

Energy Policy for the Kingdom of Lesotho

DRAFT

1. Introduction

1.1 Historical perspective

An energy policy is influenced by local, regional and international development trends such as trade relations, foreign investment criteria and political and economic ideologies. Many transformation activities occurred since 1985 when the Lesotho Energy Masterplan (LEMP) was prepared and it is therefore imperative to review the existing policy. The new trends put more emphasis on commercialisation and privatisation of some components of the energy sector. In addition to these, community participation, gender and environmental issues could no longer be ignored. The energy sector should also be seen to be contributing towards the improvement of livelihoods through the provision of basic energy services and employment creation. When the LEMP was formulated, certain assumptions were made and as variables changed, it became imperative to review and revise an energy policy.

The Lesotho Energy Masterplan (LEMP) was formulated based on comprehensive data collection and a development of models that would assist in the projection of future energy demands for all sectors of the economy. The targets that were set out by LEMP were not met due to constraints that were realised during the implementation phase. In 1997, the LEMP approach was reviewed and the Department was advised to follow a more flexible approach in the form of an Energy Policy Framework.. This approach would enable the Department of Energy to separate an energy policy document from a detailed action plan, which can be reviewed and updated from time to time. The Energy Policy Framework document is more detailed and it was used a reference document for the development of an Energy Policy.

1.2 Process towards an Energy Policy Framework

The Department of Energy supported by a team of Danish and southern African energy experts undertook research, analysis and consultation to identify pertinent issues, problems and challenges in the energy sector.

1.3 Chapter Layout

The Energy Policy document has been divided into a number of chapters. The first, an introduction to the document, outlines the rationale for the policy formulation process, the nature of the process, and the expression of the policy. The introduction also includes a description of the vision of energy policy, expressed by stakeholders at the first workshop and developed within the Department of Energy, and more importantly, the energy policy goals. In addition, the introduction includes a description of the current environment in which energy policy is being formulated and a profile of the energy sector. Chapter 2 presents the Government of Lesotho's policy choices for demand and supply sectors including households, transport, industry and commerce. Chapter 3 presents policy choices related to various crosscutting issues. Chapter 4 covers governance issues. In each of these sections, policy statements have been expressed in a similar format.

This format includes the following:

- A brief background to introduce the major features of the sub-sector.
- Key challenges that Government sees for itself in addressing them and formulating policy.
- A statement of Government's policy for the sub-sector.
- An outline of the implementation strategies of the policies.

Specific plans for the monitoring and verification of each of these policy choices are detailed in the Action Plans linked to this Energy Policy Framework. Each policy is stated in indented italics in the relevant sub-section. Policy is expressed on a high-level basis, and on the assumption that it will be

the responsibility of the Department of Energy to implement it. Where this is not the case, this is stated, together with the naming of the Government Department, or any other institution, that would otherwise be responsible. Policy statements and associated strategies have been scrutinised by a team of Department of Energy staff and consultants, to ensure that they are attainable, implementable and realistic.

1.4 Energy policy vision

The vision for the Energy Policy Framework for the Kingdom of Lesotho is as follows:

Energy shall be universally accessible and affordable in a sustainable manner, with minimal negative impact on the environment.

1.5 Energy policy goals

Policies presented in the Energy Policy Framework for the Kingdom of Lesotho are based on the following energy policy goals.

1.5.1 Contributing towards the improvement of livelihoods

The energy sector will contribute towards poverty alleviation in Lesotho. This will be achieved through the creation of income generating opportunities that sustain and improve the lives of people in the country through facilitating the provision of affordable technologies and services.

1.5.2 Contributing towards economic growth and investment

The energy sector in Lesotho will contribute towards economic growth through initiatives that emphasize efficiency in energy sector management, job creation as well as those that position Lesotho as a competitive player in the SADC region. Emphasis should be placed on the creation of conditions that encourage private investment, but which ensure, where appropriate, that ownership of energy sector resources continues to rest locally.

1.5.3 Ensuring security of supply

The Government of Lesotho will ensure security of energy supplies to meet the national requirements from diversified sources that are subject to local resources, regional agreements and economic feasibility.

1.5.4 Contributing towards the protection of the environment

Energy resources will be used in such a way that international, regional and local environmental agreements and protocols are observed.

1.6 Context for energy policy

1.6.1 National development and economic objectives

The country's revenue base continues to depend primarily on customs revenue. For the past ten years, customs receipts (including grants) have accounted, on average, for 54 per cent of total Government revenue, and has financed 78 per cent of recurrent expenditures. Economic dependence on customs revenue is likely to be significantly affected by a number of events currently taking place in the world economy and including the outcome of the negotiations on the SACU Agreement, the European Union (EU)/South African Free Trade Agreement, negotiations of a Post-Lomé relationship with the EU, the ratification and implementation of the SADC Trade Protocol and the anticipated next round of World Trade Organisation negotiations.

The Sixth National Development Plan (1996/97-1998/99) states that the primary objective of national policy is to enhance sustainable human development. It further outlines the objectives of human development as enabling people to lead long and healthy lives, acquire knowledge, and have resources needed to accommodate acceptable levels of human needs. The Government of Lesotho's Vision 2020 outlines the pathway to the achievement of its vision, which has been provisionally stated as follows: "Lesotho shall be a democratic, peaceful, prosperous, secure and self-reliant nation by the year 2020." These strategies will seek to promote the following:

- **Employment creation.** This should be achieved through the utilisation of labour-intensive methods, creation of sustainable employment schemes and programmes, promotion of rural development opportunities and establishment of programmes targeted at small- and medium-scale enterprises.
- **Sustainable human capacity enhancement.** This should be achieved by ensuring that appropriate education and training and excellent health services are accessible to all.
- **Sustainable development and growth from own resources.** Aggressive programmes for entrepreneurship should be embarked upon, as well as programmes to intensify and diversify agricultural production. Local materials and resources should be cost-effectively used and aggressive environmental management practices should be adopted. The tourism industry should also be promoted.
- **Reform, democratisation and empowerment.** The democratic dispensation and modern institutions should be aligned with chieftainships. Law enforcement structures should be enforced, and plans to establish local governments should be given priority.
- **Poverty reduction** continues to be the key national development objective and is seen as a major component of sustainable human development. Growth in employment is also considered critical to sustainable human development.

Lesotho's economy is also affected by internal developments and constraints. It is argued, for instance, that the liquidation of the Lesotho Agricultural Development Bank and the restructuring of the Lesotho Bank have had a significant impact on domestic economic productivity. Declining activity of the LHWP has also affected economic growth, as has reduced agricultural production, poor performance in public sector utilities, and political instability.

1.6.2 Decentralisation

The Ministry of Local Government is responsible for Government's current decentralisation initiative, which is in line with the development of democracy in the country. The major goal of the process is to realise sustainable development under the control and management of the people who are directly affected, thus ensuring better coordination of development efforts and full participation of communities in poverty reduction efforts. The effective implementation of the energy policy will require capacity building and empowerment of the Local Government structures.

1.6.3 Privatisation

Government policies on privatisation aim at creating an enabling environment for increased private sector participation in the development process, while limiting direct Government intervention. Privatised and commercially viable energy sector will ensure efficiency and effectiveness in providing energy services. Privatisation will also ensure that limited Government resources are directed to where they are most needed.

1.6.4 Macroeconomic aspects of the energy sector

The energy sector is a vital component of the economy. It provides essential inputs for other economic sectors and for basic needs and social services. It can also be seen as an economic sector in its own right, contributing directly to GDP, gross fixed capital investment, Government revenues and employment. Furthermore, it affects the balance of payments. The first measure - linkages to overall

GDP - is a standard way of determining the energy sector's contribution to the economy. The other measures are useful in that they show trends in the energy sector that GDP linkages may not. With a view to placing the energy sector in a wider context, this section examines the energy sector contributions to the economy of Lesotho.

1.6.4.1 Contribution to GDP

The electricity and water sub-sectors are estimated to have improved by 3.0 per cent, compared with a decline of 30.9 per cent in 1998 i]. In 1997, the electricity sub-sector contributed 5.2 per cent to GDP at factor cost compared with 5.0 per cent registered in 1996. This improved performance is attributed to the successful completion and commissioning of the 'Muela Hydropower station which has brought economic benefits to the country through generation of electricity for domestic consumption and export to South Africa.

1.6.4.2 Contribution to Government revenues

The energy sector contributes to Government revenue through direct taxes, income taxes (corporation and other energy institutions and employee earning), fuel taxes and dividend payments. The largest contributor to state revenues is liquid fuel taxes, which brought in M48 042 794.27 in 2000/2001 (excluding sales tax). Since the commissioning of the 'Muela hydropower plant, some surplus electricity has been sold to South Africa. LEC also contributes corporate taxes, amounting to M13 022 225.00 in 2000/2001.

1.6.4.3 Contribution to employment

The overwhelming majority of formal energy-sector jobs are in service stations, where most people are directly employed as pump attendants, mechanics and office workers/managers, although precise numbers are not available due to the aggregation of statistics. There are also approximately 600 (LEC approximately. 450, LHDA 70, contractors and consultants share the rest. 2003 LEC/IMTF Monthly reports) people employed by the electricity sector and about 140 people employed by energy-related institutions (for example, the Department of Energy, Appropriate Technology Section, wood and coal companies and solar energy dealers, etc).

1.6.4.4 Contribution to gross fixed capital formation (GFCF)

During the 1990s, the electricity sector has made a significant contribution to gross fixed capital formation, resulting from the construction of 'Muela power station. The electricity and water sectors contributed 24 per cent of GFCF in 1999. The implementation of new power projects could lead to the increase in contribution to GFCF in the future.

1.6.4.5 Impact on balance of payments

Since 1986, Lesotho has been importing an increasing amount of transport equipment and machinery. Foreign trade statistics for 1996 show that the transport sector was the second largest component of imports with the contribution of about 19.5 per cent to entire imports. Energy carriers in the sector are limited to petrol and diesel. Private vehicles mostly utilise petrol, while diesel is used primarily in the construction and agricultural sectors, as well as in the transport sector. In 1998, about 96.6 million litres of petrol and approximately 47.3 million litres of diesel were consumed. All petroleum products, and some electricity (after the commissioning of 'Muela) are imported from South Africa. Together these imports amounted to 4 per cent of the overall imports in the country in 1998/99. Electricity accounted for about 0.6 per cent of national imports but this amount varies considerably depending on 'Muela production which in turn depends on water head at Katse Dam.

2. Energy demand and supply

The first part of this chapter (2.1 to 2.4) focuses on demand sectors while the second part covers supply. It should be noted that there are no specific policy statements for the demand sector as challenges are addressed by the supply sector.

2.1 Rural and urban households

The residential sector is responsible for 81 percent (23933.71 TJ) of the country's total energy consumption (Energy Balance 2000). At the household level, energy is used mostly for cooking, space and water heating, lighting, powering entertainment appliances (radios and televisions), and running small-scale income-generating activities, which are more common in the urban areas because of the relative availability of energy sources. Sources of energy used include electricity, LPGas, paraffin, candles, coal and biomass fuels (woodfuel, cow dung, crop residues and shrubs). The extent of usage of different energy sources differs from urban to rural households, depending on the availability of energy sources, as well as extent of disposable household income.

Due to cold weather, use of energy sources tends to increase in winter, particularly for space heating. Since most houses are poorly insulated, there is a considerable potential for reducing the energy demand for space heating through simple retrofit measures as well as improved building designs to utilise solar energy.

According to recent studies (Lesotho Demographic Survey (2001); Lesotho Core Welfare Indicators Survey (CWIQ) 2002):

- About 56 percent of households in Lesotho use firewood for cooking, 39 percent use Gas/paraffin, 1.6 percent use electricity and 3.5 percent of households use other sources of energy.
- About 56 percent of households use Gas/oil for lighting, while about 38 percent use candles, about 10 percent use electricity and less than one percent use other forms of energy.
- About 90 percent of households do not have access to grid electricity, the majority (more than 70 percent) of the Basotho, particularly those who live in rural areas, rely heavily on biomass fuels for major domestic energy end-uses.
- About 67 percent of all households in Lesotho use biomass fuels as main sources of energy for space heating while approximately 27 percent use paraffin, four percent use coal and LPGas and electricity constituted about three percent.

It is Government's contention that ensuring the availability of a range of affordable and safe energy sources to households is an important way of uplifting poor people's living standards. While a wider range of fuels is available in urban areas, accessibility of fuels is still a major constraint in rural areas. Furthermore, even if the accessibility of fuels is addressed, the high cost of appropriate appliances is still often likely to militate against the optimum use of energy. The inadequate provision of energy services and appliances invariably leads to the high dependency on biomass energy. In particular, this has limited the ability of rural households to improve their livelihoods.

Since the provision of adequate energy services is a key catalyst for the eradication of poverty, the challenge is to make energy options affordable, accessible and safe for households, as well as encourage a greater choice of fuels. As an important step towards attaining energy security and enhancing the sustainable use of energy resources for households, the Government will seek to:

- improve the choice of affordable energy options for households;
- provide information on energy resource options, and their cost-effectiveness;
- assist in reducing indoor air pollution resulting from burning of biomass;
- promote the efficient use of energy, thus reducing households' heating expenses in winter, in particular.

2.2 Transport

Modes of transport in Lesotho include public buses and taxis, private vehicles, and trucks. With the exception of a flying doctor service and military use, air transport is now largely limited to the passenger link between Maseru and Johannesburg in South Africa. A short railway line is also used for the delivery of goods into Maseru for businesses: it extends to milling companies' premises. Animal forms of transport have been very important in rural areas, especially horses and donkeys which continue to be the major transport mode where road networks do not exist. Bicycles, to a lesser extent, are used as a means of transport.

Government has long recognised the importance of energy conservation measures in the development of this sector and the economy. Government also acknowledges the important links that this sector has with the environment. This is enshrined in the goals of the Sixth National Development Plan. Despite this, problems still exist in this sector, such as pollution from vehicles and unreliable supply of fuels, especially in the remote areas.

Transport is an essential input to virtually all aspects of development, and the contribution from the energy sector is only one component. The transport sector constitutes about 12 % (4013.69 TJ) of the total energy consumption. The main challenge for the Government from an energy policy point of view is to facilitate the efficient, safe, reliable and environmentally friendly use and supply of petroleum products in the transport sector. This involves:

- Ensuring the reliable supply of fuels needed for the transport sector.
- Encouraging the use of these fuels as efficiently as possible to meet the ever growing demands for both passenger and goods transport.

2.3 Industry, commerce and government buildings

Medium-to-large-scale industries include manufacturing, textile, mining (including quarrying) and construction. Small-scale industries include carpentry, steelworks, brick making, sewing and knitting. Electricity is used as a major source of energy in the production line, for lighting, motive power and for space heating in these industries. Other forms of energy used by this sector include coal, diesel and oil. The extent to which these types of fuels are used depends on industry-type. The commercial sector comprises wholesalers, retailers, hotels, restaurants and other business services. Electricity is used as a major source of energy for refrigeration, lighting, space heating and cooling. LPGas and coal are used for cooking and steam production.

Government buildings consume relatively large amounts of energy in the form of electricity for space heating and cooling, as well as lighting. Other common forms of energy that are used for space heating in this sector include coal and LPG. Solar energy is used in some health centres in remote areas for lighting, refrigeration of vaccines, communication and water heating and pumping.

The challenge for Government is to:

- Enhance the competitiveness of electricity tariffs for commerce and industry.
- Promote the efficient use of energy.
- Ensure the reliable and quality supply of fuels needed for these sectors.
- Provision of energy infrastructure for industrial development

2.4 Agriculture

Agriculture requires energy input at all stages of production, in traditional farming practices, it is mostly human labour and/or animal power. The modern farming practices on the other hand, use

mechanised processes to run and these require commercial energy inputs such as electricity, petroleum products, solar and wind energy.

Energy is required for both pre- and post-harvest processes, hence the provision of reliable and good quality energy is an essential feature of agricultural development and it is also of prime factor in achieving food security. In the national energy balance, agriculture accounts for less than one percent of the total energy consumption (this covers petroleum products only). Other energy sources are not accounted for but may not change the picture significantly. This is worrying when considering that food security is of prime importance to any nation.

The main challenges for the agriculture sector are to:

- Remove or reduce some levies on petroleum products used for agricultural activities
- Set up special tariff of electricity for agricultural activities
- Improve affordability of renewable energies and technologies for farming activities

2.5 Biomass fuels

In all its different forms, biomass is the main source of energy for the majority of households – especially rural households in Lesotho. Although biomass may be classed as a renewable resource, if harvested in a sustainable manner, it is treated separately from the other renewable energy resources such as solar, hydro and wind energy. Firewood which is an important form of biomass is gathered from government and private woodlots, natural forests (i.e. shrub lands) and community plantations. In some areas firewood is purchased from wood and coal retailers, who import the product from South Africa.

According to the projected figures for the year 2000, the total firewood consumption in the country was 15,626.10 TJ, of which 729.4 TJ was imported. A significant amount of firewood is consumed by the residential sector (15,618.8 TJ), followed by commerce and the public service (7.29 TJ) while the industrial sector consumed only (0.01 TJ). Commerce, industry and public service consumed 7.30 TJ of the imported firewood while the rest (722.1 TJ) is consumed by the residential sector. Cow-dung as a source of energy has been used for generations in Lesotho. The energy balance for the year 2000 indicated that 3,015.42 TJ which is about 13 percent of the total residential energy consumption (23,933.71 TJ) was satisfied by use of animal dung. This is gathered from the fields for those who do not own livestock and from kraals for those who do. The responsibility of collecting this fuel lies mainly with women and children.

Another form of biomass used in the residential sector for energy purposes is crop residues. The energy balance for the year 2000 estimated that five percent of the total energy consumption of this sector was satisfied by crop residues. It should be noted however that there has not been a comprehensive household energy survey since the early 1980s.

Government recognises that household energy consumption (particularly in rural household) may not undergo a simple transition from biomass fuel to commercial fuels due to a range of socio-economic and cultural factors. There is a strong possibility that many households will continue to use biomass as the main source of energy in the rural areas. Excessive consumption of biomass exacerbates soil erosion by leaving the soil bare and depriving it of essential nutrients that can be derived from these resources (especially crop residues and animal wastes). In some areas, women and children spend many hours collecting firewood that lasts for a short time. Areas where firewood can be gathered or bought are scarce in the rural areas and remaining patches of indigenous trees and shrubs are not properly managed.

2.5.1 Negative impacts caused by burning biomass fuels

Medical studies in other developing country contexts have identified burning of biomass fuel as one of the major causes of respiratory diseases and eye problems. There is no reliable Lesotho-based information on links between the high level of respiratory diseases and the burning of biomass in the household setting. As Lesotho is also a developing country, with high dependence on biomass for household energy use, Government suspects that biomass fuel combustion is a key contributor to the ill health of rural and urban dwellers.

2.5.2 Challenges for biomass energy

The main challenges to Government in the area of biomass energy are to:

- improve the availability of biomass resources.
- promote the sustainable use of biomass in the country.
- make available quantitative data on the consumption patterns and depletion of biomass.
- encourage the switch to alternative fuels to reduce the pressure on biomass.

2.5.2.1 Improvement of the availability of biomass energy resources

In accordance with the national policy on forestry [ii] and with due regard to environmental benefits, and under policy guidance of the Forestry Department, the Department of Energy will continue to support afforestation programmes. In particular, the Department of Energy will support programmes aimed at conserving and promoting the sustainable use of existing indigenous trees, as well as other wood resources.

Government will ensure the security of biomass energy resources availability.

Government will collaborate with relevant stakeholders in:

- forming a Liaison Committee comprising stakeholders to assist in designing afforestation programmes and following up on progress.
- continuing to promote afforestation programmes that take place at the community level;
- improving conservation measures, energy management as well as sustainable use of biomass resources.
- continuing to support endeavours aimed at implementing the Forestry Act of 1998, which calls for land to be made available for tree planting purposes.

2.6 Electricity

Electricity is widely recognised as a major driver for economic and social development. Its provision in adequate amounts and at appropriate price levels is central to the improved performance of different sectors of the economy, as well as uplifting people's standard of living. Over 60 percent of all the electricity consumed in Lesotho is used by the manufacturing, mining, commercial, agriculture and public service sectors, and the price of electricity is a key factor in determining the competitiveness of firms in both the domestic and international markets. Therefore, any factor that leads to an increase in the price of electricity will not only harm domestic firms' competitiveness in the export market, but could also make them vulnerable to competition from imported goods. In fact, other countries use favourable electricity pricing to give their industries a competitive edge on global markets.

Electricity is also an important intermediate consumption good. Indeed, for most households, it is the preferred source of energy because it is clean and versatile. Presently, however, about 10 percent of households in Lesotho have access to electricity. Electricity enables households to use a multitude of

appliances to access basic services such as high quality lighting, cooking, hot water and warmth. It also facilitates access to entertainment activities. The social benefits of affordable electricity are significant, ranging from improved health to better learning opportunities, cleaner local environment and better access to information.

2.6.1 Challenges for the electricity sector

As noted above, the level of electrification in Lesotho is very low. A higher penetration of electricity in the energy mix is expected to yield benefits including creating opportunities for income generating activities and inducing an improvement of the livelihoods of the Basotho. The Government faces serious challenges in realising these development benefits from electricity, although, as described above, some important steps have already been taken to improve the prevailing situation in the sector. Large-scale electrification of Lesotho will require substantial capital inputs. Government recognises that one way of securing this capital is to attract private sector investment. At the same time, Government notes that private sector involvement will demand market related returns on invested capital, and that this could work against the public sector goal of extending the electricity service, especially to the poor, who are generally unable to provide the returns required.

The main challenges of the electricity sector are to:

- increase the level of electrification;
- ensure security of electricity supply
- reform the electricity industry so as to achieve economic and technical efficiencies;
- ensure the existence a governance system which supports efficient and effective running of the power sector;
- create an environment conducive to private sector participation and investment;
- promote the efficient use of electricity;
- make optimal use of Lesotho's power sector resources through regional cooperation.

Some of the above challenges are being addressed in sections 3 and 4 of this document.

2.6.1.1 Increasing the level of electrification

The low electrification rates defeats the purpose of Government to improve the livelihoods of Basotho. Increased access to electricity by households will go a long way in contributing towards economic growth and improved livelihoods;

Government is committed to ensuring that an increasing number of urban and rural households have access to electricity services.

In implementing the above policy, Government will:

- establish a National Rural Electrification Fund (NREF) aimed at achieving universal access to electricity, and addressing all issues relevant to the legislation, design, funding, governance, planning, monitoring and evaluation thereof. The NREF will be used as a subsidy to partially offset development and initial set-up costs in rural areas;
- set annual electrification targets based on stakeholder consultations and monitor the progress in achieving these targets;
- establish the level of electricity levy required by the Electrification Programme, and co-ordinate/harness available resources to be directed to the Electrification Programme;
- facilitate and develop the integration of grid and non-grid electrification with other infrastructure, planning and development activities, including the national energisation programme;

- develop standards, codes of practice and specification for off-grid solutions;
- design an information dissemination programme for the Electrification Programme to ensure the involvement of local communities in the design, planning and implementation stages;

2.6.1.2 Electricity supply security

Currently, Lesotho is not importing as much electricity from South Africa, as it did in the past. Rather, it sources power requirements largely from its own 'Muela Hydropower Plant connected to the Lesotho Highlands Water Project, and owned by the Lesotho Highlands Development Authority. Eskom power is required mainly as back-up. Thus, Lesotho currently achieves energy security through a mix of local and regional energy sources. Yet, the current mix is not necessarily the most financially and economically efficient option for Lesotho. A challenge to government will be to achieve an economically optimal balance of energy sources from both Lesotho and the region when satisfying the country's energy requirements.

Government will ensure the security of electricity supply in the country.

To implement this Government will:

- Explore and develop other electricity generation possibilities
- Review the existing arrangement for the ownership and management of existing mini-hydropower plants

2.7 Petroleum and gas

The importation of petroleum products is carried out by private companies from South Africa through the Customs Union agreement. These companies are responsible for the importation of products in quantities greater than 200 litres according to the Fuel and Services Control Act of 1983 and Importation of Petroleum Products Regulations of 1989. Lesotho will continue to import these products as long as there are no discoveries of oil reserves. Transportation of these products from the Durban refineries into Lesotho is either by road or rail. There are currently three major depots in Maseru with a storage capacity of approximately six days of petroleum supply [iii]. These depots do not have storage facilities for LPGas.

The supply and pricing of petroleum products in the sub-region (Botswana Lesotho, Namibia, South Africa and Swaziland) is co-ordinated by the Interstate Oil Committee (IOC). The main role of this committee is to ensure, through joint procurement, the availability of petroleum products within the SACU region. The pricing of petroleum products in Lesotho is the responsibility of the Minister responsible for energy but powers have been delegated to the Petroleum Fund Board. The Board is responsible for setting the pump prices of diesel and petrol, and the wholesale price of illuminating paraffin. Lesotho is divided into four pricing zones based on the distance from the nearest depot inside and outside the country. These are the Lowland zone (including Qacha's Nek district because of the Cerdaville depot), the Quthing Zone, the Mokhotlong Zone, and the Thaba-tseka Zone. Each zone has a transport differential resulting in prices being different throughout the country. Sales tax is based on the Lowlands prices.

The use of LPGas in Lesotho was modest in 1988 and consequently, the LEMP [iv] made little mention of this energy source. Since then, however, there has been a sizable increase in consumption of this fuel: import statistics indicate that demand has increased from approximately 0.29 million kg in 1988 to 5.0 million kg in 2000 [v]. Although the supply of LPGas is not controlled, the importation in quantities greater than 100 kg is limited to registered wholesalers or retailers according to the Liquefied Petroleum Gas (Trade and Handling) Regulations of 1997.

2.7.1 Challenges for the petroleum and gas sectors

The main challenges for the petroleum/gas sub-sector are to:

- ensure the security of supply of petroleum products.
- ensure availability of petroleum products, and fair price regulation;
- ensure proper control of petroleum products at the borders;
- initiate awareness on safety of LPGas and paraffin; and,
- ensure participation of Basotho in the sector.

2.7.1.1 Security of supply of petroleum products

The current petroleum storage capacity in the country is 706 760 litres for petrol, 588 800 litres for diesel and 833 430 litres for illuminating paraffin. This was estimated in 1990 to correspond to six days of petroleum consumption. At current monthly consumption levels of approximately 7, 4 and 6 million litres of petrol, diesel and illuminating paraffin respectively, this can only provide approximately three days of petroleum supply. Therefore, there is a need to determine the appropriate level of strategic stocks as insurance against any supply disruptions that may occur.

In recent years the IOC has reached common agreement amongst its members on issues related to cross-border trade in petroleum products. In particular, this committee ensures, through joint procurement, the availability of petroleum products within the SACU region. It has become clear that there are various potential ways in which cross border trade in southern Africa in petroleum products can be improved, particularly with regard the harmonisation of specifications, and widening of signatories to the IOC agreements.

Government will ensure the security of supply for all petroleum products.

In consultation with the relevant stakeholders such as oil companies, the Government will:

- Ensure that oil companies in the country adhere to the regulations on minimum storage capacity per company.
- Review existing legislation to ensure that the current situation in the petroleum sector is sufficiently addressed.
- maintain joint procurement of petroleum products within the region

2.7.1.2 Ensuring availability of petroleum products

The distribution of petroleum products to some regions of the country is unreliable and inconsistent. Poor infrastructure, such as roads, works against fair and optimal distribution of petroleum products in these regions. Poor road networks often result in retailers travelling longer distances to secure petroleum products and this often results in prices being prohibitively high. Some dealers have taken advantage of this situation, charging, in some cases, higher pump prices than those stipulated by the Government. Furthermore, the relatively small market size of petroleum products in the remote and sparsely populated areas worsens the security of supply in these areas, this acts as a disincentive for large oil companies to distribute petroleum products on frequent basis.

Government will take measures to ensure that petroleum products are available, affordable and equitably distributed throughout the country.

In order to realise this policy, Government will create an enabling environment that will encourage investment in rural areas by undertaking the following:

- establishing country-wide monitoring of the frequency of petroleum supply to the remote areas.

- through the Petroleum Fund, developing an incentive package targeted at energy supply companies to invest in rural areas.
- facilitating the construction of adequate storage facilities in rural areas in order to reduce the costs of transportation.

2.7.1.3 Improving safety of petroleum products and services

Petroleum products, particularly LPGas have not always been handled and used safely, leading to injury and damage to property. In general, suppliers of fuel do not provide adequate information on safety and appropriate handling. The Ministry of Health does not keep detailed statistics of accidents caused by these fuels. However, there is growing evidence to suggest that such problems do exist.

Production and dissemination of information on energy efficiency and safe use of electricity has traditionally been the responsibility of LEC. In many cases savings of electricity through the use of efficient appliances are cheaper than the building of new production facilities. The promotion of the safe use of electricity is an important way of reducing risk of accidents.

Government will promote efficiency and safety in the use, handling and trading of energy products.

Government will:

- ensure, in collaboration with the police and inspectors from the Ministry of Trade and Marketing, that LPGas regulations are implemented;
- work in close collaboration with the LPGas Association of Southern Africa to ensure that all wholesalers comply with the existing legislation through the establishment of an office of the Association;
- facilitate training of trade inspectors and the police on safety of petroleum products;
- disseminate safety information related to LPGas and paraffin through popular media (radio, newspapers etc);
- collaborate with other local and regional institutions on safety of petroleum products.
- develop an action and implementation plan to ensure that relevant information is available to the public;
- initiate studies to determine how to improve and enforce safety standards in households, industrial plants, manufacturing entities and appliances;
- ensure that LEA put in place (and enforce) safety standards of appliances and works in households, industrial plants and manufacturing entities.

2.8 Renewable Energy

In the context of the overall energy balance, renewable energy (RE), excluding large hydropower and biomass, currently plays a small role in terms of total energy consumed. It is Government's view, however, that since about 90 percent of all households in Lesotho do not have access to grid-electricity, renewable energy could play a more important role in terms of enabling household to meet their energy requirements. It should be borne in mind, however, that many Basotho already depend on a mixture of renewable forms of energy (wood, other bio-fuels, natural solar heating of buildings and hydrocarbon fuels for their basic energy needs.

2.8.1 Current status of renewable energy

2.8.1.1 Solar photovoltaic (PV)

Solar photovoltaic (PV) is one of the renewable energy technologies with the highest potential for success in Lesotho. The services relating to renewable energy technologies (including PV) are provided by the private sector in the country. No local manufacturing of PV system components is undertaken in Lesotho. Solar PV has application in the following areas: solar home systems (include lighting and entertainment), solar PV for clinics and schools (comprise refrigeration, entertainment and lighting), water pumping and telecommunications. There are also potential applications in more productive uses such as cottage industries and small-scale agriculture.

About 1 per cent of total rural households currently use solar home systems. Total installed capacity for households is estimated at 61.6 kW_p. It is estimated that about 4 000 systems are installed in Lesotho. At household level, solar PV competes with kerosene or candles for lighting, and disposable dry cell batteries or charged automotive batteries for powering radios and TVs. An analysis undertaken by the DOE indicates that about 30 per cent of rural households could afford solar PV if there is a financing mechanism (whereby owners buy on credit) in place.

The Department of Energy has developed a code of practice for the installation of solar home systems. Generally, however, local solar dealers do not always adhere to the code.

There are about 150 clinics in the country, the majority of which are in remote rural locations not supplied with electricity. Thirty-two of these clinics have been provided with solar PV, although they are in varying states of operation due to poor maintenance arrangements. Forty-three clinics are provided with diesel generators but, due to high running costs, they are generally under-used. The total installed capacity of solar PV in clinics is estimated to be 25.4 kW_p [vi].

Solar PV for water pumping is widely used by the Department of Rural Water Supply for providing potable water to rural communities. There are few cases where individually owned systems are operated. The key problem experienced by PV water pumping systems relates to theft or vandalism. At present, there are about thirty-five systems installed of which only eleven are working because solar panels were stolen. The DRWS is still installing new systems and new security measures are being developed. The total installed capacity is estimated at 132 kW_p [vii].

Currently, there are about 18 solar PV telecommunication systems installed by Lesotho Telecommunications Corporation (LTC) currently Telecom Lesotho (TCL). As with water pumping, theft is a major problem. The total wattage installed is estimated at 67 kW_p.

2.8.1.2 Solar thermal

The major areas of application for solar thermal are solar water heaters, passive solar design of buildings, solar cookers and solar dryers. Key users of solar water heaters are both government and private hospitals and clinics. Nine government hospitals are provided with solar water heaters that have electrical back up. Almost all the clinics have solar water heaters, although most of them are in bad state of repair due to poor workmanship and lack of equipment, and of maintenance standards unsuitable for local conditions. It is estimated that there are about 500 systems installed. The lack of a viable financing scheme is perceived to be one of the major obstacles for penetration of the technology. Installed capacity is estimated at 0.22MW. The largest potential for the application of the technology at the household level is in the urban areas where electric geysers are used for hot water requirements.

2.8.1.3 Passive solar

With about 300 days of sunshine, there is significant potential in Lesotho to encourage passive solar design. Passive design was first formally introduced in the country under Thaba-Tseka Integrated Rural Development Project in 1979. Funded by USAID, the Renewable Energy Technology Project

(RETP) continued to promote these concepts (1981 onwards). The concepts are generally applicable (and fundamental) to any building designed for human habitation. Currently, the focus of the Department of Energy in this regard is on the residential sector. A code of practice for passive solar design and energy conservation has been developed and published, its implementation is however yet to start.

2.8.1.4 Solar cookers

The Appropriate Technology Section (ATS) within the Ministry of Local Government produces solar cookers but its focus is now on investigating the viability of, and need for, research into and development of the technology. The Bethel Business and Community Development Centre (BBCDC) is also involved in production of this technology. Although it has a potential for reducing the burden of fuel shortages, the penetration of the technology has been very slow. In 1993, the technology was ranked lowest on the priority list of technologies that have potential for success in the country [25]. The technology was said to conflict with the norms of Basotho. For example, cooking around midday is at odds with the normal pattern of eating (the main meal is either in the evening or in the morning).

However, there is a high potential for application of this technology in schools and institutions. Most schools in rural areas have feeding programmes. Since the meals at schools are taken around midday, the demand matches the availability of the energy source. It may therefore be more appropriate that application of solar cookers focuses on schools and institutions rather than on households.

2.8.1.5 Solar dryers

Solar dryers are used mainly by rural households for drying vegetables and fruits. In 1993, a socio-economic study found the solar dryer to be the most viable renewable energy technology for Lesotho. ATS, one of the manufacturers of solar dryers, produces about 70 units per annum and the reported demand exceeds this production rate. ATS now plans to transfer the production of the units to a private entrepreneur. In order to successfully effect this transfer of production, ATS is undertaking training of some individuals who are engaged in meal works business. One such training has been completed in Leribe. Besides providing training, ATS also undertakes market assessment for the prospective manufacturers so as to ensure that there will be business on this product. There is great interest among the manufacturers on improving their skills in this line of business.

2.8.1.6 Wind energy

In the past, low-speed water-pumping units have been installed for supplying potable water to the rural communities and individual households. The technology is losing popularity in the country since most of the existing units are neither maintained nor replaced when they are malfunctioning. Of the forty-three wind water-pumping units installed in the country, only a few are still operating. It is likely that the lack of maintenance is related to the question of ownership of the units.

The possibility for exploiting the wind energy resource has been assessed, after one year of continuous measurements at three different sites namely Lets'eng-la-Terae, Phahameng and Sani Top. This assessment was focused on the large-scale and isolated generation of electricity. The estimated total annual energy production (AEP) for the case study wind farm at Lets'eng-la-Terae is 37.3 GWh. The net annual energy production from the wind farm varies from 3.5 GWh to 3.95 GWh per wind turbine per year for a wind farm of 10 wind turbines. A 17.5 MW wind farm, established at Lets'eng-la-Terae would be able to produce electricity at a cost of 45 lisente per kWh.

2.8.1.7 Mini- and micro-hydropower

Mini- (or micro-) hydropower units consist of systems with capacity of up to 2 MW. At present, there are three mini-hydropower plants, unconnected to the grid, and a further one connected to the grid with diesel backup. The total installed capacity of these units is about 3.25 MW. Twenty-two further

sites have been identified for the purposes of harnessing hydropower potential. All the existing units were commissioned less than ten years ago. LEC owns and operates them. In most cases, the units are not operating at their full capacity because of drought and siltation. A significant organisational problem associated with the existing mini-hydropower plants is that customers have to travel long distances to the LEC office in Maseru to pay their bills, since local revenue collection facilities are not available. The existing institutional set-up limits full utilisation of the installed capacity and expansion to increase the customer base. The electricity sector reform presents possibilities for private or community ownership of these facilities.

Other problems are the erratic seasonal flow of the rivers in the country and serious siltation at the power plants. The problem of siltation is related to the large-scale soil erosion in the country in that the eroded soil is washed down the rivers to accumulate at dams used for mini-hydropower plants. While soil-erosion is a major challenge for the country, beyond the scope of energy policy alone, dam siltation requires regular attention.

2.8.1.8 Biogas

Slightly more than 40 biogas digester systems were constructed in Lesotho from the early 1980s with support from FAO and UNESCO, and with involvement of the National University of Lesotho as well as the Department of Energy. This experience is documented in a socio-economic study of renewable energy technologies [viii]. In general, application of the technology has proved unsuccessful, for a number of reasons including high initial cost, lack of water and lack of trained people to maintain the plant. In addition, LPGas is readily available and makes production of biogas less attractive. The study [25] recommended that efforts related to biogas in Lesotho be discontinued. However, a biogas expert from Germany who has been engaged in biogas technology development in some African and Asian countries is currently modifying this technology to suit local conditions. The technology is applied as a means for controlling sewage disposal in urban areas and biogas is one of the benefits. His interest in biogas technology development in Lesotho started in 2002. The Department of Energy is monitoring the developments in this field and if the technology can be proved to be working will not hesitate to be actively involved.

2.8.2 Challenges for renewable energy

The main challenge for Government is to make renewable energy technologies affordable and accessible to households and to increase the use of renewable energy for productive purposes with the goal of improving the livelihood of the Basotho. The share of RE technologies should be increased within the context of various national development programmes. The major barriers towards the penetration of renewable energy technologies can be summarised as follows:

- high initial cost of most renewable energy systems.
- insufficient information and public awareness.
- lack of standards for solar water heaters and solar water pumping systems as well as solar PV application for telecommunications.
- inadequate institutional capacity.

2.8.2.1 Making renewable energy technologies more affordable and accessible

To acquire a renewable energy (RE) system, households generally have to pay its full upfront cost. There are currently very few financial schemes in the form of credit provided by either suppliers or lending institutions. The situation as it currently exists renders it very difficult for many households to own RE systems. This has resulted in low penetration of the technology in the country.

The application of PV for income-generating activities is of prime importance in rural areas. Even though the technology is well suited for rural households, the costs associated with it are beyond the reach of many. However, if this technology is tied up with issues of poverty alleviation more

households can have access to PV systems. The areas of focus could be on cottage industries such as dressmaking, which has recently been identified as a high priority area among the rural population. A recent study by FAO on Solar PV for sustainable Agriculture and Rural Development indicates that there is a big potential for PV in improving agricultural productivity. These would cover areas such as irrigation of small farms and lighting for poultry.

Government will improve customer affordability to access and utilise renewable energy services.

In order to fulfil the above policy statement, the following will be undertaken:

- Government will develop financing schemes that are suitable to the economic conditions of the country. In particular, Government will initiate cross-subsidisation of renewable energy technologies to the rural poor through the National Rural Electrification Fund.
- Government will remove levies on imported components of RE systems such as PV panels, hydro/wind turbines and solar collectors.
- Government will create an enabling environment encouraging international investment in renewable energy technologies in the country. This may include facilitating the establishment of international/local and/or public/private joint ventures on the manufacturing and/or assembly of renewable energy components, as well as installation.
- Government will facilitate the establishment of Rural Energy Service Companies (RESCOs).
- Government will investigate the possibilities, under local conditions, of applying PV to income-generating activities.

2.9 Coal

Coal represents only five percent of Lesotho's total energy consumption, and is thus not a major contributor to economic output. Coal is mainly used in the lowlands and urban households for cooking and heating in winter, and a few industries use it to fire boilers. According to the Energy Balance for 2000, households consumed 1264.28 TJ of total coal consumption, Industry consumed 129.84 TJ, whereas Commerce and Public Services consumed 73.99 TJ. All coal used in Lesotho is imported from South Africa. Currently, Government plays a minimalist role in the sector, and the private sector has a virtual monopoly in coal importation and supply.

Unlike petroleum and gas products, which are subject to specific regulations, coal imports are aggregated together with other imported goods. This makes it difficult to know accurately the quantity and quality of coal imported. Considering it carries the responsibility of providing medical care for people with respiratory diseases caused by the inhalation of fumes, it is becoming clear that Government should play an active role in instituting specific measures to regulate the quality of coal imported, and used. Government also acknowledges that it would be inappropriate to enforce coal standards until residents have access to real alternatives.

Coal supply and import shall be treated similarly to other energy sources such as petroleum and gas products. While not undermining the role of the private sector in the distribution of coal, the Government needs to protect the health of the users and the general environment from indiscriminate coal combustion. Possible coal taxation should *not* only be seen as raising the general Government revenue for the benefit of the fiscus, but as internalising or accounting for the external costs of consuming coal.

2.9.1 Challenges for the coal sector

Key challenges for Government in this area are to:

- Regulate coal imports

- Improve data collection on quantities and quality of coal imports.
- Improve people's awareness about externalities associated with coal usage.

2.9.1.1 Regulating coal imports

All the coal that is used in the country is imported from the Republic of South Africa however there is inaccurate recording of coal imports in terms of both quality and quantities. This means that the current figures on coal supply and consumption may not give a true reflection of the existing situation in the country. This situation (lack of accurate and reliable data) makes high-level planning and policy formulation more difficult. Different grades of coal are available in the market and where coal usage cannot be avoided in the interim higher grades of coal which releases fewer pollutants will be encouraged.

Government will ensure that the importation and usage of low quality coal is avoided.

To implement this policy Government will:

- liaise with the relevant departments to update and improve existing data collection measures so as to ensure that an accurate database on coal imports is maintained.
- establish an inter-ministerial committee, with representation from the private sector, to generate policy guidance on future coal supply and consumption, as well as regulatory measures to reduce the use of low quality coal.

2.10 Energy efficiency and conservation

Experience from all corners of the world indicates that significant financial, economic, environmental and social benefits are achievable when energy is utilised more efficiently. For these benefits to be achieved, the given levels of service need not be reduced. Indeed, service levels can be increased at less expense than when energy is used inefficiently. The Lesotho Government recognises the importance of giving attention to the effective and efficient use of energy, and aims to target its strategies in the following demand-related areas: households, industry and commerce, government and transport.

The key challenge for Government is to encourage greater energy efficiency in all sectors of the economy, thus resulting in improved economic efficiency and the release of savings for investment in other areas of the economy as well as ensuring that the barriers inhibiting investments in energy efficiency and demand-side management (particularly related to affordability and information) are reduced. In order to achieve this, Government must:

- promote thermally efficient dwellings.
- promote the efficient use of energy.
- increase knowledge on energy efficiency and conservation.
- ensure that adequate investments in energy efficiency and demand-side management are made;
- ensure that appropriate technologies and practices are in place.

2.10.1 Promoting thermally efficient buildings

Three potential sources of energy influence the internal environment of buildings: the ambient energy of external climate, the metabolic energy associated with activities and processes which take place in the dwellings, and the generated energy which is produced in the building, primarily from the combustion of fuel or consumption of energy. The poorer the thermal performance of a building, the

more the fuel required to maintain an acceptable level of comfort. By improving the thermal performance of a building, one can minimise the need for generated energy for space heating and cooling thus reducing energy costs. The efficient and effective use of energy in buildings can also contribute towards poverty alleviation and reduce environmental degradation.

Building materials used in the lowlands, urban and foothills are predominantly concrete blocks for walls and corrugated iron sheets for roofing. The majority of buildings have no ceiling and little insulation, which means that they tend to be very uncomfortable in extreme weather. In the mountains, rubble stone and thatch (derived from wheat straw building materials) are used widely for building materials. As some studies have concluded [ix], savings of up to 85 per cent of domestic heating costs could be achieved through the installation of ceilings and insulation. It is estimated that if the measures recommended in a building code prepared by DOE [x] are followed, about 70 per cent of heating demand could be saved.

Although a code of practice in this regard exists, there is little or no co-operation from the building industry to implement the measures. The Building Control Act was promulgated in 1995 under the Ministry of Local Government but accompanying regulations of the Act are yet to be gazetted. This has rendered it difficult to enforce the code of practice for energy conservation, despite the fact that clear reference has been made thereto in draft regulations. Government should be seen to be taking the lead role in implementing policies related to energy efficiency and conservation as it is one of the major consumers of energy, as well as releasing government budget for investment in other important areas.

Government will adopt and promote thermal efficiency and energy-efficient practices and technologies in its own buildings.

In close conjunction with its commitment to establishing a nation-wide information and awareness campaign, Government will execute this policy through undertaking the following:

- seeking out international support to install energy-efficient equipment in its buildings.
- creating incentives for public servants to utilise energy efficiently and sustainably.
- undertaking energy audits in selected government buildings and monitoring progress.
- ensuring that all new government buildings are constructed on the basis of sound energy and thermal efficiency principles.
- liaise with all relevant authorities in ensuring that building regulations as pronounced in the Building Control Act are adhered to.
- conduct awareness campaigns on energy efficiency in buildings and houses.
- liaise with Local Authorities and other relevant bodies responsible for site allocations in order to facilitate building of energy-efficient houses.
- develop incentive-based mechanisms to encourage architects, developers and commercially and self-help based builders to construct thermally efficient homes.
- work with utilities, manufacturers, retailers and importers to ensure that energy-efficient equipment is available on the market.
- work with utilities and private companies to develop financing arrangements that provide incentives to customer investment in energy efficient equipment.
- assess the feasibility of establishing and maintaining an appliance-labelling programme.

2.10.2 Promoting the efficient use of energy in commerce and industry

Commerce and industry, as well as Government and other public institutions tend to incur high and unwarranted costs due to extravagant use of energy. High energy demand is exacerbated by poor thermal efficiencies, lack of heat reclamation and retention techniques or insulation, coupled with the high cost of energy-efficient equipment. Lack of energy management in these sectors results in losses of energy that can be avoided during production. Managers are also reluctant to invest in energy efficient equipment due to high upfront costs. It is Government's contention that energy conservation measures can bring about substantial reductions in industrial energy costs, as well as the national fuel import bill. In fact, it has been estimated that industrial fuel consumption could be reduced by 25 to 40 percent by investing in energy conservation measures.

Government will promote adoption and investment in energy efficient practices and equipment in commerce and industry.

To ensure that this occurs, Government will:

- investigate and identify barriers inhibiting investment in energy efficiency.
- co-operate with training institutions to incorporate energy conservation into curricula.
- develop a programme of action on energy management techniques with stakeholders from industry and commerce.
- Work with electricity utilities to ensure that demand-side management options (including load management and energy efficiency) are available and affordable to commerce and industry.
- encourage energy audits of industrial and commercial establishments.
- encourage simple housekeeping measures to reduce unnecessary energy consumption.
- encourage fuel switching to cleaner and more efficient energy forms.

2.10.3 Promoting the sustainable use of biomass

Government recognises that for affordability and availability reasons, biomass resources will continue to be utilised by Basotho households for sometime to come. It is therefore imperative to protect and properly manage wild indigenous trees and shrubs. Over-harvesting of this resource can be minimised through the use of biomass energy saving technologies

Government will investigate, identify and promote energy efficient household appliances.

To further this policy, Government will:

- continuously monitor energy efficient cooking technologies for acceptance and appropriateness;
- support local involvement and small business development in this area.

3. Cross-cutting issues

3.1 Introduction

Energy, is an essential input to most aspects of human endeavour, it can have a profound impact on a range of socially and economically vital areas. Crosscutting issues exist in the areas of the environment, health and safety, gender, poverty alleviation and regional co-operation. In the following, a number of relevant crosscutting issues are described and related to specific energy sector challenges and policies. The policies referred to are identified in the foregoing chapters of this policy document.

3.2 Environment

The links between energy and the environment in Lesotho have recently been reviewed, along with other environmental issues in the country. Energy-related environmental impacts in Lesotho are typical of developing countries in that they are strongly connected with the use of traditional biomass fuels. The main environmental impacts can be classified as land degradation, local air pollution and greenhouse gas emissions. Of these, the first is generally regarded to be the most serious, while the latter is presently minimal in net terms.

3.2.2 Land degradation

Land is degraded through overgrazing, soil loss from erosion and the removal of organic content and/or nutrients this include the removal of biomass (wood, shrubs, crop residues and animal waste) for use as fuel and other household requirements. Although this activity is not the major culprit for land degradation, the continued over-collection of biomass in threatened areas exacerbates the problem.

Government will ensure that biomass resources are harvested in a sustainable manner.

To implement this Government will:

- Encourage energy efficiency measures at the household level.

3.2.3 Air pollution

The combustion of any fuel, whether fossil or biomass leads to the emission of gaseous compounds and small particles, which pollute the atmosphere. The amount of pollutants released into the atmosphere depend the fuel type and the technology used. These pollutants may be dispersed by the wind or diffuse in the atmosphere to reach insignificant concentrations, and thereafter decay through chemical action.

Some pollutants, on the other hand, may remain relatively close to the point of emission and reach concentrations that can have an adverse effect on human health and inanimate objects. This is known as local air pollution. The main sources of local air pollution in Lesotho are motorised traffic, through the burning of petrol and diesel, and coal combustion, mainly in households for heating during the winter months. Both phenomena are most noticeable in urban areas where the concentration of sources is highest. The level of pollution can also be exacerbated by the atmospheric condition of a temperature inversion layer, preventing pollutants from diffusing to the surroundings atmosphere.

3.2.4 Challenges

Although quantitative data on air quality is not yet available for Lesotho, there can be little doubt that the levels of concentration of harmful substances in the air, particularly in urban areas in winter, give cause for concern. Such urban air pollution contributes adversely to the health of the population in the form of respiratory diseases.

The main challenges for this sector are to:

- Reduce emissions from fuel consumption processes while maintaining the same level of service.
- Minimise adverse health effects caused by indoor air pollution from the combustion of biomass fuels and coal.

3.2.4.1 Reduction of emissions from fuel consumption processes

The use of energy is one of the main human activities that lead to increases in GHG concentration. The most important GHG in terms of the amount of emission is carbon dioxide (CO₂), which is released when carbon-containing fuels are burnt. In the case of biomass, which regenerates, the net CO₂ emission is zero. Unsustainable biomass use, however, leads to net emission. Other GHGs are methane (CH₄) and nitrous oxide (N₂O). A consensus of scientists world-wide has led to a recognition that the increased concentration of these greenhouse gases (GHGs) is responsible for discernible global climate change, in the form of global warming, changed precipitation patterns and an increase in the frequency and intensity of extreme climatic events. This trend is forecast to increase in the coming years and decades unless the atmospheric concentration of GHGs can be stabilised and reduced as agreed in the United Nations Framework Conventions on Climate Change.

Unlike other countries in the region there is virtually no GHG emission from the power sector in Lesotho, apart from the small contribution from diesel generators and a small amount of methane emission associated with rotting vegetation in inundated hydropower reservoirs. This is because electricity is supplied almost entirely by hydropower.

An increasing number of vehicles in urban areas has resulted in road congestion, increased fuel consumption, and increased emissions of gaseous and particulate pollutants from vehicles. Motorists are generally unaware of the negative environmental effects of their fuel consumption. These pollutants can be hazardous to human beings, causing respiratory illness, as well as retardation of brain growth and stunted physical development of children.

Government will promote the use of cleaner energy sources and technologies.

To implement these, the Government will

- Participate in and contribute to the international dialogue and negotiations on limiting climate change through United Nations Framework Convention on Climate Change and its protocols.
- Carryout information dissemination campaigns aimed at reducing emissions from fuel consumption
- Developing information and education materials on energy efficiency in the transport sector.
- Promoting good driving habits amongst Basotho drivers, including, in particular, those on Government business.
- Draw a plan aimed at phasing out the use of leaded petrol in the medium-to-long term

3.2.4.2 Indoor air pollution and health effects

A special case of local air pollution is that which occurs indoors, mainly from cooking in rooms without adequate ventilation or chimneys. High concentrations of noxious gases can cause serious health problems, particularly in women and children who are most exposed to the smoke. Indoor air pollution is associated with biomass and coal combustion in poorly ventilated households. Although there is a tendency for outdoor cooking to be preferred in Lesotho, there is reason to believe that serious indoor air pollution exists. The extent of the problem however is not known.

Government will limit the extent to which the health and safety of rural and urban households are being affected by the use of energy sources within homes.

To achieve this, the Government will:

- minimise health risks associated with energy use within a household.
- enhance household awareness on different energy sources and appliances

3.3 Energy pricing and fiscal issues

The price of energy services to the consumer is a key factor for both social and economic development of any society in the world. While advancing social development and minimising the environmental impacts of energy use, energy pricing should reflect, or be moving towards reflecting the true costs, so that consumers can make informed decisions. Energy becomes an instrument for the eradication of poverty only when it is directed deliberately and specifically towards the needs of sectors that have growth linkages with other sectors in the economy.

The main challenges for the Government are to:

- use fiscal instruments to encourage efficient use of energy
- improve and introduce pricing mechanisms for commercial fuels that are in line with energy policy priorities and goals.

Government will introduce appropriate fiscal instruments targeted at reducing pollution and enhancing energy efficiency

To achieve this, Government will:

- Review the existing fiscal instruments pertaining to energy sector
- Regulate fuel prices at all levels of distribution

3.3.1 Improving and introducing the pricing mechanism for commercial fuels

The price of paraffin is controlled at wholesale level while that of LPGas is not controlled at all. The disparity in the prices of these products is a countrywide problem and worsens in the interior of the country and mountainous areas where poor road access adds to the price of the products. The existing regulatory mechanism for paraffin, moreover, is not effective since it only covers wholesalers at the level of the oil company. Consumer protection would be better achieved by extending the price control to all outlets where fuel is supplied at the pump. Similarly, LPGas prices vary significantly throughout the country and a national price regulation mechanism, taking into account different transport costs, is required.

An impediment to increased efficiency in the electricity sector is the lack of a national electricity-pricing framework. Present pricing structures and levels do not necessarily reflect the cost of supply to various customer groups and areas. This is not conducive to the efficient allocation of resources, investment in demand side management and/or the rational use of electricity. Prices are also not market-related, and are in numerous instances non-transparent, at the level of bulk supply and retail sales.

Government believes that electricity pricing reform will contribute towards levelling the playing field between existing electricity sector participants, possible new players (including independent power producers), and players in the southern African region, thereby enhancing sector efficiency and competitiveness. It is Government's view that competitive energy pricing in Lesotho could have a multiplier effect on the economy, not only leading to a direct reduction in commercial and industrial production costs, but also, encouraging economic growth.

Government will ensure that energy prices are market-based and as much as possible cost-reflective, and that the price setting process is transparent.

- To implement this, the Government will:
- Introduce mechanisms to regulate the prices of these essential fuels at certain levels of distribution.
- Initiate a survey to assess the availability of these products, and the prices being charged to customers.
- Provide consumers with information on fuel prices.
- Investigate possible fiscal policy issues to be considered in achieving competitive energy prices, and make appropriate recommendations;
- Investigate possibilities of setting profit mark-up margins for energy used by commercial and industrial sectors, as is done with petroleum products.

3.3.2 Reducing government subsidies

An energy pricing system based on market prices and cost reflectivity was outlined. This system would entail an across-the-board reduction in government subsidies, as recommended by Government's privatisation policies while the merits of moving towards a cost-reflective energy pricing system are clear, it is also Government's view that this will place a substantial additional burden on poor households, and could in fact, result in a reduction of their access to commercial fuels. Since it is an important policy objective of Government to improve the living conditions of poor households – particularly in rural areas in Lesotho. Maintaining energy subsidies targeted at these households is essential.

Government will introduce energy subsidies targeted at the urban and rural poor

In to realise this, the Government will:

- Scrutinise and revise current subsidies relating to the energy sector.
- Assess mechanisms to regulate prices of fuels such as paraffin and LPGas at various distribution levels.

3.3.3 Regional energy trade and co-operation

Lesotho imports all of its petroleum and coal products from RSA. Presently, Lesotho is self-sufficient in electricity, drawing power requirements from the 'Muela Hydropower Plant. Lesotho is an operating member of the Southern African Power Pool, and as such is fully connected to the power systems of neighbouring countries. This presents opportunities both for the import of power and export in a situation where local capacity exceeds local demand. Lesotho is a signatory to the SADC Energy Protocol, which commits member countries to co-operate on energy matters and to harmonise national and regional energy policies.

Due to the diversity of available resources for power generation, the SADC region has the potential to develop a large and efficient energy market. Even though South Africa is the largest market for electricity, surplus hydro energy is available in the Democratic Republic of Congo and Mozambique. These two countries, as well as Lesotho, Zambia and Zimbabwe, have substantial underdeveloped sites for hydropower.

The challenge for the Government is to ensure that Lesotho cooperates with countries in the region such that the economic and social benefit is maximised.

Government will ensure that the development of its legal, regulatory and institutional frameworks are in harmony with regional and international agreements.

In implementing the above policy, the Government will:

- Continue to participate in all relevant energy/electricity structures in the SADC region;
- Develop legal, regulatory and institutional frameworks that are in harmony with SADC protocols;
- Facilitate the securing of regional multi- or bilateral Power Purchase Agreements by national electric utilities.
- Import and export electricity subject to conditions expressed by SAPP.
- promote electricity trade through SAPP
- where appropriate, take up opportunities presented to Lesotho by SAPP.

3.3.4 Establishing non-discriminatory petroleum levies

There is no clear distinction between petroleum product levies charged to different sectoral activities (i.e. on construction, transport, agriculture and power generation). For example, the road maintenance levy is charged on petrol and diesel irrespective of the end use. It is Government's current view that this levy should only be charged on petrol and diesel used on the roads and not for agricultural-, construction- or power generation purposes. The objective of this is to encourage entrepreneurial business- and agricultural development.

Government will take measures to ensure that dedicated levies such as the road maintenance levy are only charged on related consumer category.

In collaboration with relevant institutions, Government will:

- develop criteria to enable a distinction between petroleum products used for agriculture, construction, power generation and other relevant economic activities from those related to transport.
- conduct feasibility studies to assess the financial and socio-economic implications of these levies, and of removing them.

3.4 Research and development, information gathering and dissemination

It is also Government's contention that lack of information and opportunities for education in the area of energy and thermal efficiency is one of the key barriers inhibiting investments in this area. This problem stems across sectors and interest groups – from households, industry, commerce and transport, to government bodies, key decision-makers, developers and architects, manufacturers and retailers etc.

3.4.1 Undertaking energy related research

While the merits of securing international and regional experts to undertake research and analysis in the energy sector are clear, the Government is also of the view that the national capacity to undertake this same work must be strengthened.

In pursuit of the formulation of energy policies that are appropriate, acceptable, and implementable, Government is committed to continuously bettering its knowledge around energy use patterns, customer energy requirements, energy supplies and distribution chains, energy technologies, energy balances, regulation, standards etc. This energy policy framework has identified various specific areas where new and/or additional research is required. Data gaps identified include.

- Commission comparative studies on the utilisation of different energy sources for different household uses, and in different areas.
- Studies to assess the biomass resource base in Lesotho.
- Develop a database on biomass resource base.
- Rural household energy surveys.
- Improve knowledge on the importation and usage of coal through liaison with Customs authorities as well as carrying out targeted surveys of household use.
- Initiate studies to determine how to improve and enforce safety standards in households, industrial plants, manufacturing entities and appliances.
- Initiate studies to determine appropriate levels of strategic stocks of petroleum products.
- Commissioning a study on the availability of petroleum products in the country.
- Initiate studies to identify investment opportunities in renewable energy in conjunction with other previous studies such as FINESSE.
- Introduce brands and codes for PV panels.
- Introduce and enforce regulations and maintain quality standards and service of renewable energy technologies.
- Initiate surveys and specialised studies to determine the extent and impact of indoor air pollution.
- Assess the extent to which the health and safety of rural and urban householders are being affected by the use of wood, candles, paraffin and other fuels within their homes.
- Conduct studies to determine the extent to which energy services to the poor should, and can, be subsidised.

The challenge to Government is to ensure that these research and information gathering activities as detailed in this energy policy framework are carried out.

Government will ensure that sufficient information and data on all energy resources become available and are regularly updated

In order for these research activities to be carried out, the Government will undertake to:

- allocate budget amounts for each of these initiatives;
- allocate human resources to each of these initiatives;
- collaborate with local regional and international specialists
- develop a database of local institutions and resources currently available to undertake energy-related research and analysis, and thereafter, assess skills and expertise thereof;
- establish a support programme for the co-financing of energy research activities.

3.4.2 Providing information on different energy sources

Studies have indicated that lack of information and awareness on benefits and problems associated with the use of different forms of energy limits individuals from making informed decisions.

The challenge to Government is to radically increase the knowledge among Basotho of all available energy resources, technologies and their safety.

Government will enhance awareness of different sectors of the economy on different energy sources and appliances.

In order to achieve this, Government will undertake the following:

- Collate existing, and develop new information dissemination programmes and awareness campaigns on the cost-effectiveness of household energy use.
- Collaborate with relevant government departments/institutions and NGOs disseminating information on energy saving devices and energy supply companies to ensure that correct advice is given to the public about products and services relevant to them.
- Conduct awareness campaigns throughout the country using different types of media such as radio adverts, training workshops and participating in the local fairs.

3.4.2.1 Increase knowledge on energy efficiency and conservation

It is Government's current view that public awareness on energy efficiency and conservation is generally low. It is also Government's current contention that lack of information and opportunities for education in the area of energy and thermal efficiency is one of the key barriers inhibiting investments in this area. This problem stems across sectors and interest groups – from households, industry, commerce, agriculture and transport to government bodies, key decision-makers, developers and architects, manufacturers and retailers.

Government will promote the efficient and sustainable use of energy in the country.

To implement this policy, Government will:

- utilise electronic (TV and radio) and other media (newspapers, brochures, etc) for information dissemination;
- work with experienced partners in this regard;
- seek out, collate and customise educational material already available locally and regionally;
- ensure that the full life-cycle benefits and costs associated with the efficient use of energy are highlighted.
- establish Energy Information Centres to provide relevant information to the public on energy matters.

4. Governance Issues

The Department of Energy will remain the leading organization in the energy sector of the country for the foreseeable future. The mandate of the Department is to establish/formulate medium- to long-term energy plans and to develop policies and strategies for the sector. These mandates will only be fulfilled in collaboration with other organizations (both government and non-governmental). The coordination of the sector is facilitated through various technical sections of the Department.

4.1 Institutional Restructuring

A Power Sector Policy Statement, formulated in 1998 and amended in October 2000, built on the recommendations of the EMP. This policy focused on institutional reform, introducing private sector participation into the electricity industry in particular, the costing structure of electricity and the establishment of a regulatory authority. To achieve the goal of ultimately electrifying the whole country, it is seen as a pre-requisite that reform measures are introduced into the electricity sector. Reforms should include initiatives to ensure increased efficiency of existing companies within the sector, and to attract new actors from local communities and the private sector in delivery of electricity services, and the electrification process.

Government believes that one aspect of the reform process may involve the vertical disaggregation of the electricity industry. It is its current view that considerable efficiency gains could possibly be achieved through separating out the competitive elements of the electricity industry (possibly generation and retail services) from the non-competitive industry elements (transmission and distribution ‘wires’).

4.1.1 Reforming the power sector

Government is committed to introducing *appropriate* reforms that result in an effective and efficient electricity sector able to provide improved services at acceptable standards while contributing to economic growth. This is premised on the notion that it may no longer be necessary or appropriate that the *entire* electricity industry operate as a monopoly.

Government is committed to implementing appropriate institutional (including regulatory functions) and structural reforms, as well as reforms relating to ownership of the electricity industry.

Government will also ensure that the burden on utilities implementing electrification initiatives does not preclude them from operating on a commercial basis.

To implement power sector reforms, Government will:

- put in place institutional (such as LEA, NREF), legal and regulatory frameworks that ensure utilities function efficiently and reliably.
- establish a Rural Electrification Unit within DoE to take responsibility for high-level electrification planning, including allocation of institutional responsibilities for non-grid and grid customers, and implementation strategies;
- liaise with relevant stakeholders on the opportunities for new electricity sector actors within the new framework.

4.1.2 Development and enforcement of standards for RE systems

Poor performance and frequent breakdowns of RE systems can be attributed to inappropriate system design, poor workmanship and inadequate attention to details of the installation. These problems may be addressed by enforcing standards for the design of RE systems and their installation. Where such standards do not exist, new standards must be developed. A code of practice for PV systems [xi] has been prepared and disseminated through a workshop for electrical contractors and training institutions. The remaining challenge is to ensure that the code of practice is followed.

In the case of solar water heaters, the major problem has been the use of equipment which is not suitable for the climatic conditions of the country, i.e. sub-zero conditions in winter. Government's challenge here is to establish standards and a code of practice that will ensure that the right products get to the market.

Government will maintain appropriate standards for the installation and service of renewable energy technologies.

In seeking to improve the standards of renewable energy technologies, Government will:

- initiate work on a code of practice for solar water heaters and their installation.
- work with the Lesotho Solar Energy Society to ensure that the codes of practice are adhered to.
- Establish local capacity to make maintenance of solar energy installations and other RE technologies readily available to consumers..
- Develop standards, codes of practice and specification for off grid solutions.

4.2 Private Sector Participation

4.2.1 Improve the performance of the electricity industry

Government's immediate objective is to drive initiatives aimed at improving performance of electricity sub-sector, thus achieving considerable improvement in the utility's financial and technical performance. The Government is engaged in the process of restructuring this sector in the country . The ultimate goal of these reforms is to privatise the Lesotho Electricity Corporation.

Government is committed to enhancing private sector investment and participation in the electricity sector.

In order to achieve this, Government will:

- establish opportunities for introducing a competitive element into the electricity sector.
- Commercialise operations of the electricity industry.
- Facilitate the participation of IPPs in electricity generation for both local and international markets.
- Allow non-discriminatory third party access to the transmission network will be introduced at regulated tariffs, allowing suppliers to wheel power through the network to consumers.

4.2.2 Introducing opportunities for local economic empowerment

In general, major oil companies have always dominated the Lesotho oil industry. From a local economic development point of view, this situation is undesirable and, therefore, there is a need for the Government to introduce measures to ensure that Basotho have access to a fair share of this

industry. Since Lesotho has no upstream activities Government has to increase Basotho participation and ownership in the downstream industry.

Government will encourage and promote active participation of Basotho in the ownership and operation of the downstream petroleum industry in the country.

In order to achieve this, Government will:

- review the existing legislation regarding importation of petroleum products and registration of companies and make amendments where necessary.
- collaborate with stakeholders and decision makers to identify areas where Basotho can actively participate in the industry.

4.3 Human resources and capacity building

Government recognises that lack of appropriate human resources within its departments could become a key barrier inhibiting implementation of the energy policies contained within this framework. To guard against this:

Government will ensure that energy institutions and organisations are adequately resourced with appropriate skills to implement the energy policies and programmes.

To ensure that this occurs, the Department of Energy will:

- undertake an annual analysis of energy experts in the country.
 - identify gaps in skills in the energy sector and provide training to meet shortcomings;
 - provide adequate incentives for trained and experienced personnel to remain within the Department of Energy.
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