilot testing should continue.

- (j) **Legal Interventions:** Legislation is one of the main instruments by which the Government steers and controls the development of the energy sector. Generally, some legislation is missing and applicable existing laws are outdated and consequently do not reflect recent developments. There is a need to update the legislation and existing laws.

3. ENERGY DEMAND AND SUPPLY

3.1 Energy Demand

3.1.1 Transport Sector

More than 40% of all imported petroleum is consumed within the transport sector. The development of the sector, therefore, has both direct and indirect implications for the total energy consumption and social-economic growth.

The energy challenge within the transport sector is to ensure efficient and safe use of petroleum products. Efficient petroleum use is determined by the standard of vehicles, the quality of the transport systems and the use of most energy efficient transport means.

There are insufficient standardisation and quality control of petroleum products and inadequate enforcement and uncoordinated safety measures. There is a need for efficient use of transportation means and improvement of underdeveloped transport infrastructure, including use of alternative systems.

Regulatory measures for improvements in licensing, storage facilities and safety standards and pricing need to be addressed. Furthermore, it is necessary to improve mass transport systems to reduce fuel consumption, traffic congestion and pollution. The exploration for possibilities of fuel switch to other energy forms such as electricity, ethanol and compressed natural gas should be encouraged.

Policy Statements

- 1. Promote energy efficiency and conservation in the transport sector.*
- 2. Encourage use of more efficient transportation modes.*
- 3. Promote fuel switch from petroleum to other alternative environmentally friendly fuels.*

3.1.2 Manufacturing Sector

Manufacturing sector is one of the major consumers of energy, particularly electricity and petroleum. In most manufacturing industries, energy is used inefficiently due to old equipment and outdated technologies as well as capacity under-utilisation.

Because of massive energy losses in the sector, there is a necessity to promote energy audits and encourage energy efficiency and conservation measures in order to save resources and the environment.

Policy Statements

4. *Ensure adequate energy supply in order to meet energy demand of the manufacturing sector.*
5. *Ensure that energy audits are mandatory and regulate energy efficiency and conservation measures.*

3.1.3 Mining Sector

For five years (1997-2001) the mining sector had remarkable growth rate of an average of 15%, which implies a corresponding increase in energy demand. Isolated mining areas are presently influenced by limited availability, unreliability and high cost of energy due to undeveloped infrastructure. Power demand in such areas is currently met by auto-generation. In order to meet the energy demand of existing and new mines, the mining companies will be encouraged to generate own power or import through regional interconnections and co-operate in development of power infrastructure. Mining companies will also be expected to sell surplus power from auto-generation to neighbouring communities.

Policy Statement

6. *Ensure reliable power supply to the mining sector, and encourage increased energy mix in energy generation and distribution.*

3.1.4 Household Sector

The household sector constitutes the largest share of the total energy consumption, mainly through its use of woodfuel. The essential end uses are heating (including cooking, brewing, smoking, firing, boiling, and ironing, lighting, and electric appliances.

In rural areas, firewood and human energy are the most used energy sources. Electricity, even in areas where it is readily available, is rarely used for cooking due to financial reasons. Firewood will, even given a radical increase in use of electricity, be an important source of energy for households in the foreseeable future. However, this

source has other negative impacts in houses, including, indoors pollution causing both health risks and safety problems to the end-user and is also time-consuming to collect. Lighting in rural areas is in most cases provided by kerosene. In urban households, charcoal remains by far the most popular fuel for cooking. The use of other energy sources such as solar, biogas and LPG, is limited despite various promotional efforts.

The prevailing poverty situation both in rural and urban areas is a major obstacle for development of the energy sector because the people's purchasing power is low. There are major differences in accessibility and affordability of energy products within rural areas. For most of the households, the high cost of commercial energy and the related appliances is a big constraint. There is, therefore, a need to facilitate economic growth through employment creation; expansion of a competitive industrial base; and establishing markets for energy efficient end-use technologies. Private entrepreneurs need to be stimulated in order to address demand and a growing household market. Among others, another factor to consider is tax incentive on end-use equipment and appliances in order to encourage their adoption.

There is a need to change the prevailing inefficient practices in energy use, and institute basic standardisation of energy end-use appliances. In order to address issues related to standardisation, safety, health, education, awareness, and maintenance, there is a need for institutional co-operation and co-ordination. Thus, sufficient human and financial resources would be required.

Policy Statements

- 7. Encourage efficient end-use technologies and good household practices.*
- 8. Encourage energy efficient buildings and wider application of alternative sources of energy for cooking, heating, cooling, lighting and other applications.*
- 9. Ensure safe utilisation of household energy appliances through regulation of safety standards.*

3.1.5 Agriculture Sector

The economy of Tanzania is dependent on agriculture, which employs over 75% of the workforce. It is also the major source of food supply and raw materials for the industrial sector. Subsistence farming is the most common activity and women are the main stakeholders in most agricultural activities.

Of the total energy demand in agriculture, 75% is met from human energy, 15% by animal power and 10% by diesel, electricity and solar power. Drying and processing of agricultural products is by traditional applications of solar energy and firewood. Many

agricultural activities contribute towards deforestation, through extensive farming and slash-and-burn practices.

The current Agricultural Policy calls for increased output and efficiency in agricultural production, timely delivery and efficient use of energy inputs into agriculture and increased use of tractors as well as use of renewable energy resources. The policy also includes the promotion of environmentally friendly technologies and methods through collaboration with other ministries and institutions.

The main energy challenge within agriculture is to ensure supply of sufficient and cost-effective energy to meet the requirements for improved agricultural activities, including agro-processing and irrigation.

There is a need to create a commercial environment and encourage entrepreneurs to develop and distribute energy products and technologies in order to improve efficiency in agricultural production and add value to agricultural products. Furthermore, methods and approaches on how to maximise the use of alternative sources of energy such as coal, micro-hydro, solar, wind, biomass, and other renewable energies, need to be developed and commercialised.

Policy Statements

10. Ensure sufficient energy supply to meet the increasing demand in agriculture sector.

11. Encourage energy efficiency in irrigation, agro-processing and other agricultural activities.

12. Facilitate agro-processing centres with appropriate energy alternatives, with emphasis on electrification in order to promote small-scale industry, employment creation and economic growth.

13. Create an enabling environment for governmental institutions and private sector, which are engaged in research and development, and the distribution of energy products and development of appropriate energy technologies for agriculture.

3.1.6 Commerce Sector

Commerce accounts for about 6% of the national commercial energy consumption. The commercial sector includes among others wholesale and retail shops, hospitals, hotels, restaurants and recreation centres. Overall, the demand for energy in the sector is mainly met by commercial electricity, petroleum, charcoal and woodfuel.

Unreliable energy supplies as well as inefficient energy use, characterise the sector. Efficiency in energy use, in particular lighting, heating, and powering of electric appliances need to be improved. It is necessary to promote the use of alternative energy sources, especially renewable energies and coal.

Policy Statements

14. Ensure sufficient and cost effective energy supply to meet the increasing demand in commerce sector.

15. Promote energy management practices.

16. Encourage efficient use of alternative energy sources.

3.1.7 Information Technology Sector

Information technology is an important element for sustainable development of all sectors. Due to the fast growth of the sector, demand for reliable electricity to support effective applications of information technology is becoming a major concern. In addition, having modern information technology in the energy sector will facilitate efficient functioning of energy activities inter-alia assessments, planning, policy analysis and other managerial services.

There is a need to improve energy services, especially electricity geared towards enhanced use of modern information technologies. Areas of improvements are overall incentives, working conditions and how to facilitate institutions and organisations working on research in energy and information technology, and dissemination of data and energy information. Furthermore, there is a need to create and develop modern information networks on energy matters.

Policy Statements

17. Facilitate sufficient, appropriate and cost effective energy supply to meet the growing energy demand in information technology sector.

18. Promote and enhance use of modern information technology for planning, assessments, policy analysis, database networks and managerial services in the energy sector.

3.2 Energy Supply

3.2.1 Electricity

Electricity supply in Tanzania consists of both interconnected and isolated systems. Installed generation capacity on the interconnected transmission grid amounts to 863 MW from both hydro and thermal generation facilities. Hydro accounts for 559MW while thermal contribution amounts to 304MW. Contribution from isolated thermal generation facilities amounts to 29MW making a total installed capacity of 892MW.

Tanzania Electric Supply Company (TANESCO) has so far been the sole vertically integrated electricity supplier on the mainland and supplies bulk electricity to Zanzibar. Three independent power producers (IPPs) supply power to the national utility: a 100 MW diesel plant by Independent Power Tanzania Ltd., and two small plants of Kiwira Coal Mine and Tanganyika Wattle Company; both supply bulk power of about 4 MW. IPP capacity will increase when the 112 MW Ubungo diesel turbines are converted into gas to electricity generation and privatised in year 2004. Tanzania also imports electricity through cross-border interconnections of about 8 MW and 5 MW from Uganda and Zambia, respectively.

The high cost of electricity and its low reliability constitutes a major challenge, especially for the manufacturing and mining sectors.

There is very limited access to electricity. At present, 10% of the population has access to electricity. In the rural area, only 1% is reached by electricity. There are significant technical and non-technical losses in the system and vandalism on power system infrastructure in some places.

Electricity needs to be made reliable and affordable to customers with very low demand, for lighting and limited domestic purposes. A system of threshold pricing for low consumption customers could, therefore, be considered. In the new emerging energy market, prices have to be monitored, and predictable and transparent mechanisms established for necessary adjustments.

It is necessary to encourage private investment in development projects, based on a rational exploitation and management of resources, and protection of the environment. Security of electricity supply needs to be enhanced through utilisation of other local energy sources, including coal, natural gas, renewable energy (e.g. geothermal) and from regional grid interconnections.

There is a need to liberalise and regulate the electricity sub-sector. The main thrust shall be based on private initiatives and investment for exploitation of the local energy sources. The prime factors determining the magnitude and pace of economic exploitation of energy reserves are: - the governance of the sector; the development

of the domestic energy demand; and the energy trade possibilities in the region. For these developments to take place there is a need to review the legal and regulatory framework, including the establishment of an independent regulator.

19. *Competition, as a principle to attain efficiency, shall apply for the electricity market.*
20. *Generation of electric power shall be fully open to private and public investors as independent power producers. Investment shall be based on economic and financial criteria considering open access to regional network, balanced domestic supply and environmental impacts.*
21. *There will be open access to the grid in order to achieve an efficient competition in generation.*
22. *Regional co-operation and integration shall be given priority in investment to ensure reliable supply, exploiting low cost energy sources for regional trade and balancing the erratic availability of hydro-based power.*
23. *Priority shall be placed on developing domestic power generation capacity based on indigenous resources in order to meet increase in demand.*
24. *There shall be an opening for strategic partnerships with technically suitable, and financially strong investors, in the sector, as a step in the development of a competitive market within generation and distribution.*
25. *Tanzania shall conduct research within the country and take part in international research, development and application of commercially viable, large-scale technologies for renewable sources of electricity generation.*
26. *The Government will support structural models (e.g. ownership contracts) in the electricity distribution system, which will ensure competition and higher-level of investment for improvement of technical and commercial systems.*
27. *The Government shall establish a new governance system in the power sector by differentiating the roles for (a) policy making and legislative functions carried out by the Government and the Parliament; (b) the regulatory functions carried out by an independent regulator; and (c) other functions carried out by public and private operators.*

3.2.2 Petroleum

Despite efforts to undertake petroleum exploration, Tanzania has not yet found oil and is, therefore, completely dependent on imported petroleum products. The total annual demand for petroleum products is 1.2 million tonnes. The average import

value per year in years 1998 and 1999 was USD 190 million, corresponding to 26% of the total export value of the country. The transport sector is the main user of petroleum products with 40% of the market, followed by manufacturing using 25% and households 10%. The balance is accounted for by agriculture, and commerce.

Even after full liberalization of the petroleum sub-sector in year 2000, the cost of petroleum products to the Tanzanian customer is high and few actors dominate the market. This creates oligopolistic behaviour. In addition, there is a problem with smuggling and dumping of petroleum products, with its consequential implications to quality control, safety and loss of revenue.

There is a need to supply petroleum products on a sustainable basis and cost effectively with due consideration to environment, health and safety.

While it is necessary to ensure smooth supply of petroleum products to all customers irrespective of their geographical locations, considerations should be made on how to facilitate cost-effectiveness and competition. Where appropriate, franchise areas should be established in order to enhance availability of petroleum products.

Further, it is a national priority that exploration of oil is given the highest possible emphasis although there are limited local resources available for oil exploration activities. However, infrastructure development, including storage, distribution, retailing systems and handling transit products will also be emphasised.

Safety, health and environmental concerns should be considered in accordance with good petroleum industry practices. There is a need to adopt, adjust and develop technical and product quality in accordance with internationally accepted standards and norms, e.g. bio coding of petroleum products, etc.

The sector needs an efficient regulatory framework in order to safeguard the interest of stakeholders and create a level playing field for the petroleum product suppliers and retailers.

The restructuring of the petroleum sub-sector should include a review of relevant legislation contained in the Petroleum (Exploration and Production) Act, 1980, the Petroleum Conservation Act, 1981 and other relevant documents. Further, there is a need to review fiscal regimes, which burden petroleum product prices. This needs to be done with a long-term perspective, taking into account the consequences to the petroleum sub-sector, which would affect other sectors.

Policy Statements

28. Security of supply will be safeguarded by supplier diversity.

29. Exploration of petroleum will be promoted in accordance with best petroleum industry practices.

30. Petroleum operations will be undertaken by ensuring highly established standards for environment, safety, health, and product quality. Environmental impact assessments and environmental management plans will be mandatory.

31. Promote regional and international co-operation in exploration, development of infrastructure, trade, database and capacity building.

3.2.3 Natural Gas

The most important gas discoveries in Tanzania are Songo Songo and Mnazi Bay. The reserves are estimated at about 30 billion cubic metres and 15 billion cubic metres, respectively.

The discovered reserves are limited, while medium-term utilisation options are several including:- electricity generation, thermal industrial applications, and petrochemical industries. Therefore, exploration and the optimal use of this resource remains a national priority.

Markets and investment in infrastructure for natural gas are underdeveloped. There is a need to introduce regulatory mechanism in order to protect other stakeholders.

There is also a need for intensive gas exploration and development of markets and infrastructure for optimal use of the resource. It is essential to formulate a long-term strategy for rational utilisation of natural gas resources.

Policy Statements

32. Promote natural gas exploration and exploitation.

33. Promote development of natural gas markets for diversified applications.

34. Establish an appropriate regulatory framework for the natural gas industry.

3.2.4 Renewable Energy

Tanzania's energy demand is characterised by a low per capita consumption of commercial energy (petroleum and electricity) and a high dependence on non-commercial energies, including biomass fuels in the form of firewood, charcoal and bio-waste. Biomass energy for the foreseeable future will remain the main energy source. Other potential renewable energy resources are micro-hydro, geothermal, wind and solar energy.

Renewable energy technologies currently in use in the country include improved wood-fuel stoves and charcoal production practices, biogas, windmills, and solar thermal and photovoltaics (PV). The applications of these technologies are at various stages of development in terms of demonstration and commercialisation.

Inappropriate and inefficient technologies dominate most energy conversion and utilisation appliances. Today, there is a lack of adequate indigenous capacity to design, manufacture, market and distribute as well as install and maintain renewable energy technologies. Furthermore, investment in renewable energy and the overall interest of commercial actors over the years have been insignificant.

There is need to promote efficient conversion and end-use energy technologies and practices in order to minimise health hazards primarily affecting women and children, and environmental degradation.

There is also a low level of awareness and understanding of available practices, technologies and resources, thus contributing to reluctance towards utilisation of renewable energy. There is a need to address economic, cultural and social barriers on the local capacity to design, develop, manufacture, market, distribute and provide after-sales services.

The challenge is to establish an institutional framework with conceptual, administrative and financial resources to play the mobilising, co-ordinating and guiding role in the development of renewable energies. The institutional framework needs to have a legal backing and mechanisms to establish standards, guidelines and codes of practice and norms for safe use of environmentally friendly renewable energy technologies.

There is a need to create a legal framework for renewable energy development and to establish an institutional structure and mechanisms to address technical, social and financial barriers for the dissemination of renewable energy technologies. Biomass, particularly woodfuel should be conserved through efficient conversion and end-use technologies which could be complemented by tree growing at household level and beyond.

Policy Statements

35. Introduce appropriate rural energy development, financial, legal and administrative institutions.

36. Establish norms, codes of practice, guidelines and standards for renewable energy technologies, to facilitate the creation of an enabling environment for sustainable development of renewable energy sources.

37. Promote efficient biomass conversion and end-use technologies in order to save resources; reduce rate of deforestation and land degradation; and minimising threats on climate change.

38. Ensure inclusion of environmental considerations in all renewable energy planning and implementation, and enhance co-operation with other relevant stakeholders.

39. Support research and development in renewable energy technologies.

3.2.5 Coal

Coal is one of the major energy resources of Tanzania. So far, the exploitation of coal for energy purposes has been minimal. The present national electricity generation capacity is only 6 MW. However, in the medium-term the national generation capacity is expected to increase.

Coal has, to a large extent, been used in industries for thermal applications, but very little has been done to promote coal briquettes for use in households. There is therefore, a need to extend applications of coal and coal briquettes for cooking and heating, particularly for households, agro-based industries, commercial and other institutions. In general, there is a lack of investment in coal exploitation and distribution. Private investors in exploitation of coal resources for energy production and other applications need to be encouraged.

The mine-mouth concept of locating thermal power plants is preferred in order to bring down the cost of transportation of coal and environmental impacts. National and regional electricity markets will encourage exploitation of coal resources for power generation.

There are high costs in the application of cleaner coal technologies and there is a risk of negative environmental impact of coal exploitation, transportation and utilisation. One needs to recognise national and international concerns to reduce pollutants from coal by application of the best available coal technologies.

Policy Statements

40. Promote exploitation of coal resources for electricity generation and other thermal applications by encouraging private sector and other stakeholders' participation.

41. Ensure that all coal exploitation projects undertake environmental impact assessments and take into consideration national and internationally accepted environmental standards.

42. Promote development of appropriate infrastructure, which will facilitate exploitation of coal for local and export markets.

4. RURAL ENERGY

Energy services have an impact on all rural economic activities, including agriculture, business, social services, gender equality and poverty. Addressing energy requirements in rural areas is in line with the provisions contained in the Tanzania Development Vision 2025. An improved energy supply in the rural areas will ensure improvement of the welfare of the rural population and the attainment of sustainable economic growth.

85% of the total energy is consumed in the rural areas where the majority of Tanzanians live. Biomass, particularly wood-fuel, constitutes 90% of rural energy consumption, which has significant impact on the process of environmental degradation. The balance 5% is met by other options such as kerosene, diesel, dry cells, grid and non-grid electricity, biogas, solar, wind and other renewable energies. The rural population with access to electricity is only about 1%. The low consumption of commercial energy has suppressed economic growth, which is manifested in low levels of agricultural mechanisation and industrialisation.

Presently, the existing energy supplies especially electricity are delivered at high cost. There is a lack of adequate investment and insignificant private participation in rural energy development. It is, therefore, a national challenge to increase access to commercial energy in the rural areas and facilitate a diversification of energy services.

Rural energy is diverse and characterised by various actors and interests. A sustainable institutional framework that can cope with the diversity, manage and co-ordinate various efforts, is a key factor for successful development of rural energy. So far, appropriate focus for handling rural energy services is lacking. There is a need to establish an institutional framework that can mobilise, co-ordinate and facilitate private and public initiatives in rural and renewable energy.

Policy Statements

43. Support research and development of rural energy.

44. Promote application of alternative energy sources other than fuelwood and charcoal, in order to reduce deforestation, indoor health hazards and time spent by rural women in search of firewood.

45. Promote entrepreneurship and private initiative in the production and marketing of products and services for rural and renewable energy.

46. Ensure continued electrification of rural economic centres and make electricity accessible and affordable to low income customers.

47. Facilitate increased availability of energy services, including grid and non-grid electrification to rural areas.

48. Establish norms, codes of practice, standards and guidelines for cost effective rural energy supplies

5. CROSSCUTTING ISSUES

The sub-sectors within the energy sector are dependent on a number of issues that apart from being of a crosscutting nature within the sector also are determined by the development of the economy at large and other sectors. The following have policy implications:

- (a) Energy Efficiency and Conservation
- (b) Energy trade and co-operation
- (c) Energy information system
- (d) Environment, health and safety
- (e) Investment
- (f) Gender issues
- (g) Capacity building, (including education and training, human resources development, R&D, and technology transfer)

5.1 Energy Efficiency and Conservation

Improvements in energy efficiency bring additional benefits and significant savings on energy use and cost. Energy efficiency and conservation must, therefore, be pursued consistently over a long-term functioning of all sectors. Energy audit is an important tool that helps to indicate energy use patterns and proposes measures to achieve energy savings.

The existing challenges are related to inadequate awareness and improper attitudes towards rational use of energy, as well as non-existence of legislation and regulatory framework for energy efficiency and conservation

There is, therefore, a need to create awareness on energy efficiency and conservation in order to induce a behavioural change. It is also important to encourage the following:- cleaner production and recycling; integration of energy efficiency in architecture and building designs, establishment of standard and legal framework.

Policy Statements

49. *Enhance energy efficiency and conservation initiatives in all sectors.*

50. *Ensure energy audits in industries, particularly the energy intensive ones.*

5.2 Energy Trade and Co-operation

Co-operation between neighbouring countries in Africa and international bodies is vital for development and economic growth. Tanzania is a member of various bodies in the region, including the African Union (AU), the East African Co-operation (EAC), the Southern African Development Community (SADC), the Kagera Basin Organisation (KBO) and the Nile River Basin Initiative (NBI).

Africa Energy Commission (AFREC) was initiated by the OAU to spear-head energy cooperation among member states. The new EAC Treaty envisions an improved and expanded trading environment by promotion of investment codes, proper regulation of the private sector and development of an East Africa Power Masterplan. SADC is a forum for regional co-operation in all sectors of economic development, among them energy. Central to SADC's energy programme is the South African Power Pool (SAPP), under which the member states will be able to trade through a linked single electricity grid. SAPP's goal for interconnection between the countries is to create an enabling environment for trade in bulk electricity. Apart from these regional bodies and institutions, Tanzania is active in international agencies and fora of the United Nations and the Commonwealth in the field of energy.

There is a challenge to maximise the potential gains from the regional and international energy trade and co-operation. Tanzania needs to attain a stronger and closer interaction between the energy planning processes with other countries in the region, notwithstanding limitations of resources to undertake Tanzania's obligations in the regional and international bodies.

Tanzania needs to continue to be an active member of the regional and international bodies in energy sector development including active participation in SAPP. There is a need to encourage joint development of common (shared with other countries) energy resources as a way of enhancing co-operation and collective reliance and security of energy supplies. Furthermore, it is also necessary to continue facilitating the movement of energy supplies to neighbouring land-locked countries.

Policy Statements

51. Increase collaboration within the East-African countries, SADC and non-SADC States in the area of energy with emphasis on future interconnections.

52. Facilitate international collaboration in research, exchange of data, information and documentation.

5.3 Energy Information System

An efficient energy information system is one of the tools for policy implementation. Thus, energy information collection, storage, analysis and exchange is vital for planning, policy formulation and in decision-making for implementation of programmes and policies. Today, there is a lack of an energy information system, resulting in poor information exchange amongst energy stakeholders. Further, inadequate capacity to manage and analyse energy information is also hampering development.

There is a need for establishing a proper energy information system that will mobilise human resources and undertake sensitisation and information dissemination to stakeholders in the sector for effective implementation of the energy policy.

Policy Statement

53. *Establish and strengthen a proper information and communication system in the energy sector and mobilise human resources to undertake sensitisation, advocacy and dissemination of information to stakeholders.*

5.4 Environment, Health and Safety

Environmental implications of energy consumption need to be considered in all sectors. All stages of energy resources (be it fossil or non-fossil) exploitation, production, conversion, transportation, storage and end-use can have negative impact on the environment. Health, safety and environmental consequences of energy production and utilisation have become a major concern. For example, hydro power dams construction has led to increased dangers of water borne diseases; uncontrolled use of woodfuel puts pressure on forests and leads to erosion, desertification, and contributes to carbon-dioxide emission.

The combustion of fossil fuels produces significant amount of pollutants including greenhouse gases and particulate. Further, there are environmental impacts of the construction of transmission lines and pipelines. On the other hand, renewable energy sources, including solar, wind, and geothermal have rather small negative environmental impacts. Hence, the production and consumption of energy should not endanger the quality of life of present and future generations. Application of cleaner production technologies must be encouraged in order to minimise pollution.

Energy efficiency should be monitored and promoted in every energy sub-sector and other sectors of the economy. Furthermore, there is a need to ensure that energy development projects and programmes are subjected to Environmental Impact Assessments (EIAs) and established sound management of impacts of energy development and utilisation.

There is a need to strengthen co-operation in national, regional and international energy programmes aimed at mitigating environmental impacts of energy to ensure the implementation of national obligations under international treaties.

Economic instruments, including the “Polluter Pays Principle” may be applied in environmental management where appropriate. There is also a need to strengthen the functions of the legislative system in health, safety and environmental protection. Disaster prevention and response plans and standards should be strengthened for transportation of dangerous commodities. Furthermore, environmental standards need to be developed in order to ensure protection of the environment, health and safety and compliance to national and international requirements.

Policy Statements

54. Promote environmental impact assessment as a requirement for all energy programmes and projects.

55. Promote energy efficiency and conservation as a means towards cleaner production and pollution control measures.

56. Promote development of alternative energy sources including renewable energies and woodfuel end-use efficient technologies to protect woodlands.

57. Promote disaster prevention, response plans, and introduce standards for exploration, production, conversion, transportation, distribution, storage, and fuel end-use.

5.5 Investment

The opportunities for investment in the energy sector are vast in monetary terms, and substantial in terms of economic development impact. With reforms taking place in the energy sector such as the liberalisation of power generation, petroleum product trade, and emphasis on enhancing rural energy supplies, private investment is bound to increase substantially.

There is, therefore, a need to make domestic and international investors aware of the potentials within the energy sector. Public and private sector partnerships should be encouraged to invest in provision of energy services. Furthermore, there is a need to facilitate and encourage investment in the development of alternative sources of energy, putting emphasis on the utilisation of indigenous resources.

Policy Statements

58. Promote private initiatives at all appropriate levels and make local and foreign investors aware of the potentials within the energy sector.

59. Ensure that a transparent and predictable institutional framework, including incentives, is in place to provide for an enabling environment for investment in the energy sector.

5.6 Gender Issues

Gender issues in the energy sector need to focus on the energy needs and ownership of resources. Gender issues should be looked at from both the demand and supply of energy. On the demand side, men and women have different demands on energy, due to the existing socio-cultural and traditional roles. On the commercial energy supply, it is clear that women are under-represented at all levels of energy generation, transmission and distribution. There is, therefore, a gender imbalance at various levels of planning and decision-making within the energy sector.

On the demand side, especially in rural areas, there is a need to relieve women from the burden of searching for energy, especially wood-fuel. All stakeholders within the energy sector need to participate and take deliberate sensitisation actions to encourage women participation in energy related education, training, programmes and projects, planning, decision-making and, not least, energy policy implementation.

Policy Statements

60. Promote gender equality within the energy sub-sectors both on the demand and supply.

61. Facilitate education and training for women in all energy aspects.

62. Promote awareness on gender issues concerning men and women's social roles in the energy sector, including training on appropriate technologies.

63. Promote awareness and advocacy on gender issues in the energy sector.

5.7 Capacity Building

5.7.1 Education

Education is a key input to any country's sustained development. The majority of Tanzanians are poorly informed about energy and related end-use practices and options. Manifestation of this situation include: - low level of renewable energy application; inefficient use of energy; and economic non-competitiveness of Tanzanian products.

There is a need for adequate physical demonstrations on renewable energy and energy efficiency to pupils and students. It is, therefore, necessary to include energy education, in particular, renewable energy and rational use of energy, in curricula for schools, vocational training centres, colleges and other learning institutions. There is also a need for mass educational and promotional efforts on energy issues targeted to the public.

Policy Statement

64. Encourage energy education in school curricula, vocational training centres, colleges and other relevant learning institutions; emphasis should be on practical aspects including physical demonstration, installations and operation.

5.7.2 Human Resources Development

The development of the energy sector is dependent on the appropriate utilisation and development of human resources. A gender balanced human resource development programme for the energy sector is an important tool in order to ensure the fair provision of training and education. Today, there is a lack of trained and skilled energy experts in the sector, particularly, women. In addition, there are inadequate incentives to attract and retain qualified energy experts in the sector.

The present situation is also constrained by cultural and traditional influences, which inhibit gender-balanced training. There is, therefore, a need to encourage and facilitate training in disciplines necessary for the development of the energy sector in various institutions and organisations.

Local counterparts and partners in executing activities in the sector should be given priority in order to enhance dissemination of knowledge and skills. Finally, there is a need to establish incentives to enhance effective utilisation of domestically and internationally available skills in the energy sector.

Policy Statements

65. *Encourage local and foreign investors and other financiers in the sector to train Tanzanians in essential skills.*

66. *Encourage and appropriately reward good performance and conduct by individuals or organisations in the sector.*

5.7.3 *Research and Development*

Research and Development (R&D) efforts that give rise to technological innovations in the energy sector are important as they lead to development and economic growth. Identifying and targeting R&D policies and priorities must be supportive of national socio-economic development goals. R&D issues relating to biomass, rural energy, energy end-use, affordability, and pricing mechanisms need greater attention.

The challenge is to overcome the inadequate financial resources and lack of skilled manpower for R&D. There is also a lack of understanding and appreciation of critical energy R&D issues both within the sector and for the general public. Today, there is a lack of institutional co-ordination in respect of various ongoing research activities in the sector. Co-operation between public and private sectors in R&D of energy issues such as demand and supply management, pricing, conservation and rural energy, need to be encouraged and co-ordinated. There is also a need to support regional and international co-operation in R&D on technological and non-technological advancement in the energy sector.

Policy Statement

67. *Promote and co-operate regionally and internationally on research and development of energy forms and of related advanced and innovative environmentally sound technologies in the energy sector.*

6. WAY FORWARD

- (a) Strategic Action Plan for implementation of the energy policy directions needs to be prepared.
- (b) The policy should be reviewed when need arises in order to take into account major developments in the national economy.