GOVERNMENT OF THE
KINGDOM OF SWAZILAND

NATIONAL ENERGY POLICY

(SEPTEMBER 2003)

Ministry of Natural Resources and Energy

CONTENTS

nistry of Natural Resources and Energy was
dence on energy imports and energy security. This dependence is due to the country being landlocked. The concern about energy security is still relevant today and will continue to be in the future. Energy is a vital commodity in all the sectors of society and is the engine for economic growth for the development of the country. Hence, the challenges in the energy sector are to ensure that there is an adequate and reliable supply of energy and that it is used efficiently to sustain our economy, our standard of living, and our national security.

The energy sector formulated strategies that are in line with the National Development Strategy (NDS), which has set a standard of living target for the country and a place in the world order, intended to be achieved in the year 2022. The strategies in the NDS placed a need for the development of a comprehensive energy policy that would encompass all the various policy initiatives, action plans, studies, research and demonstration projects. The Ministry approved the formulation of an energy policy in order to guide the energy developments of the country.

In terms of energy resources, Swaziland has substantial coal and hydropower resources, and its sugar and wood based industries produce large volumes of biomass residues. Successful tapping of these indigenous resources in an environmentally sound manner can be vital for creating employment and to reduce poverty. The over-reliance on wood fuel in the rural areas has seen our resources diminish, to such an extent that it is now a serious problem to collect firewood in some rural areas.

The challenge of the National Energy Policy is to make sure that Swaziland has a policy which clearly establishes priorities and plans for the short, medium and long term. There is no doubt that the Policy will face challenges of improving accessibility to energy. Improving accessibility of energy supplies implies investigating ways and means by which energy services can be delivered, reliably and affordably in an environmentally and socially acceptable manner, especially in rural areas where most of the population live. Policy interventions have been formulated to address equitable access to energy as a basic element, key to the development of economic activity. Furthermore, because energy availability and use affect all sectors of the economy, policies to address the global market impact have been considered including the New African Initiatives as the result of the establishment of the African Union (AU).

The country is heavily dependent on commercial energy imports, mainly electricity and petroleum products. Hence, the energy policy places great importance in energy conservation and efficiency on all the sectors of our economy. Policy interventions to use energy wisely have been formulated in order for us to reduce energy imports and use our limited fossil resources efficiently for the benefit of future generations. Regional and international co-operation has been given the attention they deserve in the policy. It is fully recognised in the energy policy that there is a need to develop indigenous energy resources and have adequate energy reserves to sustain the economy in case of supply disruptions.

I am aware that the trend dominating assistance in the energy sector is to work towards liberalisation of energy markets. However, my Ministry recognises that to move beyond the market based approach and reach the low-income groups will require strong political action, as it

nistry will continue with efforts to extend the network. The policy has recognised that there vercome and priorities and policy interventions y be reviewed to meet National objectives.

I am in no doubt that the National Energy Policy will be instrumental in developing the economic activity of the country. I look forward to the continued debate on the implementation of these policies. The role of women and the youth in the future will certainly be enhanced. The Policy also addresses energy pricing and institutional frameworks in which the energy sector functions, including options for a conducive investment climate. The policy recommends taking the energy agenda to the traditional structures as experience has proved that programmes that do not involve communities to set their own priorities, do not succeed.

The Policy is about laying foundations, the market access issues, the infrastructure issues and the human development issues. I would like to thank all stakeholders for identifying the policy objectives in line with the vision of the NDS especially their contribution throughout the two and a half-year process. Special thanks to industry and the Energy Policy Advisory Committee for their valuable time in the process, the other Ministries who participated in this project, and to the Danish Government and consultants for their support and assistance. The tireless efforts of the Project Management Group deserves praise in seeing this process through to its final steps.

Finally, I trust that the National Energy Policy will achieve its main objective to provide energy to all the citizens of the country, to contribute to the eradication of poverty, to increase employment in a sustainable manner and to reduce the countryôs heavy dependence on energy imports.

MFOMFO NKAMBULE
MINISTER OF NATURAL RESOURCES AND ENERGY

Generally, energy sectors have been undergoing rapid transformation in recent years at a global, regional and national level. These changes have included market reforms aimed at improving the services offered to consumers and encouraging investment. This has required Governments to provide an enabling environment. The Government has taken an active role in establishing an overall development programme for the country, through the National Development Strategy (NDS), to address social, economic, political and environmental issues. The critical dimensions of the quality of life are poverty eradication, employment creation, gender equity, social integration and environmental protection.

The Swaziland National Energy Policy has been developed to address the challenges of the transformation of the energy sector and the overall development of the country. It has been formulated through extensive stakeholder consultation at all levels and sectors throughout society. Based on this stakeholder consultation and the aspirations of Government, a vision of the National Energy Policy has been formulated as:

Ensuring that the development goals of the country are met through the sustainable supply and use of energy for the benefit of all the citizens of the country.

The vision of the Policy underlines the importance of the availability and accessibility of energy to cater for the development needs of the Swazi nation. Energy should be affordable and the national energy resources should be harnessed with optimum efficiency, whilst ensuring due attention to environmental concerns. The vision underscores the importance of sustainability: Swaziland must have a National Energy Policy that plans for the future but meets the needs of today. With this in mind, the key objectives of the Policy are:

(1) Ensuring access to energy for all;
(2) Enhancing employment creation;
(3) Ensuring security of energy supply;
(4) Stimulating economic growth and development; and
(5) Ensuring environmental and health sustainability.

These objectives are the foundation for the formulation of the policy statements. The Policy is structured according to the demand sectors, supply sectors, rural electrification, cross cutting issues and implementation.

Demand

The chapter on demand highlights the issues and policy direction in the context of the five main demand sectors: agriculture, industry and mining, commerce and services, transport and households (urban and rural). The focus of the Policy in the commercial sectors is on an efficient utilisation of energy in the carrying out of economic activities, and ensuring that appropriate, reliable and quality supply of energy is available. Due to the limited mining and manufacturing activities in the country, there are presently no energy intensive industries. However, plans and strategies for the future have been established to meet such demands. For households, both rural

services is increased, especially in relation to re localised shortages of wood fuel; strategies energy needs should take into account costs, ntal effects of household energy use are severe primary source of energy. Government will investigate fuel substitution and appropriate, safe and efficient appliances, the ability to acquire these appliances and the effect of subsidies.

Supply

The supply of energy mainly relates to the use of coal, petroleum products, electricity and renewable energy. There are large coal resources in the country, that are presently under utilised. If used in an efficient and sustainable manner, there are a number of benefits to the country in terms of strengthening the economy and creating employment, providing a secure local source of power, and trading power within the region.

All of the coal used in the countryôs industry is imported, mainly because industrial equipment used locally is not designed for indigenous coal. All coal mined in the country is exported despite being environmentally cleaner than imported coal. The Policy has attempted to address this issue, as coal mining can increase employment in the country and the development of projects such as a thermal power project could sustain our coal mining industry. Government will also investigate options for the utilisation of local coal and the resource potential of coal bed methane. Clean coal technologies to reduce the environmental impacts of coal will be promoted in all coal projects whether small or large, including research on suitable equipment for utilising indigenous coal. The coal industry will remain in the private hands to encourage investment and competition.

Petroleum products are the foundation of the transport sector and are presently regulated by Government. This will continue in order to protect consumers in all areas of the country and ensure affordable pricing, especially in relation to paraffin, which is seen as an essential fuel for low-income households. One of the main concerns for Swazilandôs petroleum industry is the ownership and the non-involvement of locals. It has always been the desire for Government to have minimum intervention and regulation in this industry to encourage competition and investment. The policy challenges are to increase diversification of petroleum products procurement, develop a pricing mechanism suitable for the country in line with SACU, if appropriate, and increase the storage capacity of products to mitigate against supply disruptions.

A Petroleum Act will be developed to maintain regulation, set a time-frame for price controls to be removed and phase out the Service Station Rationalisation Plan. The Act will also set a clear legislation of involving locals in this industry. Opportunities for natural gas development in the region will be followed with the objective of diversifying energy supplies in the country.

Electricity supply and use is one of the most important themes within the energy sector in Swaziland. This is in terms of both supporting commercial activities and supplying power to domestic consumers. In order to improve the efficiency of the industry and attract private investment, Government will continue with its programme of liberalising the Electricity Supply Industry and corporatisation of the utility. In conjunction with this process, it is important that the supply infrastructure is continuously upgraded and improved to meet the needs of industry and society. This also includes the sustainable utilisation of local energy resources and ensuring

ng an infrastructure attractive to Independent
us local power generation, resulting in amongst
ob creation, and a reduction in energy imports.

should be fully maximised, as it can bring both access to energy and environmental benefits. This includes the sustainable use of biomass resources (e.g. wood fuel, industrial waste such as bagasse and pulp), hydropower, solar power and wind. Hydropower is presently being used in the country to provide a substantial component of the power supply. There is a much greater potential both in terms of grid connected and off-grid in order to contribute towards rural power needs. Solar is also under utilised in the country and programmes will be developed to ensure greater uptake of solar electricity and solar thermal technologies. Wind power and other technologies will be investigated. Presently, the Ministry is undertaking a resource assessment of the wind and solar potential for the country.

Rural Electrification

Policies for rural electrification are addressed in a separate chapter, as this is one of the key challenges facing Government in the light of the 77% of the population living in rural areas. Access to adequate energy supplies is a key element of Governmentôs rural development strategy. The Government is therefore developing strategies to extend the electricity grid to all areas of the country. This is seen as an essential component towards the social and economic upliftment of all citizens of the country. Stakeholders in defining the direction of rural electrification policy, established a goal for the Ministry, whereby *access to electricity is made available to all citizens of the country by 2022.* This is in line with the objectives, as stated in the National Development Strategy, which are to: ñensure improved access to a range of energy services for the whole population in urban, peri-urban and rural areasò; ñmake electricity available and affordable in rural areas so as to improve social economic development and welfareò; and ñto ensure sustainable fuelwood managementò.

Many rural homesteads are widely scattered and not properly resettled. In view of this dispersed distribution of the population, rural electrification will have to rely on a range of technology options for different areas and environments. Electricity can be made available to rural areas through connection to the national grid and through off-grid solutions. Grid electrification will focus on densely populated resettled areas and areas with high development potential. Resettlement will facilitate increased access to the grid and reduce costs for reticulation. Off-grid technologies may include solar PV, wind, micro- and mini-hydro power systems, biogas, biomass, hybrid systems, diesel and petrol generator systems.

An overall prioritisation strategy has been adopted through consultation with stakeholders. The priority is to first extend the grid to schools, health care facilities and other essential public services, and second to agricultural, commercial and industrial development areas. Consideration will also be given to areas with a high potential for economic development. In conjunction with the above prioritisation, the electrification of homesteads is vital. It is intended that, where viable, grid extensions be routed through resettled areas. Investments in rural electrification are to be strictly prioritised and planned in such a manner that they provide maximum benefit according to the goal, policy objectives and the availability of resources (funds, technical expertise etc.).

ere are a number of issues that cut across all of sue. Swaziland is a landlocked country and as rticular petroleum and electricity. Government therefore needs to ensure that there are strategic stocks and diverse supply routes for petroleum, secure electricity supplies and the maximising of local resources in terms of power production. Security of energy supply can also be improved through the conservation of energy and diversification of sources.

Other cross-cutting issues include: environment, health and safety, energy efficiency, access to energy for low-income groups, gender, employment creation, quality assurance and quality standards, research and development, energy planning, and the need to take cognisance of regional and international energy trade and co-operation. Policy recommendations for all these issues have been developed in line with the vision and policy objectives. These issues provide linkages with other sectors, which impact on energy developments. In the area of research and development, the priority of Government in the short term will be policy related research and evaluation of technologies and demonstration programmes.

Institutional Framework

One of the major comments by stakeholders during early consultation was that the Policy be ñimplementableò. In order for this to happen, it is essential that an appropriate institutional framework is in place. This includes the public and private sectors, donors, organisations such as NGOs, CBOs etc, and the general public. Within Government, an Energy Department will be established with an appropriate budget and expertise. This includes the establishment of a Petroleum Inspectorate to monitor compliance with fuel standards and legislation, a Policy Research Unity and Regional Energy Units. A National Energy Forum will also be established to provide an independent platform for energy users and to advise Government on policy issues. Local energy organisations and community based committees will also be strengthened. It has been recognised that human resource development is essential for both the public and private sector. The need to transform and develop appropriately trained and skilled human resources has been highlighted. Investigations will be conducted to establish the sectorsô skills requirements and recommend human resource development strategies and programmes.

Energy Policy Priorities

Financial and human resources are limited within Government. Therefore it is essential that policy statements are prioritised according to the policy objectives and needs in terms of short term and medium to long term. Government in its poverty reduction strategies has identified a number of projects, which would require support from the Energy Sector. Hence the need to establish priorities aimed at facilitating Governments goal of overall economic development.

Conclusion

Implementation of the Policy is essential in fulfilling Governmentôs overall development objectives. The next phase in the development of the National Energy Policy will be the development of a National Energy Policy Implementation Strategy. This Strategy will outline the methodologies on how the activities will be carried out, by whom and the resources required.

igures

abbreviations

	Mechanism
CO_2	Carbon Dioxide
DANCED	Danish Co-operation for Environment and Development
DPM	Deputy Prime Minister
DSM	Demand Side Management
ERA	Energy Regulatory Authority
ESI	Electricity Supply Industry
ESMAP	Energy Sector Management Assistance Programme (World Bank)
ESRA	Economic and Social Reform Agenda
EU	European Union
GoS	Government of Swaziland
GDP	Gross Domestic Product
GEF	Global Environment Facility
GWh	Gigawatt Hours (10^9 Watt hours)
IBLC	In Bond Landed Cost
IPP	Independent Power Producer
IRP	Integrated Resource Planning
kV	Kilovolt (10^3 Volts)
kW	Kilowatt (10^3 Watts)
LPG	Liquefied Petroleum Gas
MoE	Ministry of Education
MoF	Ministry of Finance
MoHSW	Ministry of Health and Social Welfare
MoPWT	Ministry of Public Works and Transport
MEPD	Ministry of Economic Planning and Development
MET	National Meteorological Services
MNRE	Ministry of Natural Resources and Energy
MVA	Motor Vehicle Accident Fund
MW	Megawatt (10^6 Watts)
NEMCO	National Energy Management Committee
NDS	National Development Strategy
NESA	National Energy Savings Association
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
PCB	Polychlorinated Biphenyl
PEU	Public Enterprise Unit
PSO	Public Service Obligation
PV	Photovoltaic
R&D	Research and Development
RATPLAN	Rationalisation Plan
RDA	Rural Development Area
PSMP	Public Sector Management Programme
REASWA	Renewable Energy Association of Swaziland
REC	Rural Electrification Committee
SACU	Southern African Customs Union
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SCORE	Select Committee on Rural Electrification
SCOT	Swaziland College of Technology
SEA	Swaziland Environment Authority
SEB	Swaziland Electricity Board
SEDCO	Small Enterprise Development Company
SHS	Solar Home System
SME	Small to Medium Scale Enterprises
SNEPP	Swaziland National Energy Policy Project
SO_2	Sulphur Dioxide
SPTC	Swaziland Post and Telecommunications Corporation
SWER	Single Wire Earth Return
TJ	Tera Joule (10^{12} Joules)
UNDP	United Nations Development Programme
UNESCO	United Nations Education and Science Council
UNFCCC	United Nations Framework Convention on Climate Change
UNISWA	University of Swaziland
VA	Voluntary Agreements
VOCTIM	Vocational and Commercial Training Institute
WEC	World Energy Council

1.1 Background

The energy sector has been undergoing rapid transformation in recent years at a global, regional and national level. These changes have included market reforms and the introduction of appropriate regulation. Governments have been withdrawing from directly managing markets and their role has progressively moved towards setting up sound rules which are administered by impartial regulators. There has also been a progressive movement towards pricing energy to reflect the true costs of supply. Consequently, in many cases this has resulted in higher energy prices, which have in turn stimulated greater efficiency of energy supply and use. However, there is also strong emphasis towards ensuring access and affordability of energy services to all of the population. The major task for the Government of Swaziland therefore is to achieve a balance between its economic and social responsibilities.

Within the Southern African Development Community (SADC) region, the energy sector reform process has been moving at a fast pace during the last five years. The prime objectives have been to increase efficiency and attract and facilitate participation by private investors and financiers. In 1996, the SADC Heads of States approved the SADC Energy Protocol. The main objective of the Energy Protocol is to promote the harmonious development of the regionsônational energy policies and matters of common interest for the balanced and equitable development of the regional energy resources.

During recent years the Kingdom of Swaziland has made major efforts to formulate and reach consensus regarding overall national development policies and action plans. These have culminated in the National Development Strategy (NDS), which embodies the long-term vision for the development of Swaziland. The overall vision set out in the NDS is that *"By the year 2022, the Kingdom of Swaziland will be in the top 10% of the medium human development group of countries founded on sustainable economic development, social justice and political stability".*

Underlying the vision in the NDS is the focus on the quality of life in the country. The critical dimensions of the quality of life are *poverty eradication, employment creation, gender equity, social integration and environmental protection*. These are, in turn, crucially linked to education, health and other aspects of human resource development.

When translated to energy policy development, the vision infers that the energy policy should therefore also strive to promote sustainable economic development, social justice and political stability, by supporting poverty eradication, employment creation, gender equity, social integration and environmental protection. An energy policy needs to be based on the overall development policies and in particular policies with relevance to the energy sector, such as public-private partnerships, environment, business promotion, privatisation, etc.

tional Energy Policy

ability to do work or conversion of this capability to motion ô. In the context of the National Energy Policy, energy impacts on all sectors of society and the economy. Energy activities relate to both the supply and demand. Energy carriers and sources can include petroleum products (petrol, diesel, paraffin and Liquefied Petroleum Gas (LPG)), solid fuels (coal), electricity, renewable energy (hydro, wind and solar) and the use of biomass (wood fuel, wood waste and bagasse). Energy is crucial to economic and social development, and to alleviation of poverty.

Developments in the energy sector at a global, regional and national level have necessitated the institutionalism of concrete policy guidelines to channel the development of the energy sector in the Kingdom of Swaziland. The Ministry of Natural Resources and Energy agreed, together with stakeholders, that an energy policy be formulated, in accordance with other sectoral policies, so as to contribute to the attainment of the NDS Vision. Furthermore detailed studies covering, amongst others, strategic fuel depots, household energy, solar energy and rural electrification, have reached a similar conclusion that policies in these areas must be put in place. It has therefore been found pragmatic to formulate a comprehensive policy to cover all the areas of energy. One of the major issues requiring urgent policy guidance is the security of energy supply, emanating from the fact that Swaziland is landlocked and imports most of her energy requirements.

The formulation of the energy policy is also a response to the countryôs commitment to regional co-operation. The SADC Energy Protocol clearly urges Member States to develop national energy policies that should enhance the provision of energy co-operation and integration in the context of the principles of the SADC Energy Regional Co-operation Strategy and Policy.

The Kingdom of Swaziland is party to a number of conventions and agreements at a global level. Globalisation, the new international environmental agenda, and market reforms are some of the new developments of recent years. Swaziland therefore needs an energy policy that learns from and takes advantage of these emerging international developments.

Thus in 1997, Ministry embarked on the preparations for the formulation of a comprehensive national energy policy for the country. Once in place the energy policy will have to be followed by the formulation of appropriate legislation and implementation strategies for the various sub sectors of the energy sector so as to provide a sound framework for politicians, investors, energy suppliers and consumers.

Government is committed to building the economy and improving the access to energy for all its citizens, hence the need for the policy. The policy formulation process has been supported by the Danish Government as part of the Swaziland National Energy Policy Project (SNEPP).

An understanding of the socio-economic context within which the policy will be implemented is crucial in the development of the energy sub-sector policies. Thus, this section attempts to highlight the social and economic environment prevailing in Swaziland and relates the consequent impacts on the energy sector.

Swaziland is a landlocked kingdom situated in the eastern part of southern Africa, sharing borders with the Republic of South Africa to the North, South and West and the Republic of Mozambique to the East. It covers a land area of 17,364 km^2.

1.3.2 Physiography

Swaziland is divided into four geographical zones. The western-most zone, the Highveld, with the capital Mbabane, lies at an average altitude of 1,300 metres and covers 29% of the country. The climate is temperate. The land is not generally suitable for crop cultivation, but well suited to forestry. Swazilandôs large wood and pulp industries are situated in this region. The subtropical, hilly Middleveld covering about 26% of the country lies at an average altitude of 700 metres. It is the most densely populated part of Swaziland, and the main commercial and industrial centre is situated in the Matsapha industrial area. The relatively dry Lowveld, covers 37% of the area and lies at an altitude of 200 metres. Swazilandôs large agro-industries, mainly sugarcane, and coal deposits can be found in this region. It is relatively sparsely populated. Near the border with Mozambique, the land rises to an altitude of 600 metres. This region is referred to as the Lubombo plateau, which covers the remaining 8% of the country. It is climatically similar to the Middleveld.

1.3.3 Transport infrastructure

Traditionally, the countryôs most important link abroad is the rail link to Mozambique and South Africa. There is a good road infrastructure, providing access to most parts of the country, and Manzini airport services regular flights to Johannesburg and regional airports.

1.3.4 Population and demography

According to the 1997 census, the population was 980,722, with 77% of the population living in rural areas and 23% living in urban and peri urban areas. In 1997, 172,416 households were registered, with 34% of the households situated in urban areas. Company towns established in connection to the major industries; sugar, pulp and timber, are a significant component of urban settlements.

During 1990-1997 the population growth was 3.4% per year. This relatively high rate is expected to be somewhat reduced in the coming years due to the HIV/AIDS pandemic. There is also a movement towards increased settlement in urban areas. Educational

racy rate is about 75% for both males and

time of sluggish economic growth means in real terms, a worsening of the standard of living for the average Swazi. This poses a serious challenge in the provision of affordable energy services to the general population whose average income level is decreasing.

1.3.5 The economy

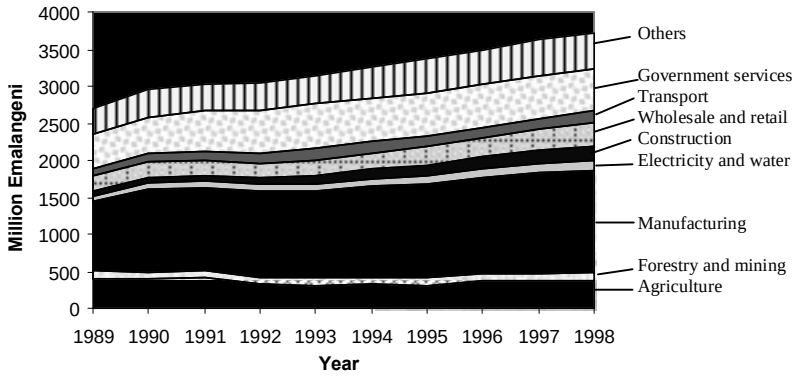
In the late 1980ôs, the economy of the country grew rapidly. However, analysis conducted in the Swaziland Poverty Reduction Strategy indicates that the gains from the past were being eroded. Indications show that at present 66 % of the population live below the poverty level. Government has formulated poverty reduction strategies that will require the support of basic energy services. Energy is vital to fighting poverty and the policy will develop a conceptual framework on the understanding of energy in relation to poverty.

Government has formulated a Population Policy, whose goal is to improve the quality of life by influencing trends as well as responding to challenges such as HIV/AIDS. Official statistics indicate that the unemployment ratio was around 22 % (1995 estimates) and is still increasing. As expected, females have a higher unemployment rate than males, and there is higher unemployment in rural areas compared to urban areas.

The performance of the Swaziland economy, which is dominated largely by export based agricultural and agro-based manufacturing production, has been sluggish in recent years, largely a reflection of the vulnerability of primary production to climatic and external factors. The Swaziland economy, like most of the region, depends heavily on South Africa. The major forms of dependence include the areas of trade, investments and energy (electricity, petroleum products and coal).

Per capita income (GDP/population) in 1998 amounted to 3,791 Emalangeni (Figure 1), ranking Swaziland among the lower middle-income developing countries. The Lilangeni is linked at par to the Rand.

Figure 1: Gross domestic product, 1998 prices



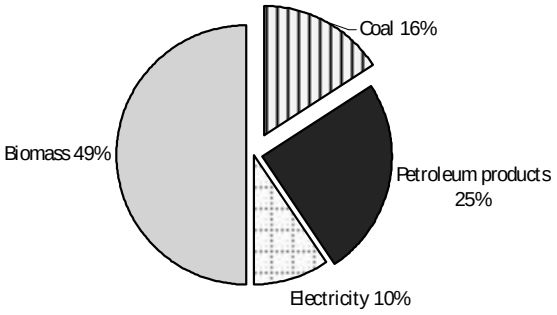
grew at an average rate of 6.5%. This high
nt years. From 1996 to 1998 the growth rate
nomic growth has even further reduced. The
g sector, accounting for 37% of the GDP. It must be noted that the manufacturing industry is dominated by only a few large firms.

Agriculture is mainly based on subsistence farming, cash crops and livestock. The contribution to GDP amounts to 10%. However, manufacturing of value-added products largely originates from the agro-based industries: sugar processing, wood pulp production and fruit canning. Most energy for these activities is provided through human labour or animal power, though tractors and other electrical equipment are used to some extent. The energy statistics for the sector are dominated by the few industrially operated wood, fruit and sugar cane cultivation companies and do not represent traditional farming. Nevertheless, electricity and diesel are the dominant commercial energy carriers used by the sector contributing about 47% and 44% respectively in 1999.

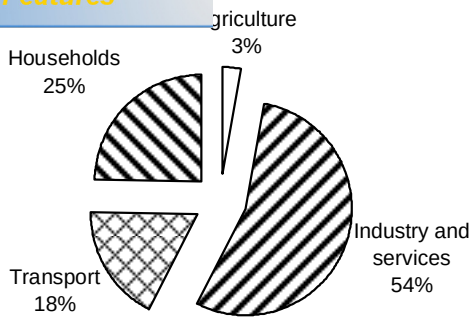
The dominant role of the manufacturing sector in GDP is also reflected in the share of the total employment in the private sector compared to the public sector. The public sector accounts for 15% of GDP, however the growth has been negative since 1994. From an energy perspective the agricultural and manufacturing sectors are not only interesting as sectors with a large energy demand, but also in that these sectors in their production provide useful by-products that contribute to the energy supply. The sugar and pulp industries in particular produce vast amounts of biomass by-products that are used for process heat and electricity production.

Swaziland imports the major energy carriers: petroleum products, electricity and coal. Figure 2 indicates that, the country imports almost half of its total energy requirements in the form of coal, petroleum products and electricity. The high import of energy products has a negative impact on the countryôs balance of payments. Figure 3, indicates the distribution of energy demand according to the various sectors.

Figure 2: Total final energy consumption by energy carriers, 1999 (37,395 TJ)



umption by demand sectors, 1999
95 TJ)



The 1999 Energy Balance (Annex 2) details the energy demand and supply for the country according to fuel types, imports, exports and demand sectors.

1.4 The Process of formulating the National Energy Policy

In the past, a number of technical, economic and institutional studies have been conducted on the Swaziland energy sector. These studies, provided a foundation for the formulation of the energy policy.

Although the Ministry has been able to establish energy data, technology information and elements of energy strategies, the need for a comprehensive national energy policy and strategies for implementation remained.

The policy formulation project began in August, 1999. It has been a consultative and participatory activity with the involvement of stakeholders and decision makers at strategic points throughout the process (see Figure 4). This has been through creation of a dialogue between the expert process consisting of the Energy Section of the Ministry, assisted by international, regional and national consultants and: stakeholders representing the energy supply industries, users and utilities; governmental, regional and local decision makers; and selected groups of energy consumers.

Three national workshops were held to capture and include views from all key stakeholders and to create consensus on major issues and priorities. A number of working groups were formed to deliberate on the following specific areas:

(i) Security of energy supply and overall governance of the energy sector;
(ii) Use of indigenous resources for the generation of electricity and heat;
(iii) Use of energy in areas not connected to grid electricity;
(iv) Energy savings and energy efficiency;

f petroleum products; and

Workshops and interviews in rural areas were carried out to gather first-hand information on key priorities within communities, main energy problems, appropriateness of different technology options and organisational issues. These were complemented by consultations with Tindvuna Tetinkhundla.

An Energy Policy Advisory Committee was established to assist and advise the policy formulation process, comprising senior Government officials and senior representatives from selected organisations. Consultation with decision makers took place to review policy options at key stages of the policy formulation process;

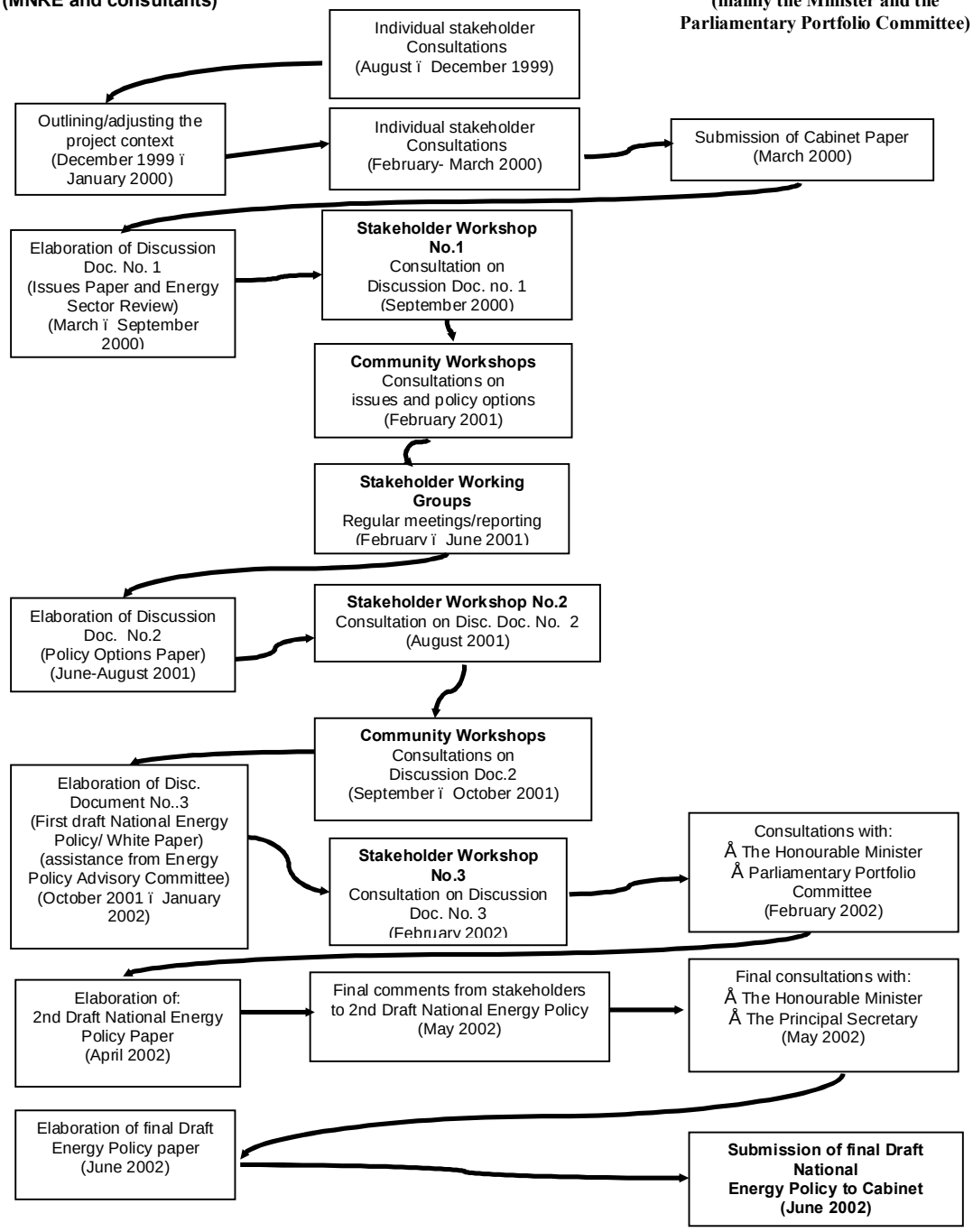
Figure 4 outlines the policy formulation process since 1999.

The energy policy formulation process ran parallel with a process on the formulation of a Rural Electrification Policy. This process was carried out under the Ministryôs programme on restructuring the Electricity Supply Industry (ESI) of Swaziland. One activity of the ESI restructuring process was to address the issue of improving access to electricity services for the population and the local economy, particularly in rural areas. This situation is particular to the country due to the majority of the population living in rural areas. Numerous donors have shown interest in assisting in developing the electricity infrastructure in rural areas. The high importance of this subject and the high political priority gave rise to the development of a separate chapter on rural electrification.

rmulation process

(MNRE and consultants)

CONSULTATIONS WITH DECISION MAKERS
(mainly the Minister and the Parliamentary Portfolio Committee)



Based on wide stakeholder consultation and the aspirations of the Government, the ***Vision*** of the National Energy Policy has been formulated as follows:

Ensuring that the development goals of the country are met through the sustainable supply and use of energy for the benefit of all the citizens of the country.

Mission statements will be developed for each sub-sector based on this overall Policy vision.

1.6 Energy policy objectives

The vision of the Policy underlines the importance of the availability and accessibility of energy to cater for the development needs of the Swazi nation. Energy should be available at an affordable cost to all citizens of the country. The national energy resources should be harnessed with optimum efficiency whilst ensuring due attention to environmental concerns. The vision also underscores the importance of sustainability: Swaziland must have an energy policy that plans for the future but meets the needs of today. With this vision in mind, the key objectives that the policy must pursue can be outlined as follows[1]:

a) Ensuring access to energy for all

Access to energy for all sectors of the economy and in particular to rural areas is a key development ingredient. Currently, there is a high dependence on wood fuel, which is not evenly distributed throughout the country and very few rural households have access to electricity. Supply of other energy carriers in remote areas is in many cases difficult due to cost limitations and poor transportation infrastructure. Access to energy should not only concern the physical availability but also the affordability. Affordability of energy is a major concern for low-income households and needs to be adequately addressed.

b) Enhancing employment creation

Creation of employment is a prime element in the overall strategy on poverty reduction. Given the high level of unemployment in Swaziland, energy solutions should contribute to the creation of employment possibilities for locals. Employment creation may either be directly in the energy sector or created indirectly as a result of competitiveness of the sector.

[1] These energy policy objectives (inline with the NDS) were agreed upon in the First Stakeholder Workshop.

Deleted: ,

ort term and long term concerns. Short term security issues are those related to the availability of energy carriers on a day to day basis and include; the quality of the supply, reliability of the infrastructure, and the stability of energy imports. Longer term security concerns include the stability of international agreements on energy import infrastructure and price as well as development of the countryôs own energy resources. Being landlocked, Swazilandôs energy import is heavily dependent on relatively few supply alternatives and transportation routes. This is especially the case for petroleum products and electricity.

d) Stimulating economic growth and development

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The energy sector can contribute significantly towards economic growth through initiatives that emphasise efficiency in energy sector management. Access to cost-effective and reliable energy also promotes economic development through increased competitiveness of industry. This is an important contribution to the national economy. Increased use of indigenous energy resources and efficient energy use, thereby reducing the need to import energy, will stimulate growth of the national economy and improve the balance of payments. In order to support economic growth and development, it is essential that there is a sustainable institutional framework in place.

e) Ensuring environmental and health sustainability

World-wide, energy is recognised as the main source of global pollution. Emissions of Carbon Dioxide (CO_2) and other harmful substances resulting from the energy sector are a serious concern globally. The local environment is equally important for the future development of Swaziland. Deforestation, air pollution from vehicles and industry, indoor pollution due to cooking with wood fuel and disruption of ecological systems due to hydropower are examples of environmental impacts of energy supply and use. Care must therefore be taken that the proposed energy policy options are based on an environmentally sustainable approach and ensure the protection of public health.

These five policy objectives are the foundation for the formulation of individual policy statements, in line with the NDS.

1.7 Structure of the policy document

The energy policy document has been structured into eight chapters.

The *first* chapter gives an introduction to the energy sector, describes the context of the energy policy and introduces the vision and objectives of the energy policy.

The *second* and *third* chapters contain details of policies governing the demand and supply sectors, respectively.

electrification. Rural electrification has been
ion on electricity since it is one of the key

The *fifth* chapter deals with policies on cross-sectoral topics such as environment, gender, security of energy supply, and international co-operation.

The *sixth* chapter addresses the implementation of the Policy and the strengthening of relevant institutions. It has to be emphasised that the Policy, if it cannot be implemented, will fall short of its purpose. Therefore this chapter gives forethought on how the policy implementation is envisaged. However, detailed policy implementation issues such as the use of means, the need for financial and human resources and the specific role of key stakeholders are not addressed in the document and will need detailed and careful analysis during the formulation of a strategy for implementation.

Chapter *seven* gives a reflection on the priorities of the policy within the short and medium/long term and how the energy policy should be revised, monitored and evaluated. These priorities are linked to the energy policy objectives. A time frame for policy implementation is furthermore an area for the subsequent implementation strategy.

The last chapter, chapter *eight,* describes the way forward.

Chapters two to six follow a generic format that can be described as follows:

- Background information to introduce the major features of the sector/section;
- The key issues that face the sector;
- Motivations for particular policies;
- A clear statement of Governmentôs policies, written in bold italics;
- Where necessary or appropriate:
  - Targets
  - Details on the implementation
  - Mechanisms for monitoring and evaluation

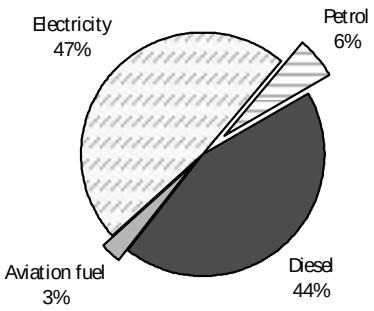
The policy statements are defined mainly in terms of the responsibility and commitment of Government, e.g. ñGovernment will ensureé .ò. Although Government is seen as the focus of the policy, the lead Government agency, implementing the National Energy Policy, will be the Ministry of Natural Resource and Energy, through the Energy Department. The role of Government is to create an enabling environment for the policies to be carried out. Apart from Government Ministries and institutions; the private sector, NGOs, or other organisations may carry out the implementation. The specific roles of the key players will be defined in the implementation strategy.

2.1 Agriculture

2.1.1 Overview

Agriculture plays a critical role in the economy as a food provider and a major contributor to exports. However, it is not a major energy consumer and accounts for only about 3% of the total energy used in Swaziland. The energy requirements for large farms include energy for satisfying on-farm and off-farm operations, which depends on agricultural development policies. This has resulted in agricultural practices changing within the country as commercial agriculture expands onto Swazi Nation Land. Irrigation is a major energy consuming activity in this sector. Traditional agriculture as practised by individual households and communities, involves a significant amount of human and animal energy, which is difficult to quantify. Figure 5 describes the consumption of energy within the agricultural sector. This is mainly in terms of commercial energy use.

Figure 5: Agricultural energy consumption, 1999 (1,025 TJ)



2.1.2 Main issues

The main challenges in improving agricultural energy use are as follows:

- Stimulating the use of more efficient machinery and processes; and
- Optimising energy supply and end use options so as to best benefit small scale, rural farmers.

2.1.3 Energy supply for rural agriculture

Traditional farming is an important element of the livelihoods of rural communities. The energy policy aims to complement agricultural policies on improving agricultural productivity in rural areas. An adequate and reliable supply of diesel and electricity is important for enhancing rural farming.

access to all appropriate forms of energy to

There will be a need to identify the energy supply problem areas with the full involvement of the Ministry responsible for agriculture.

2.1.4 Energy efficiency in the agricultural sector

A number of activities can be undertaken to reduce the amount of energy required for agricultural output. Practices such as increased use of timers, computerisation and use of low-energy pumps could reduce energy requirements for irrigation and improve competitiveness of agricultural products. These activities could result in benefits to the individual farmer and ultimately to the energy sector in general.

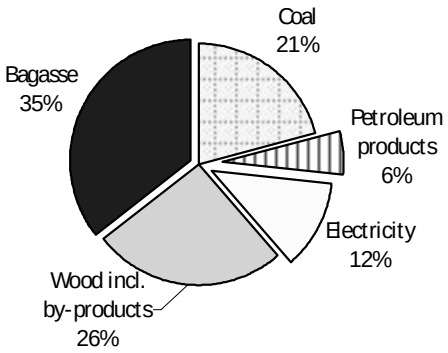
Government will promote measures to improve efficiency of energy use in agriculture, such as the provision of information and use of low-energy equipment.

2.2 Industry and mining

2.2.1 Overview

The industrial sector, including the mining sector, is the major energy-consuming sector in Swaziland comprising 54% of the total energy consumed in 1999. The industrial sector is dominated largely by export orientated agro-based production. Soft drink concentrates, sugar and woodpulp are major export revenue earners. The sector has been volatile in recent years due to difficult conditions in international markets. This has led to the closure of a number of firms and the establishment of new, mainly textile orientated firms.

Figure 6: Industry, mining and services energy consumption, 1999 (20,487 TJ)



comprises only the Maloma Colliery and the
d from the mining sector has been reduced
re of the Mpaka coal mine, the Dvokolwako
mbu.

Figure 6 illustrates the breakdown of consumption of energy in the industry and mining sector (note: this also includes the commerce and services sector). Energy demand in the industrial sector is concentrated on the sugar and wood based industries. Supply of commercial fuels to the industry has progressively improved, but major concerns still remain regarding the reliability of electricity supply. Power outages within this sector, even for a short period, can result in losses of production, however this situation is improving as a result of the ongoing system-strengthening programme. The cost of energy, particularly electricity and coal is also a matter of concern to industry.

There is a significant scope for increasing efficiency of energy use in this sector. This makes sense for at least three reasons. Firstly, energy supply infrastructure is costly. Therefore, inefficient use of energy results in investment in energy supply equipment that is in excess of what is actually needed. Secondly, excessive energy consumption increases the production costs of goods. Consequently, these goods will be less competitive in the market. Thirdly, the inefficient use of energy compounds environmental problems within the energy sector. The most important of these problems are the reduction of local air quality due to air pollutants and the production of gases that contribute to the greenhouse effect, resulting in climate change.

2.2.2 Main issues

The main issues for energy in industry are as follows:

- Ensuring rational electricity tariffs for industrial consumers;
- Improving the quality and reliability of electricity supply; and
- Stimulating energy savings and efficiency practices within this sector.

2.2.3 Reliability and cost of electricity supply

The supply of reliable power is crucial to production processes and is a key parameter for investors. Hence, there is a need to have cost-reflective tariffs in this sector The continuing programme of electricity supply system strengthening seeks to address the quality and reliability of supply.

The Government has been encouraging the development of industrial areas in selected locations outside the Manzini-Mbabane corridor. It is necessary therefore that the electricity supply infrastructure is geared to support this objective.

Government will ensure continued improvement of the electricity supply infrastructure for the industrial sector as part of the overall strategy for attracting investment.

onservation in industry

ner category, it is also the category with the onservation potential. There are numerous activities that can be carried out to improve energy efficiency in industry, however prioritisation of the most appropriate activities is necessary. Energy efficiency improvements and optimisation in areas such as lighting, motor driven systems, and steam systems are possible in most firms.

A programme covering the food and beverage industry has been operating since 1995 under the auspices of the SADC Industrial Energy Management Programme. The programmeôs main focus has been on the capacity building of managers, engineers, technicians, lecturers of technical colleges and consulting engineers.

Government will initiate an energy efficiency and conservation programme to encourage energy savings.

Activities in energy efficiency and conservation in industry will be initiated, prioritised and implemented in co-operation with the appropriate industrial organisations.

2.3 Commerce and services

2.3.1 Overview

The sector comprises a large range of energy users, including offices (both Government and private), retail, education, health care facilities and catering. Data on the energy usage patterns in this sector is very poor. In general this sector is well supplied with energy carriers, however the most frequently cited problem is the poor reliability and quality of electricity supply.

This sector also presents numerous opportunities for improvements in energy efficiency such as heating, ventilation and air conditioning, building energy management systems, hot water generation, lighting and appliances.

2.3.2 Main issues

The main challenges for energy provision and use in this sector are:

- Ensuring quality and reliability of energy supply; and
- Stimulating energy savings and efficiency practices.

2.3.3 Energy efficiency in the commerce and services sector

It is important that there is a high quality and reliability in the supply of energy in order to develop the sector and allow it to operate efficiently. Energy efficiency practices in the commerce and services sector are not institutionalised mainly due to a lack of awareness. The Government sub-sector presents large opportunities for programmes on

nd public buildings. World-wide experience
easures can be implemented in this sector.

-raising programme for the commerce and services sector on energy efficiency and conservation measures.

Government will ensure that an energy management programme for all her institutions is implemented.

2.4 Transport

2.4.1 Overview

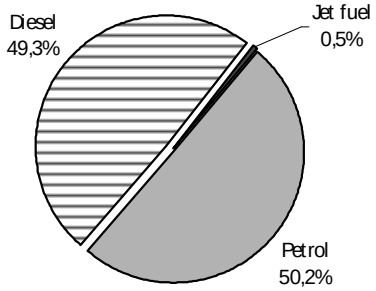
The transport sector is crucial to Swaziland. Most journeys are work related. However, an important problem is the acquisition of data, for example to differentiate between fuel used for passenger transportation and that used for freight. Nearly all passengers on public transport are conveyed by road as are the majority of goods. In general, transportation in Swaziland consists of several travel modes, but the dominant modes are road travel (passenger transport) and freight (goods transport).

Modes of road transport for passengers in the country include the conventional bus, midi-bus, mini-bus, sedan taxi and private car. However, in regional and international terms, car ownership levels are still very low and the majority of the population use public transport.

A transport policy is in place, which addresses the main issues in this sector. However, there are a number of energy related issues, which deserve to be addressed by the energy policy also. The transport sector is the dominant consumer of petroleum fuels and is responsible for about 18% of the total energy demand. Air pollution from the transport sector is directly related to the combustion efficiency of petroleum fuels

Figure 7 describes the energy consumption patterns for the transport sector.

Figure 7: Energy consumption in transport, 1999 (6,672 TJ)



ergy use is concerned are:

on in the administration and implementation of the energy policy, the transport policy, the environmental policy and other related policies;

- Promoting an optimum and efficient use of transport energy; and
- Managing the environmental and public health impacts resulting from the use of transport energy.

2.4.3 Co-ordination on transport energy matters

Policies on transport energy should complement the related national policy on transport. There is a need for closer co-operation on issues such as the establishment of an appropriate linkage between petroleum product prices and bus fares (as long as both are regulated). Other matters of co-operation include the monitoring and regulation of the efficiency, maintenance and age of vehicles on public roads.

Government will integrate and harmonise implementation of the various national policies related to the transport sector.

Government will forge closer links among her agencies to assist this process.

2.4.4 Energy efficiency in the transport sector

The gradual change of the local fleet towards newer models ensuring proper combustion of fuels as well as stricter applications of proper maintenance of vehicles can play a significant role in improving management of transport energy. More efficient vehicles will result in tangible benefits in terms of a cleaner local environment. However, regulations to promote this change should take into account the needs of transport users, particularly public transport users.

Government will promote fuel saving measures in the transport industry.

There is also a need to improve efficiency in the use of fuel in the rail and air transport sectors. Currently in the country, rail transport is dominated by diesel powered engines.

Government will progressively introduce tighter maintenance and inspection procedures so as to stimulate development of more energy efficient and environmentally friendly modes of transport.

This policy has to be implemented in close co-operation with public vehicle operators.

Information on vehicular efficiencies and benefits of proper maintenance are strategies that need to be employed.

In the following sections, the energy needs within rural and urban households are dealt with according to the different options for access to energy and the varying patterns of consumption.

The Ministry of Natural Resources and Energy, with assistance from the World Bank/United Nations Development Programme (UNDP) Energy Sector Management Assistance Programme (ESMAP), produced a Household Energy Strategies report, based on surveys carried out in 1993/1994. This report highlights some of the key challenges and recommendations for both rural and urban energy.

Energy itself is not a basic human need, but is critical to the achievement of other developmental and social objectives. For example, staple food on which people depend often requires energy for preparation and preservation.

2.5.2 Main issues

The main issues for improving energy services in households are:

- Improving the reliability of the grid electricity infrastructure;
- Making electricity available to as many households as possible;
- Provision of electricity at affordable prices to improve the rural household energy situation and to attract entrepreneurial activity in rural areas (see Chapter 4 for details);
- Increasing accessibility to and affordability of sustainable energy in rural areas;
- Security of energy supply;
- Integrating provision of appropriate energy services into wider development programmes and improving co-operation between agencies involved in rural development;
- The effects and impacts of deforestation and providing a wide range of energy options so as to reduce pressure on indigenous forest resources;
- Strengthening efforts aimed at empowering women;
- Stimulating energy savings and energy efficiency practices in households;
- Implementation of a proper resettlement strategy;
- Ensuring that rural energy programmes are planned and implemented in a fully participatory manner; and
- Ensuring the supply of energy services to peri-urban areas.

2.5.3 Rural households

About 77% of the total population, equivalent to about 114,000 households, live in rural areas (1997 census). Data on energy use in rural areas is limited and discontinuous. It is known however, that most energy in rural areas is used for household purposes, predominantly in cooking. Generally in the rural areas, gender is an important issue,

nsible for not only the cooking and heating in
l, often over long distances. Energy issues
ajority of the female population.

Traditional fuels, firewood in particular, are still dominant in cooking and heating in rural areas. Based on a forestry inventory carried out in 1999, it is estimated that the indigenous forest area of Swaziland is 652,000 ha while the commercial forest area is 136,700 ha indicating a total forest cover of about 45% of the total land cover. The indigenous forest cover is dwindling and this is being felt by rural households in some areas who often have to travel long distances for their wood fuel needs. It is estimated that in 1999, the annual consumption of wood fuel in rural areas was 347,000 tonnes (Energy Balance 1999). This demand outstrips supply and is a threat to the sustainability of the resource. It is however worth noting that there are regional differences between sources of wood fuel in Swaziland, enhancing local shortages and surpluses.

Previous Government interventions have concentrated on supply side measures, specifically encouraging the planting of trees for firewood purposes. This intervention produced mixed results but generated numerous lessons, which could benefit future initiatives.

Transitions to other energy carriers has not been satisfactory. Only about 5 % of households have access to electricity (see Chapter 4 on Rural Electrification). It estimated that 30% use paraffin and 10% use LPG, for cooking. The main constraints have been the low incomes of the rural populations as well as inadequate distribution systems of these carriers in rural areas. Although the use of renewable energy technologies, primarily solar PV systems is still minimal, it has been increasing steadily over the past years.

2.5.3.1 Rural wood fuel supply

Since wood fuel will continue to be the dominant energy resource in rural areas in the foreseeable future, means to replant trees and ensure a security of supply should form part of a broader sustainable forest management strategy.

Government will ensure the participatory establishment of multipurpose woodlots and individual tree growing so as to increase rural wood fuel supply.

However, it is noted that wood fuel is just one of the many end-uses of trees and as such the goals of woodlot projects should be wider than just provision of wood fuel. Additionally, emphasis should be placed on participatory sustainable forest management in order to build support from local communities.

Communities will be encouraged to establish communal and individual multipurpose woodlots located closer to areas of consumption. Other methods of establishing woodlots will be investigated and promoted. The establishment of individual woodlots will be promoted, as the ownership is clear from the onset.

ation

a difference in the long term. Shorter term cies of the use of wood, particularly in households need to be explored. Most wood and biomass fuels are used in open fires with tripods and three legged pots. This system has a poor conversion efficiency. In higher income households, wood is burned in heavy iron coal stoves. These stoves are inappropriate for firewood and most have even lower conversion efficiencies than a three-legged pot on an open fire. There is a need for further demonstration and research on improved wood fuel stoves that could be suitable for and acceptable to rural communities.

It is now general knowledge that promotion of improved wood fuel stoves alone is insufficient in relieving pressure on wood resources. Therefore action in this area will include other objectives such as the reduction of indoor pollution, reduction of the financial costs of cooking and enhancement of convenience.

Government will promote the development and dissemination of improved cooking technology as part of a wider strategy on the reduction of wood fuel consumption.

Lessons learned locally and from other parts of the world will be reviewed and taken into account. Stakeholders will be exposed to a variety of appropriate technologies before choices are made. Environmentally friendly and energy efficient appropriate technologies will be promoted. Standards will be developed in order to adopt appropriate and safe equipment in the country.

2.5.3.3 Fuel substitution

Encouraging substitution of wood for other energy carriers could help to relieve pressure on forests as well as the burden of wood fuel scarcity on women. The major available options are paraffin, LPG, electricity, coal, biogas and solar cookers.

Best means of availing suitable alternatives to wood fuel, such as LPG, paraffin, electricity, wood fuel briquettes and solar cookers will be advocated.

Fuel substitution has technological and cost implications. Appropriate equipment such as higher quality paraffin stoves and solar stoves may not be easily affordable to low-income households. Close co-operation between Government and the private sector is crucial

Government will encourage the establishment of demonstration projects to show the different technologies, which could be adopted. This effort will assist in the promotion of the acceptable technologies in order to ensure access to appropriate services in rural areas. Energy savings practices will also be demonstrated and promoted for use in rural households.

e selection and use of energy options in
en are fully involved in the decision making
nership and control.

2.5.3.4 Co-operation in rural development

Numerous development projects and programmes are always in progress at any one time in the rural areas. In some instances different agencies plan and implement projects without consulting other agencies with a potential interest in the areas concerned. While duplication is not always harmful, it is often not the best way of utilising scarce resources. Co-operation and dialogue among institutions such as Government, NGOs, communities and donor agencies needs to be enhanced so as to realise the full benefits of programmes aimed at rural areas. On the other hand it is recognised that provision of energy alone cannot solve rural problems but that energy can play a significant part within broader development programmes.

Government will ensure meaningful integration of energy within broader rural development interventions through forging dialogue and co-ordination among agencies and communities involved.

It is recognised that it is difficult to provide energy services in rural areas due to the dispersed nature of settlements. Government, through the National Resettlement Policy will promote resettlement to facilitate cost-effective infrastructure development.

The financing of schemes to increase access to energy is crucial for uplifting the quality of life for rural households.

Government will encourage the use of credit schemes for energy projects for rural households.

2.5.3.5 Knowledge transfer and information dissemination

Education and knowledge transfer is a key instrument for improving the quality of energy services in rural areas. Rural communities require information and education on alternative energy technology options, new technology options, limitations, costs and operational know-how.

National awareness raising programmes and action strategies aimed at improving education and information dissemination on energy technology options, costs and technical know-how will be developed and implemented.

Government extension workers, NGOs, CBOs and community leaders will form a cornerstone of a strategy to implement this policy. Once energy supplies are improved, Government will promote the use of energy efficient equipment and raise awareness on energy saving methods.

an areas are those defined in the Urban
s associated with large companies, so called company towns. Urban energy requirements consist mainly of the commerce and services sector as well as the household sector. About 23% of the total population and the equivalent of approximately 58,700 households live in urban areas (1997 census). In major urban areas and company towns, an estimated 40 ï 50 % of households use electricity. Paraffin and LPG are used extensively as cooking fuels for lower income households. Wood fuel is a minor and declining fuel in urban centres, and is used for both cooking and for space heating. Distribution of energy to households, primarily coal and LPG in company town still persists. There are however, indications that LPG and electricity are gradually displacing coal in company towns.

Electricity is the most preferred energy carrier for end-users in urban areas. Frequent power cuts especially under severe weather conditions are the major concern of households. The tariff system, which allows cross-subsidies between consumer categories, results in relatively low electricity prices for households. However, this is still unaffordable to many households.

2.5.4.1 Grid electricity

Electricity is the energy carrier of choice for routine household chores. Electric cooking, though not the most efficient in terms of energy use, is convenient and relatively safe. Electric lighting can improve the standard of living and assist education and income generating activities etc. Most gadgets and equipment around the households are designed to be powered by electricity. Therefore, access and reliability of the electricity service is a key factor in raising the standard of living for urban households.

The electric power system in urban areas will be upgraded and maintained in order to deliver a quality and reliable service to urban households.

Innovative means of improving service delivery to urban areas will be developed. Such innovative means could include easier and quicker methods for reporting and responding to faults; convenient payment arrangements; and methods to improve system integrity.

Government will encourage utilities and service providers to increase connectivity of urban households.

The actual provision of electricity and the attraction of new consumers is the domain of utilities and service providers. In urban areas, increasing the number of connections will benefit the utilities and service providers, subsequently increasing the economies of scale of their operations.

2.5.4.2 Energy savings and energy efficiency in urban households

Rational use of energy and cultivation of a culture for energy conservation in households has not received sufficient attention. Many households are not aware of the cost saving

efficient appliances and how to differentiate
re also low cost energy saving opportunities
improvement of the thermal performance of
ogrammes suitable for both low-income and higher income households to stimulate energy conservation.

Demonstration programmes can form a key element in the implementation of energy savings and conservation. Co-operation with energy service providers is necessary for sustainability of this effort.

An awareness creation programme and action strategy aimed at improving energy savings and conservation in urban households will be developed and promoted.

Many of these strategies under urban households will also apply to rural households.

2.5.5 Peri-urban energy

The term ñperi-urbanò in this document refers to areas outside formal urban boundaries and jurisdictions, which are in the process of urbanisation. These areas are characterised by high population density; fast and unplanned growth resulting in, amongst others, poor health and environmental conditions; poor service infrastructure; lower income levels; unclear jurisdiction in matters of planning, land tenure and land transfer and fluid boundaries. Furthermore, people in peri-urban areas are reluctant to invest due to insecurity of land and property ownership. This includes investing in energy services.

The energy needs of peri-urban areas are to an extent a hybrid between those of rural and urban areas and are the least understood. Paraffin plays a more significant role in energy provision but there is a gradual transition to LPG and electricity. Bottlenecks in the transition to electricity use are the relatively high connection costs, wiring costs, appliance costs and the general insecurity of ownership.

The energy needs and characteristics of peri-urban areas will be examined and the means of improving access to appropriate energy services will be determined and applied.

3.1 Coal

3.1.1 Overview

Coal is the only naturally occurring fossil fuel in the country. The coal reserves, defined as ñrun-of- mineò reserves, amount to 207.6 million tonnes, while the probable and potential reserves are estimated to be at least 1 billion tonnes. Swaziland therefore holds large resources that are untapped.

At present the Maloma Colliery is the only operating mine. Maloma exports all of its production, which fluctuates considerably due to market conditions. In 2000, the production was 228,000 tonnes compared to the 1998 level of 410,000 tonnes. Another mine, EmaSwati Coal Mine based at Mpaka, was closed mainly due to the low international coal prices around 1990-1992. Other potential mining areas are at Mhlume, Hlane, Lubhuku, St Philips and Mpaka Area 3.

The coal reserves consist of semi-anthracite and anthracite coal, which have a high energy content and low content of volatiles and sulphur. While anthracitic coal can be used for power generation, it is presently more valuable if sold for industrial purposes. Domestic anthracitic coal is therefore exported for use in the metallurgical and cement industries, while cheaper bituminous coal is imported from South Africa for use as a fuel. In 1999, imported bituminous coal amounted to 243,000 tonnes.

While the anthracitic coal has good characteristics for use in the metallurgical industry, when used as a fuel it has some limitations, such as poor ignition characteristics and clinkerisation of ash. The most appropriate indigenous coal that could be used in industry, as well as for power generation, is semi-anthracite, which constitutes the greater part of the national coal reserves. However, both the anthracite and semi-anthracite coals would require retrofits to boilers, stoves etc if they were to be used locally.

Most of the bituminous coal imported from South Africa is used in the sugar and pulp industries and to a lesser degree in households. In some cases coal is used for combined heat and power generation within the industries. Import of coal is mainly done directly by the industries.

While the export of the indigenous coal is beneficial to the overall economy of Swaziland, there is a need to review its use for energy purposes within the country. This would have advantages with regard to employment, particularly in the mining sector, security of energy supply and establishing a local market to sustain the mines. Domestic anthracitic coal is also less polluting than imported bituminous coal in terms of sulphur emissions. However, coal is one of the most polluting fuels with high emissions of CO_2. There are therefore both advantages and disadvantages regarding the increased use of coal. The benefits of coal use must therefore be weighed against the global and local

rtant question is national security of energy
ntensified use of indigenous coal it must be
le and will continue to be in the longer term.

Local coal could potentially be used for the following industrial purposes: gasification plant fuel, cement and ceramics kiln fuel, thermal power generation fuel, in the manufacture of carbides and electrodes, and as a reductant in the ferro-alloy industry. Such industries are not yet present in Swaziland. For household purposes it should be noted that coal used indoors can cause health problems and local environmental problems. However, the local anthracitic coal is a low smoke fuel compared to imported low quality bituminous coal and therefore not as damaging to both health and the local environment.

The lack of a Mining Policy in Swaziland in the past has been a hindrance in the development of the mining industry in general. Once the Mining Policy is in place, there may be some interesting possibilities for an increased use of Swazilandôs coal resources. However, these must be weighed carefully against the drawbacks, which include health considerations, global and local environmental effects and costs.

3.1.2 Main issues

From an energy point of view, the key policy issues in this sector include the need to:

- Establish the real costs and benefits of expanded coal use in the country and if feasible, ensure a conducive and enabling environment so as to encourage development and investment in the coal industry in Swaziland;
- Ensure that the environmental damage resulting from the use of coal is monitored and kept to a minimum;
- Maximise skills and expertise from returning employees in the coal mining industry; and
- Improve production in local coal mines.

3.1.3 Substituting imported coal for indigenous coal

Use of indigenous anthracite and semi-anthracite coal could enhance energy security of supply, benefit balance of payments and reduce local pollution. However, indigenous coal is more expensive and requires investment in retrofitting of boilers, stoves etc. If such equipment can be produced in Swaziland this may also benefit local employment in the manufacturing industry and the use of returning minersô expertise and skills in increasing coal mining operations.

Government will conduct a cost-benefit analysis regarding increased use of indigenous coal in the industry and households taking due consideration of the environmental and health consequences.

The use of clean coal technologies will in particular be assessed by all stakeholders involved in the utilisation of coal.

l-fired thermal power station in

South Africa at a relatively low unit price, making indigenous electricity generation less favourable from a purely economical point of view. However, the present surplus of generating capacity in South Africa is expected to diminish in the coming years. In the medium term, import prices for electricity may increase significantly, thereby making local power generation more attractive. The establishment of a power station may also allow Swaziland to be an active player in the SAPP with the potential to sell power in the regional market. The 400kV line and electricity network strengthening has made it possible to import and export electricity within the SADC region.

A number of feasibility studies have been carried out by the private sector regarding the establishment of a coal-fired thermal power station. However, these studies focused on commercial and financial interests rather than the social, economic and environmental interests of the country.

A feasibility study on the establishment of a coal-fired thermal power station will be conducted.

This study shall include strategic considerations such as increased security of supply and the question of mining semi-anthracite coal from the now closed coal mine and from other potential sites. This study shall also assess the environmental and social aspects and the involvement of locals in the mining industry. Government, in co-operation with the private sector, could jointly conduct the study.

3.1.5 Potential for coal-bed methane

There are no known coal-bed methane reserves in Swaziland but there may be need for further investigation to ascertain if such additional energy resources could be available. A barrier for such an investigation is the costs involved.

The resource potential for coal-bed methane and its use for energy purposes will be investigated.

3.1.6 Pricing and taxation of coal

Currently, prices are not regulated and there are neither incentives nor levies or extra taxation for using coal for energy purposes. Pricing mechanisms , if developed, could be powerful instruments used to support policies on the use of coal and the type of coal used.

Government will investigate the appropriateness of various pricing incentives and taxation so as to encourage the use of clean coal technologies.

Studies on the potential uses of local coal may facilitate the implementation of policies. Means of implementing this policy could include approaches such as stimulating

l technologies is rewarded and regulations tricted.

sation

Since Swazilandôs known resources of coal could cover more than 500 years of production, the need for future coal supply and present consumption are not in conflict.

Government will facilitate sustainable and expedient utilisation of the coal resources by private sector interests, in line with sustainable human development goals articulated in the NDS.

There is a need to provide a conducive environment for investments in coal mining and the establishment of coal based local enterprises. The Mining Policy will address these concerns and hence make it easier for prospective investors to undertake mining operations. Local coal mines will be encouraged to increase production, especially for export. In addition, it is necessary to keep an up-to-date data system to monitor the coal resources.

3.2 Petroleum products

3.2.1 Overview

Swaziland holds no known reserves of oil. All petroleum products are imported from the Republic of South Africa through five international oil companies: Shell, BP, Engen, Total and Caltex. The petroleum products are imported via rail and road and in most cases distributed from the storage depots in Matsapha. Presently, there are two main suppliers of LPG and a number of suppliers of lubricating oils.

The Government considers the supply of petroleum products to be of strategic importance. Therefore prices of petrol, diesel and illuminating paraffin are subject to regulation. Petrol and diesel are significant inputs in the production process and are a livelihood for many local businesses in public transportation. The price of illuminating paraffin on the other hand is monitored because it is a fuel for low-income groups. The market sets prices of the other petroleum products such as lubricating oil, jet fuel, heavy fuel oil and LPG. The price of LPG is at present not regulated even though mainly low-income households use it.

With regard to pricing of petroleum products the global trend is to leave the pricing to market forces. For Swaziland the situation is that all petroleum products are presently imported from South Africa where there is a regulation of product prices. The In-Land-Bonded-Cost (IBLC) of the product to the port of Durban, deemed to be purchased from Bahrain and Singapore, influences the cost of landed fuel at Matsapha (import parity).

Additionally, Government imposes the following taxes and levies: Fuel Tax, Sales Tax, Customs and Excise Duty, Fuel Oil Levy and MVA (third party insurance). The profit

costs related to handling, transportation and iving the retail price at the pump. The main nternational oil prices and the exchange rate pricing model (IBLC) is used in all SACU Member Countries.

The Ministry monitors international pricing conditions as well as each productôs slate position on a monthly basis. Proposals for changes in the prices of regulated products are discussed and recommended by the Fuel Pricing Committee. The Committee comprises representatives from Government Ministries, the petroleum sector and consumer interests. The Fuel Price Controller, in consultation with the Minister for Natural Resources and Energy, approves prices based on the Committeeôs recommendations. One of the roles of the Ministry is to protect the interests of consumers and to ensure access to affordable petroleum products.

The number of retail stations is controlled through the Petrol Rationalisation Committee. The committee has the objective of controlling the number of retail outlets so as to maintain economic viability in the industry while also encouraging high service standards for the consumer and public. The committee achieves its role through a Service Station Rationalisation Plan (RATPLAN), which is a five-year-plan. The RATPLAN is not a legal document but an agreement amongst the five companies and Government on the sharing and location of sites and the number of retail outlets.

The Ministry will embark on the process of updating, amending and consolidating existing pieces of legislation on petroleum to produce an all-embracing and comprehensive Petroleum Act. Relevant legislation includes the Fuel Oil levy Act of 1980, the Price Control Order of 1973, and the Petroleum legislation of 1959. In addition, a draft bill has also been completed, to establish an Energy Regulatory Authority primarily for the electricity sector. However, it is intended that regulation of the petroleum sector will be incorporated at a later date.

Security of supply especially for petroleum products continues to be a problem. Current petroleum fuel storage capacity stands on average at 5-7 days. This is considered to be very low compared to other countries and a cause for concern because Swaziland, as a landlocked country, has few alternative options in case of major supply disruptions, which could for example be as a result of accidents in refineries, natural disasters etc.

In 1990, the Ministry embarked on a prefeasibility study concerning strategic fuel depots and a feasibility study on ethanol blending using the molasses from the three sugar mills in the country. There is therefore a need to conduct studies that will investigate the viability of establishing strategic stocks for the country, including the site, size and organisational structure. The possibilities for blending petrol with ethanol or other biofuels also needs to be investigated.

There are large natural gas resources in the region that have been discovered and are being exploited. The Ministry, through regional and international forums, will explore

energy resource for the diversification of

The challenges for the petroleum sector include the following:

- Regulation of the petroleum industry;
- Ensuring adequate product availability in rural areas while not undermining the oil industryôs economic competitiveness;
- Ensuring stable and reliable product availability for the countryôs various economic sectors;
- Achieving regional competitiveness and fair pricing of petroleum fuels;
- Encouraging meaningful and sustainable participation of locals in the industry;
- Ensuring that jobs, particularly on the forecourts, are not jeopardised and that new jobs are created; and
- Ensuring adequate commercial storage of petroleum products.

3.2.3 Regulation of the petroleum industry

The Government regulates the petroleum industry in the country, i.e. petrols, diesel and paraffin. All companies importing and distributing petroleum products must be registered with the Ministry. The retailing of petroleum products is regulated through the RATPLAN. Pricing is regulated using the SACU In-Bond-Landed-Cost (IBLC) model.

Swazilandôs petroleum market is closely linked to SACU, which implements the system of regulating petroleum product prices according to the IBLC formula. This formula is undergoing review in order to make it relevant for todayôs trading environments as well as to improve its transparency.

Price regulation shall be maintained in the short term and will be subject to review so as to ascertain its appropriateness and relevance in the longer term.

Government will closely monitor the oil market and pricing issues in practice and evaluate the need for revised regulation of the petroleum product prices. The procedures for price regulation will be reviewed in the proposed Petroleum Act. In the longer term the liberalisation of the petroleum market will be considered subject to regional developments. The Government, in collaboration with the Oil Industry and SACU and/or SADC Member States, will also strive to work towards a pricing mechanism that reflects the true costs of importing products into the country. Meanwhile the Government will consider if regulation of oil prices shall only apply to the wholesale prices and let the local market determine the retail prices.

Government will investigate deregulation options in the medium to long term.

The regulatory framework will be monitored and reviewed on a regular basis or in the event of a significant development in the regional or international environment.

of other petroleum products. The regime of to be taken into account.

The Ministry is presently the regulator of petroleum prices, however the regulatory function may be transferred to the proposed Energy Regulatory Authority (ERA) at a future date.

3.2.4 Marketing and distribution

The Service Station Rationalisation Plan (RATPLAN) intends to secure availability of oil products around Swaziland by regulating the number of outlets while taking economic development of the oil industry into consideration.

Regulation of service stations and fuel outlets by means of the Rationalisation Plan will be maintained, and modifications to the Plan will be effected every five years.

For effectiveness of the RATPLAN, Government will ensure that newcomers in the market also comply. In future, trading licenses for petroleum wholesale and retail should be obtained from the Ministry of Natural Resources and Energy in order to improve governance of the sector. This will be reflected in the proposed Petroleum Act, including legalising the RATPLAN. In the meantime, closer co-ordination between the Ministry of Enterprise and Employment and the Ministry when issuing licenses for petroleum marketing is necessary.

Since access to modern energy services in rural areas is one of the key objectives of the energy policy, means to improve supply and distribution of petroleum products in rural areas should be investigated.

Government in collaboration with the oil industry (including LPG suppliers) will develop effective means of ensuring adequate access to petroleum products.

Government will work closely with local businesses involved in the petroleum industry especially the dealer councils and associations.

3.2.5 Commercial fuel storage facilities

The oil industryôs storage facilities are located in Matsapha. Normally the storage holds supply for 5-7 days of operations, while dealers hold 2-3 days of supply. At present there are limited possibilities to expand the storage facilities in Matsapha. These stocks are maintained to secure smooth operation of the supply chain under normal circumstances. In case of major disruptions in the oil supplies, these stocks may not be adequate. This is a critical issue because, being a landlocked country, Swaziland has few alternative supply routes for fuel in case of supply problems.

Government will require commercial companies to store a minimum quantity of stocks to ensure fuel availability.

l in collaboration with the oil industry taking

3.2.6 Procurement

Procurement of oil products for commercial use is a natural part of the industryôs activities, which may be best taken care of by the companies in the market. Governmentôs interests are in ensuring good product quality so as to protect local consumers and also encouraging diversity of product sourcing.

Government will put in place quality control measures that will ensure that marketers of oil products adhere to agreed product specifications - including environmental considerations - and that these conform to regional and/or international standards.

Government needs to carefully consider in the future investigating means and ways to participate and get involved in the procurement of this product. This could be done in the most cost-effective manner in partnership with one of the players in the industry.

Government will ensure diversification of the sources of petroleum products imported into the country so as to enhance security of supply as well take advantage of competitively priced fuels available in the international markets.

The establishment of a refinery has also been debated on several occasions; however the size of the local market and the logistical problems in exporting from the refinery, as well as the huge investment costs do not favour such an idea at present. However, in the medium to long term, the establishment of a refinery may be an option and this position will be reviewed when the need arises.

3.2.7 Involvement of locals

Today, all oil companies are foreign international companies trading as local companies. More local involvement in the industry could be achieved through the development of programmes to assist interested locals in entering the market. Other opportunities include increased involvement of locals in providing services to the industry such as the maintenance of dispensing and other technical systems.

Government will ensure the oil industry increases the involvement of locals.

Government is also considering the establishment of a national oil company responsible for the strategic stockholding, in co-operation with the oil industry.

3.2.8 Use of indigenous biofuels

There are some plants that can be grown specifically for oil extraction to use a biofuel, e.g. maize. rape seed, sunflower seed, jathropa cursas, and euphorbia. Some of the oils can directly substitute petroleum fuels like paraffin and diesel, although blending with other fuels is the predominant method of using biofuels. It is technically feasible to

t of sugar manufacturing. There are presently
nol from molasses.

roleum; but it must be ensured that the petrol meets the required specifications for the countryôs vehicles. The use of ethanol will have positive environmental effects and also benefit the balance of payments and economic development in the industries concerned. Ethanol blending with petroleum takes place in some countries and many of the technological problems have been resolved. The commercial introduction of this option in the local market is therefore the main issue.

Government will conduct further investigations on blending ethanol with petrol with a focus on introducing products in the local markets.

It is envisaged that a small-scale demonstration project will be commissioned in consultation with vehicle dealers and the oil industry, before embarking on a full-scale scheme, if this option is found appropriate.

3.2.9 Pricing and distribution of Liquefied Petroleum Gas (LPG)

The LPG market is not regulated, as is the case for other petroleum products; and the suppliers and dealers are not part of any stakeholder group. The price for LPG varies considerably across the country. It is to a high degree used in the urban and peri-urban areas by low and middle income households; the distribution to remote areas is costly.

Government will monitor pricing of LPG products more closely and will facilitate a closer dialogue between herself, suppliers and dealers.

The need for price regulation of LPG will be investigated. Government will also ensure the distribution of information on the safe use of LPG.

3.3 Electricity

3.3.1 Overview

Electricity supply and use is one of the most important themes within the energy sector in Swaziland. The organisational infrastructure, the technical performance, and delivery mechanism are just a few of the challenges the sector faces.

The mission for the Swaziland electricity supply industry is to provide affordable and accessible electricity to meet social and economic needs, in a financially and environmentally sustainable manner, while optimising the use of national energy and infrastructure resources.

The global trend is liberalisation of the electricity sector. The objectives of this liberalisation are that electricity should be produced more efficiently and traded in

er tariffs. New investments and new players situation puts specific emphasis on how the ting utilities shall be reorganised in order to ed competition.

Swazilandôs electricity supply is to a high degree dependent on imported electricity from South Africa. This is a cause for concern with regard to security of supply since almost all supplies come from one source. Increased utilisation of local energy resources ï hydro, coal, biomass, solar and wind - could alleviate this problem. However, the situation today is that electricity imports are relatively cheap due to excess capacity in the region. Therefore new technologies may seem uneconomic in the shorter term. In the longer term the regional excess capacity is expected to diminish and imports prices may therefore increase making other supply alternatives more attractive.

Also, Swaziland faces challenges regarding the security, reliability and quality of supplies as the local electricity supply often experiences power cuts. This is a consequence of a combination of poor weather conditions with excessive lightening and a weak power grid with little reserve capacity. The country has for a long time been supplied from three 132 kV lines. The integration of the 400 kV transmission line will now improve the power supply situation.

Another important question is the extension of electricity supply. Only about 20% of the population are connected to the grid and there is a huge gap between the urban and rural households with regard to connection. On average 40-50% of urban households are connected, whereas in rural areas only about 5% of the households are connected. Access to electricity is considered an important part of the standard and quality of life and alleviation of poverty. Social and economic consequences of extended supply must therefore be carefully considered and evaluated against each other.

Further extension of the electricity supply is not only a technical problem. The major problem is that extending the grid into sparsely populated areas is uneconomic from the utilities point of view, because the electricity consumption is too low compared to the grid extension and maintenance costs.

In 1999 electricity counted for 10% of Swazilandôs total energy consumption. Of the total electricity consumption of 988 GWh, 15% is consumed by the households, 14% by the agricultural sector while industry, commerce and services account for 71%. Most of the electricity consumed in industry can be attributed to a small number of large companies.

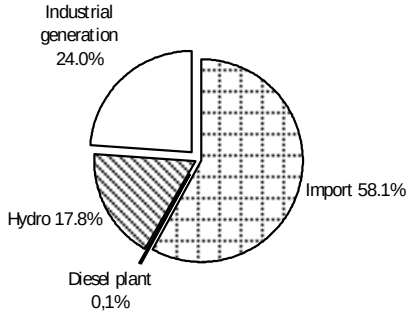
The Government owned Swaziland Electricity Board (SEB) has monopoly on the import, distribution and supply of electricity through the national grid. SEB operates according to the Electricity Act of 1963 and the Public Enterprises (Control and Monitoring) Act of 1989.

In addition to the electricity supplied from SEB, some of the major industries produce electricity for their own industrial consumption and for their company towns. These

d but do not sell the generated electricity to

y supply in Swaziland in 1999 amounted to 1,100 GWh. Of this 639 GWh (58.1%) was imported from South Africa by SEB. 196 GWh (17.8%) was produced from domestic hydro power plants, mainly operated by SEB. SEB also produced 1.4 GWh (0.1%) from their diesel generator. The industries produced 264 GWh (24.0%).

Figure 8: Total electricity supply, 1999 (1,100 GWh)



In the National Development Strategy it is stated that future options for the development of the Swaziland electricity supply industry shall be identified and options for competition and private sector participation shall be investigated.

Swaziland is a party to the SADC Protocol on Energy of 1996 and a member of the Southern African Power Pool (SAPP). The SAPP enables SEB to trade freely within the Power Pool with respect to purchase of bulk power and energy.

The SADC Energy Protocol states that the members of SADC shall strive towards an integrated power system that would be productively used and optimally managed in an environmentally sound manner.

The protocol sets forth the following guidelines for regional integration and co-operation: electricity trading and power pooling shall be promoted within the SAPP; integrated resource planning in the electricity sector shall be promoted; a regional electricity master plan shall be developed; and common regional standards, rules and procedures relevant to generation, transmission and distribution of electricity shall be promoted, particularly in areas where the region holds a comparative advantage.

The electricity infrastructure shall be developed and utilised in an environmentally sound manner, and electricity projects shall be subject to environmental impact assessments in conformity with agreed standards. Universal and affordable service to all citizens and the importance of quality customer service in national electricity policies shall be emphasised.

g Swazilandôs electricity sector. These may include:

- The globalisation trend in the world towards liberalising energy markets with consequences on ownership, re-organisation and investment;
- Ensuring reliability and quality of power supplies;
- Inefficiencies in the Electricity Supply Industry;
- Introduction of a regulatory framework capable of securing a market oriented electricity supply industry, which at the same time attracts new players and investments;
- Increased use of indigenous energy resources for electricity generation, thereby contributing to the security of supply;
- Securing development of the sector in an environmentally sustainable manner;
- Ensuring continuing increase of quality and reliability of electricity supply;
- Affordability of electricity supply for consumers;
- Increasing access of electricity throughout the country; and
- Increasing cost reflectivity and transparency of electricity tariffs.

3.3.3 Restructuring of the Electricity Supply Industry (ESI)

As in many countries in the region, the ESI in Swaziland is undergoing major reforms that intend to liberalise the industry and allow more effective private sector participation.

Presently, the legislation and regulation of the Swaziland ESI is based on the 1963 Electricity Act. This Act is considered amongst all parties to be outdated and not reflective of recent developments in the ESI. Governmentôs objectives for the ESI, among others, are to:

- Improve quality and reliability of supply;
- Facilitate economic development by increasing access;
- Attract/ facilitate private sector involvement in the ESI;
- Mobilise finance;
- Increase commercialisation/customer orientation in the ESI;
- Reform the legal and regulatory framework;
- Improve ease of connection and reduce costs;
- Increase public acceptability;
- Enhance security of supply; and
- Ensure consistency with international trends.

In March 1998, Cabinet made a decision to corporatise the utility and establish an independent regulatory authority. The aim of the restructuring process is to facilitate the commercialisation of the ESI through a new legal framework and regulatory reform. This will allow private participation and third party access, enable the monitoring of performance and allow reform and transparency in pricing. In this context corporatisation

ental parastatal to a company operating under

of the 1963 Electricity Act was undertaken and new Electricity and Energy Regulatory Authority Bills will be in place in the short term. The legal status of SEB will evolve in stages in line with Governmentôs Privatisation Policy. The initial corporasitation will not affect the ownership, as the new company will remain fully owned by Government. An independent Energy Regulatory Authority, once in place, will be responsible for the monitoring and controlling of the industry and the issuing of licences. In the initial stages, it will regulate the electricity industry; in the future its mandate will be expected to cover the whole energy sector. Realising that Swaziland is a small country, steps would be undertaken to ensure that, before the electricity market is unbundled, the market will be developed to sustain itself and to make sure that the energy supply is not neglected.

Government will continue with the present restructuring process and will investigate the various commercialisation opportunities for the electricity supply industry.

A timetable for restructuring will be put in place in the short term, with clear objectives and targets and procedures for review and monitoring. Through the restructuring of the electricity supply industry Government will ease the way for attracting investments to the power sector. This process will also identify opportunities for the involvement and empowerment of locals.

3.3.4 Electricity infrastructure

Prior to 2000, electricity was imported from South Africa through three 132 kV lines with a total capacity of 96 MW. Subsequently a 400 kV transmission line between Mozambique and South Africa through Swaziland has been established, adding 250MW to the capacity. Although the 400 kV line was built with the intention of supplying power from Eskom to an aluminium smelter in Maputo, it also contributes to Swazilandôs security of supply, as SEB is tapping power from the line.

The integration of the 400 kV line into the national grid will improve the quality of supply to industry. Power outages within this sector, even for a short period, can result in huge losses of production. This situation is improving as a result of the ongoing system-strengthening programme. Later on this improvement will also be realised in households once the system integration project is finalised and further upgrading of the national grid has taken place.

The Government has also been encouraging the development of industrial areas in selected areas outside the Manzini-Mbabane corridor. It is necessary that the electricity infrastructure be geared to support this objective.

Government will continue to facilitate improvement of the electricity supply infrastructure and thus improve the energy supply service.

al sector as part of the overall strategy for

3.3.5 Production

In 1999, the domestic electricity production amounted to 460 GWh. SEB produced 190 GWh from the hydropower plants at Edwaleni, Ezulwini, Maguduza and Mbabane. A privately owned hydro plant also produced 6 GWh, and SEB produced 1.4 GWh from their diesel unit. Installed capacity of the SEB hydro plants is 41 MW and the diesel units add 9.5 MW.

The remaining electricity production came from independent producers, mainly from the major industries Ubombo, Mhlume and Simunye sugar mills and the pulp industry. Together these four companies produced 264 GWh, 27% of the electricity consumed in Swaziland, thus contributing considerably to the overall supply.

For the sugar mills the electricity produced is mainly based on bagasse and coal. The pulp industry utilises black liquor, a by-product in the pulp production process, together with wood waste and bark. All electricity produced is co-generated with steam for industrial processes, and is used for their own industrial purposes and for supply to the nearby company towns. At present there are no arrangements for selling self-generated electricity to the grid, but this will in future be facilitated with the coming of new legislation for the sector.

The restructuring of the electricity supply industry will also facilitate access to the market for third party producers by creating a level playing field and as such pave the way for increased security of supply. An important feature within the production sector could also be the utilisation of domestic coal in power production as dealt with under Section 3.1 on Coal.

Government will ensure there are clear guidelines for opening access to the national grid.

Increased utilisation of indigenous energy resources for electricity will improve security of supply, create job-opportunities and stimulate the economic growth. Due to the relatively low import prices at present these opportunities are more relevant in the medium term.

Government will carry out investigations and promote efficient and environmentally sound technologies for the utilisation of indigenous resources for electricity production.

3.3.6 Hydro potential, wind and solar energy

As mentioned above, SEB produces the major part of hydro-based electricity in Swaziland. SEBôs hydro-based installed capacity is 40.5 MW.

aguga Dam. The Maguga power plant could,
9 MW in peak periods.

plants particularly in the scale of less than 1MW, which might be suitable for local off-grid solutions possibly in combination with other stand-alone technologies.

Electricity generation from solar photovoltaic is increasingly gaining ground in many countries. Some of these systems are grid connected and can be integrated into facades of buildings. The costs however, remain very high compared to traditional electricity technologies. But the costs are decreasing and for the time being, solar photovoltaic is a realistic alternative to supply isolated areas with distances too long and costly for the normal grid.

World wide, wind electricity generation has been growing rapidly in recent years. In many cases wind turbines provide a significant input to traditional energy sources and are becoming increasingly economically attractive. The competitive situation of wind energy is dependent on the wind conditions and the alternative supply costs.

Activities are being carried out in Swaziland to gain further information on the solar and wind resources to help evaluate their economical viability.

These renewable energy resources are necessary from an environmental and security point of view. However, economically these technologies must be able to compete with traditional energy sources, which for the time being are relatively cheap in Swaziland, otherwise they will have to be subsidised. Swazilandôs economic situation may not favour large scale subsidies, however direct subsidies alongside other ways to support the development of renewable energy sources, will be required.

The Kyoto Protocol, and the subsequently developed instruments for investments in cleaner energy options, may support the establishment of such systems in Swaziland and thereby subsidise the sector. Indirectly, investments in clean technology systems in Swaziland will reduce the need for coal based electricity produced in other countries and be beneficial both to the regional and global climate.

Renewable energy solutions and other IPP technologies can also be supported by Public Service Obligations (PSO), which is a levy imposed on the users of an electricity grid. Such provisions are common in other liberalised electricity markets. The initiatives on restructuring the electricity sector are also a possibility to create an environment to facilitate the entry of new technologies into the supply system.

Government will support programmes promoting the utilisation of renewable energy resources for electricity production.

Government will establish and support demonstration plants aimed at promoting the utilisation of the various technologies.

resource is the generation of heat and power as is also a possibility in the future. In the longer term when waste collection, disposal, and treatment of waste is more developed and the quantities justify it, the possibilities for utilising these resources should be further evaluated.

3.3.7 Independent Power Producers (IPP)

Independent Power Producers (IPPs) refer in general to private firms or other entities that produce energy for sale to the national grid and/or for own purposes. The existing local generators within the sugar and pulp industries could be developed into IPPôs if they also delivered power to the grid. Presently, the installed capacity of independent industrial production plants is approximately 50MW.

These industries may be able to increase their production of electricity in order to be self-sufficient or to sell electricity to the national grid if the playing field is level. The following benefits could be achieved: increased efficiency of energy conversion and use; increased diversity of electricity supplies; job creation; reduction in electricity imports; and a reduction of harmful emissions.

There is a huge potential for the use of indigenous resources in the production of electricity and process heat in Swaziland. The large coal reserves represent the most obvious resource but also bagasse and wood waste could be utilised further. Feasibility studies are being considered on establishment of plants for further utilisation of bagasse.

From the viewpoint of security of supply and local employment, utilisation of these resources is desirable. However, the viability of production of electricity is highly dependent on the prevailing electricity prices in the region, which for the time being are rather low. It is therefore difficult for IPPs to compete with the low import prices SEB obtain from South Africa.

Since the low import prices are caused by an over capacity in South Africa, which is expected to diminish over the coming years, prices in the longer terms are expected to increase and thereby making production from IPP generators more financially viable.

The challenge today for Swaziland is to establish a regulatory framework that enables the establishment of IPPs, but at the same time realising that the establishment of such generators is at present not financially attractive without incentives.

It is possible that development of IPPôs which utilise renewable energy resources can benefit from the international initiatives related to the agreements on the Kyoto Protocol being developed by the UNFCCC. Part of this agreement is to develop mechanisms to support environmental friendly electricity production. The Clean Development Mechanism (CDM) may support IPP solutions, which from a narrow economic point of view are less economically viable. The CDM guidelines are currently being developed.

nment to allow the establishment of IPPs in emented.

in the establishment of IPPs. The licensing procedures for IPPs will ensure the company fulfils specified social responsibilities, as defined by the proposed Energy Regulatory Authority.

The potential for IPPs will regularly be reviewed. An important aspect of this programme will be exploring the potential of utilisation of CDM or similar funds with environmental objectives. A secretariat within the Government will be established to provide information on procedures and developments under the CDM programme.

3.3.8 Tariffs

Electricity prices to consumers differ considerably based on consumption patterns and requirements. However, the price the consumer pays does not necessarily reflect the true costs of supplying the power. Recent tariff studies indicate that domestic consumers pay less than the actual costs of electricity service, whilst commercial and industrial consumers are being overcharged (compared to the costs of supplying them). The electricity tariff in the country is uniform for domestic consumers. However, there is a high cost of servicing rural domestic consumers due to the low number of connections.

The situation, when some consumer groups pay more than others and the differences are not justified in real cost, is referred to as cross-subsidisation. In principle, tariffs with cross subsidies should be avoided and ñtrueò cost reflective tariffs imposed. However, there might be good reasons for some cross subsidies. A special tariff for low-income groups (poverty tariff) would also have some social benefits.

There might also be a need to introduce more flexible tariffs reflecting the regional situation where import prices vary over the day and season. Generally, there is a need that the way tariffs are constructed and their relation to costs should be made fully transparent.

Government will ensure that electricity tariffs are fully transparent and cost-reflective.

There will continue to be a justification for some cross subsidisation for rural consumers. The options for more flexible tariffs (eg smart tariffs, poverty tariffs etc) and cost reflective tariffs will be further investigated.

3.4.1 Overview

Renewable energy resources tap naturally occurring flows of energy to produce electricity, fuel, heat, or a combination of these energy types. Swaziland has several renewable energy resources including biomass, solar energy, and hydro energy.

Commercial biomass energy in the form of bagasse and wood waste is used for heat and electricity production in local industry. The amounts of bagasse and wood waste converted to energy in 1999 were about 1.2 million tonnes and 990,000 tonnes respectively.

Traditionally biomass, especially wood fuel, constitutes about 90 % of the total energy consumed in rural areas. Wood fuel supply, mainly through indigenous forests, is declining due to the unsustainable management of the resource. Many people in rural areas are now facing decreased wood fuel availability across the country. In 1995 (Rural Household Energy Survey), the estimated total wood increment was 317, 000 tons, while the estimated demand was 475, 000 tons, implying a shortage of 158,000 tons. In 1991, the Ministry undertook a countrywide project to demonstrate woodlots for firewood supply. The project had some success in some areas and improved the wood fuel supply situation but it has not been formally evaluated. The Ministry has also been involved in a number of initiatives to promote efficient wood stoves primarily through the private sector

Swazilandôs wind and solar regime is not well documented as limited data is available. However, a long-term resource measurement programme has been established. Five sets of measuring equipment were installed at National Meteorological Services (MET) and Rural Development Area (RDA) sites around the country in early 2001, to ascertain the wind and solar resource status.

Preliminary indications are that annual solar averages are very favourable and lie between 4 to 6 kWh/m^2 per day. The most popular use of solar energy has been in solar photovoltaic (PV) systems. The estimated installed capacity of solar PV is 56 kW peak mainly in private residential systems, telecommunication systems and signalling systems on the railways.

The Ministry has been involved in various initiatives to promote the use of solar energy. From 1992 to 1995, the Ministry established an extensive solar pilot project mainly to electrify clinics and schools. Several street lighting, solar water heating and vaccine refrigeration systems were also installed through the project. The project also installed four solar water-pumping schemes in different regions of the country. The project results indicated that there is sufficient solar irradiation in many areas throughout the country. However, there are certain institutional and technical barriers that need to be overcome in

ect sustainability and performance. Other
d Solar Market Development Project in 1998
Village Project in 1999. In addition to these,
e Harare Declaration on Solar Energy and Sustainable Development, a result of the World Solar Summit of 1996.

There is a need to pay closer attention to the area of passive solar applications, which could have major benefits in building design and in food processing.

Wind resource measurement at 10, 20 and 30 metre levels are in progress and will assist in mapping the wind regime and providing estimates of the wind power potential in the country. Generally in Swaziland, wind speeds are relatively low and grid-connected wind power generation is unlikely to be a major option. However, there could be a potential for micro wind turbines (e.g. for battery charging).

On the other hand, wind pumps have been in use in Swaziland for a number of years by farmers for water pumping and irrigation. This application seems to hold the greatest potential for wind energy in Swaziland, especially since mean speeds slightly below 4m/s could be sufficient for their viable deployment.

Hydro power plants with a total capacity of 40.5 MW are being operated by SEB in various sites in the country. However, the potential for mini or micro hydro plants has not been exploited. A resource assessment of the potential for application of these small plants has been completed and indicates priority areas where a more detailed feasibility should be focused.

The potential for other renewable energy resources such as geothermal and ñbiofuelò crops (except ethanol from molasses) has not been investigated.

If applied appropriately, renewable energy resources are considered to be a very important component of a sustainable energy system and can have the following benefits:

- Reduction of dependency on imported fuels;
- Suitable for small off-grid applications, and can play a significant role in the provision of clean energy to rural and remote areas; and
- Reduction of pollution and emissions associated with conventional energy systems.

The above benefits may necessitate the prioritisation of renewable energy technologies over conventional energy technologies, even when it not the least-cost solution. For example, solar technologies may be given a higher priority than grid electricity or petroleum products.

The Ministry developed a Renewable Energy Action Plan in 1997, indicating a long-term programme for the development of renewable energy. A number of activities in the plan have already been undertaken but there are still activities requiring attention, particularly in the area of biomass energy and quality assurance of renewable energy technologies.

f a wider usage of renewable energy is to be realised. They include the following:

- Lack of knowledge and public awareness on renewable energy. There is a need for dissemination of information and demonstration;
- Difficulty for renewable energy technologies to compete with conventional fuels on a strict cost basis;
- High investment costs compared to conventional energy technologies, and financial issues such as: access to finance, cost of finance and the risk associated with new technologies;
- Lack of relevant institutions with sufficient capacity to promote the use of renewable energy technologies; and
- Lack of a quality assurance framework and appropriate standards.

3.4.3 Renewable Energy Programme

A Renewable Energy Programme and Action, produced in 1997, is outdated, however a number of the activities have not yet been carried out. There are many developments in the area of renewable energy and there is a need to update the action plan. The Renewable Energy Programme should be integrated into the National Energy Policy Implementation Strategy.

3.4.4 Information, awareness and demonstration

Low level of knowledge in the country about renewable energy technology options results in low uptake of these technologies. Options such as wood efficient stoves and solar PV could significantly improve the levels of clean energy services particularly in rural areas. Most of these technologies are technically proven but there is still need for social and adaptation research in order to promote their dissemination. Prioritised technologies will then need to be demonstrated in order to build consumer confidence and increase knowledge. Well prepared information needs to be made available to the public and investors so as to inform, educate and enhance decision making.

Government will develop a renewable energy information programme and will establish and maintain an appropriate renewable energy information system.

There will be a need to collate and enhance existing information and to make this easily accessible to both local and international interests.

Government will support and promote the dissemination of information and demonstration of prioritised renewable energy technologies.

There is need to have a facility where pilot projects can be carried out and tested; known technologies can be demonstrated to the public for educational purposes and awareness.

3.4.5 Financing of renewable energy applications

While renewable energy technologies may be cost-effective from a life cycle analysis basis, they often have higher capital costs as compared to conventional energy technologies. This makes diffusion of most renewable energy technologies difficult since end-users, in particular households and communities normally evaluate alternatives on first cost basis rather than life cycle costs. Four major financial problems are often encountered in both small and large scale renewable energy, namely:

- High capital costs: initial investment into renewable energy is often unaffordable;
- Access to finance: accessing credit or loans to finance systems or projects is a problem, particularly for perceived high risk areas such as Solar Home Systems (SHS);
- Cost of finance: when financing involves credit or loans, raising and servicing these loans comes at a cost; and
- Risk: All projects are exposed to risks, which are often considered to be high when new technologies are involved. Reducing and sharing risk among key players is essential for the success of renewable energy projects.

Appropriate financing mechanisms will be further investigated and facilitated.

Such financing mechanisms could include co-operation and assistance with existing credit and savings organisations in the country or could involve international financial partnerships. Government will also investigate opportunities to develop incentives for renewable energy. Such incentives may be short term and have specific objectives and targets.

Financing incentives, such as waivers on sales tax and import duties on selected technologies, will be examined. There will be a need to raise awareness among local credit agencies and co-operatives. Additionally, international finance provided in support of the international environmental agenda will be sought. Providing financial support to renewable energy will allow the country to reap the benefits in terms of accessibility of energy and the improvement of local and global environmental conditions.

3.4.6 Capacity building and knowledge transfer

Relatively low technical and institutional capabilities in the field of energy, and in particular renewable energy, continues to be a hurdle. There is a need for the inclusion of renewable energy topics in the curricular of schools and tertiary institutions. This, hopefully will in-turn stimulate interest in pursuing energy related careers. Additionally, there is a need to strengthen the capacities and capabilities of Government agencies, NGOs and the private sector in order to allow them to deal more effectively with renewable energy applications and programmes.

here applicable, topics on renewable energy training curricula and will encourage the le energy.

There will be need to produce appropriate educational material in order to support this policy. Furthermore, a dialogue will need to be established between the Ministry of Natural Resources and Energy, and training and educational agencies in order to assess realistic means for achieving this.

The capacities of development agencies, which promote and implement sustainable programmes on renewable energy, will be strengthened.

3.4.7 Quality assurance and standards in renewable energy

A key requirement for the widespread uptake of renewable energy systems is to ensure the availability of good quality equipment in the market. It becomes important for end users to easily identify good quality products against a known standard thus protecting them from unsafe and unreliable products. Typically, this is done through the development of standards or approval ratings. It is envisaged that this should be a regional programme throughout SADC.

An appropriate centre for quality assurance and standards for energy applications, in particular renewable energy technologies will be established.

These policies will entail a number of steps including the development of a quality assurance framework, development of technical specifications for selected technologies, testing of new technologies and promotion of the standards among end-users and other players in the country. In many cases quality standards can be adopted or adapted from those in use in other countries.

Government will support the establishment of the centre in collaboration with donor organisations. This will also serve as a ñcentre of excellenceò in as far as sustainable energy applications are concerned.

3.4.8 Technology promotion

Renewable energy technologies are a key element of a sustainable energy future. Technologies with relevance to the Swaziland situation include:

- Solar photovoltaic systems (solar PV);
- Solar water heaters;
- Wind;
- Micro (<100kW) and pico hydro (<5kW);
- Efficient use of biomass;
- Biogas;
- Woodlots; and
- Hybrid (wind and solar).

hnologies, for example when designing and
ammes, Government will carry out a cost-

Government will promote demonstration units to display these technologies, for example through Tinkhundla centres.

3.4.9 Solar water heaters

Preliminary investigations have shown that there is a large potential for the use of solar water heaters in residential and commercial buildings. Presently, water heating in residential and commercial buildings is carried out through electric water heaters, which in turn creates a large electricity demand that could otherwise be avoided.

Government will encourage a wider use of solar water heaters in residential and commercial buildings through promotional means and support for private sector initiatives.

The capital cost for solar water heaters in Swaziland is relatively high. There could thus be a need to support means of production of certain components within Swaziland. Other benefits of this policy will be the creation of employment and stimulation of small businesses.

The Ministry, in conjunction with the private sector, will need to implement focused awareness and promotion campaigns, in particular with professionals and developers in the building sector.

The cost savings resulting from the use of solar water heaters have been demonstrated in many countries. The Government is paying high electricity bills, part of which is a result of water heating in her public buildings and institutional living quarters.

Government will develop a programme to install solar water heaters on all her institutional buildings.

A feasibility study will be required to analyse the costs and benefits in comparison to and in combination with other solutions. Based on international experience and on the local conditions, it can be estimated that Government could save at least 15% of its annual electricity bills.

3.4.10 Charcoal

Charcoal production is clearly inefficient in terms of energy, but is convenient due to the high energy density of charcoal as compared to wood. Therefore, it could be relatively costï effective to transport charcoal from areas such as the highveld, with surplus of wood fuel resources, to areas such as the lowveld, where there are resource constraints. While charcoal usage for routine cooking in urban and peri-urban areas of Swaziland is currently not common, lessons from other countries in Sub-Saharan Africa are of striking relevance. In these countries, rapid urbanisation created a demand for low cost fuels for

, since electricity and petroleum fuels could particular charcoal, emerged into the urban rapidly catching Governments off-guard and unprepared, resulting in severe deforestation of indigenous forests. Therefore, it is necessary to carefully monitor the slightest indications of growth of a charcoal market and put in place quick and efficient measures to control it or to ensure orderly development.

The general production of charcoal for the household cooking market will be encouraged if it can be clearly shown that it will be environmentally sustainable.

Charcoal production could be promoted primarily in the highveld and in exceptional cases where the encroachment of bush or alien species needs to be controlled. In other areas, it will be discouraged.

There are many different types of charcoal kilns. The thermal efficiencies of these kilns vary widely, depending on the technology adopted.

Government will investigate a framework for establishing efficiency standards for charcoal kilns.

The establishment of a licensing framework for charcoal producers will also be investigated.

3.4.11 Briquettes

Briquettes are small fuel bricks made from compressed material, often from waste paper, sawdust, coal dust etc. The Ministry initiated pilot projects to test the manufacturing and sale of these bricks. There is a large potential market in the country, especially in areas where there are wood fuel shortages.

Briquettes can be manufactured on both a small scale on an individual basis and also on a commercial scale, especially at or close to industries with a suitable waste.

Government will further investigate the manufacturing and utilisation of briquettes to satisfy energy needs.

3.4.12 Other technologies

As technology advances new discoveries have emerged that can enhance power production and use. Although these technologies are at an early stage, it is incumbent on Government not to overlook their importance for future use as power producers. The technologies may include, fuel cells and geothermal.

Geothermal energy is also a potential renewable energy resource that can be utilised in the country. Since the geothermal resource does not fluctuate with the seasons, it is a stable source of power/steam generation. There are at least nine hot springs in Swaziland

e south of the country to about 52° C in the mperatures may be relatively low. There are om the north at Matsamo and Mhlume at an ogy behind the development of geothermal heat/steam production, including power generation, is at an advanced stage in countries like the United States of America, New Zealand, Japan, United Kingdom, Germany and others.

Government will investigate the opportunities for the adoption of other clean and renewable energy technologies.

ATION

4.1 Overview

Rural Electrification is a high priority issue in Swaziland. Access to adequate energy supplies is a key element of Governmentôs rural development strategy. The aim of Government is to provide a climate and infrastructure that will progressively maximise the quality of life and energy security of the people of Swaziland and make the best of the countryôs natural resources. The Ministry therefore is developing plans to extend the electricity grid and provide access to electricity to all areas of the country. This is seen as an essential component towards the social and economic upliftment of all citizens of the country.

In the rural areas of Swaziland, the vast majority of homesteads and a large number of public facilities are without adequate access to electricity. This can be attributed to the high costs of extending distribution lines to dispersed communities in rural areas. Rural Electrification is a non-viable activity for any electricity utility especially if the densities of households are low, as is the case in Swaziland. With the present rate of electrification the situation will remain unsatisfactory for the rural population for many years. The low connection rate in rural areas was mainly due to the high capital costs in paying for the infrastructure. In 1999, less than 5% of rural communities had access to grid electricity, which results in a prevailing marginalisation of rural people. Furthermore, social and economic development in rural areas may also slow down the current trend of migration to urban areas.

The Government has been addressing the problem of rural electrification for the last decade through a number of studies and programmes. Rural electrification includes all areas of the country not presently covered by an electricity grid infrastructure and where grid extension is deemed not viable on purely commercial terms. Rural electrification may also cover electrification of peri-urban areas, where appropriate.

The goal for the Ministry is that access to electricity is made available to all the citizens of the country by 2022. This is in line with the NDS and has been developed through extensive consultation and has been supported and ratified by stakeholders.

The objectives of the NDS, for accessibility of energy services under the Fuel and Energy Sector are to: ñensure improved access to a range of energy services for the whole population in urban, peri-urban and rural areasò; ñmake electricity available and affordable in rural areas so as to improve social economic development and welfareò; and ñensure sustainable fuelwood managementò.

lectrification are:

- access to electricity to dispersed homesteads. Due to the relatively long distances between most homesteads in rural areas, the costs of grid extension is prohibitively expensive;
- access to electricity to Government institutions, such as schools, clinics etc. in order to improve essential services in rural areas;
- accessing funds for rural electrification as it is a costly exercise;
- addressing the necessity to create a balance between the supply and demand for electricity;
- prioritisation and planning procedures should ensure an equitable and transparent distribution of resources; and
- identifying the appropriate non-grid options should grid extension not be viable. In some instance, for example when a community is far from the existing national grid, non-grid solutions may be appropriate.

4.3 Objectives for rural electrification

To achieve access to electricity throughout the country, the following objectives for rural electrification have been developed:

- to support the development of rural areas in the country in a sustainable manner;
- to promote the productive use of electricity in rural areas in order to facilitate socio-economic development;
- to improve living conditions by satisfying the basic need of electricity supply;
- to promote electrification of public facilities in order to facilitate the delivery of services to rural areas;
- to provide access to electricity to as many homesteads as possible in order to slow down the rate of wood fuel consumption;
- to improve the social gap between rural and urban communities in order to limit migration; and
- to contribute towards poverty alleviation.

These objectives are closely linked to other development strategies of the Government, including: infrastructure development (communications, environment, water supply and human settlements); agriculture, land and rural development; economic services; education and training; health and social welfare; gender; and disadvantaged groups.

4.4 Electrification Options

Approximately 77% of the population live in rural areas (1997 census), many living in widely scattered homesteads. In view of this dispersed distribution of the population,

ange of technology options for the different

areas through connection to the national grid and through off-grid solutions.

4.4.1 Grid electrification

Grid electrification involves extension to the national grid to consumers at a standard voltage and quality of supply.

Government will pursue grid electrification particularly in densely populated resettled areas and areas with high development potential.

This will be in line with Governmentôs Resettlement Policy, whose main aim is to utilise the countryôs resources for the benefit of as many people as possible. The costs are greatly reduced in supplying electricity services to resettled areas.

4.4.2 Off grid electrification

Off-grid technologies are stand-alone sources of power that can supply a mini-grid system or a one-off user. They rely on either natural resources such as the sun, wind, water or biomass to drive them, or fuel being brought in.

Off-grid electrification options may be more appropriate and could be implemented in areas remote from existing grid lines and less densely populated, where grid connection may be too costly.

Such technologies include:

- **photo-voltaic systems (solar PV)**: these systems offer an opportunity to meet small-scale demands for electricity such as for lighting, medicine cooling, communication, education (e.g. overhead projectors, computers), entertainment (radio and TV) etc;
- **wind**: wind turbines may be encouraged in areas where there is a constant source of wind at adequate wind speeds to produce electricity. Low wind speed turbines may be suitable for small-scale demands;
- **micro- and mini-hydro power systems**: small-scale hydro power is presently in limited use, but for locations close to rivers, streams and canals, it may be an attractive option for the development of mini-grids or for individual homesteads;
- **biogas**: these systems may be appropriate for lighting purposes where there is a continuous supply of biodegradable matter (cattle, pigs, chicken, vegetable waste etc);
- **biomass**: organic matter such as crop residues, forest trimmings or wood from sustainably grown trees can be used for power generation;

of two or more of the above technologies
of supply depending on the availability of

- **diesel and petrol generator systems**: this type of power supply is to some extent already being used at public facilities and private enterprises.

Government will encourage the development of demonstration projects for the various off-grid technologies.

For example PV systems and solar water heater systems for school and clinics.

Government will also investigate the appropriateness of sustainable renewable energy technologies to assess their potential future application for off-grid electrification.

There are other technologies, for example gasification, and more complex hybrid systems that could be explored in the future to meet the energy requirements of the country.

4.5 Prioritisation and planning

Investments in rural electrification are to be strictly prioritised and planned in such a manner that they provide maximum benefit according to the goal, objectives and the availability of resources (funds, technical expertise etc).

4.5.1 Prioritisation

An overall prioritisation strategy has been adopted through consultation with stakeholders, as a methodology for extending the grid to rural communities and increasing access.

The first priority is to extend the grid to schools, health care facilities and other essential public services, followed by agricultural, commercial and industrial development areas. Prioritisation will also take account of areas with a high potential for economic development, where appropriate.

4.5.1.1 Schools, health care facilities and other essential public services

The quality of education in non-electrified schools in rural areas is hampered by a lack of electrified services such as laboratory equipment, audio-visual equipment, computers etc. The lack of electrified services in school staff quarters may also make it difficult to encourage teachers to remain in or be attracted to non-electrified schools. These factors tend to aggravate the inequality of opportunities between rural and urban students. The low percentage of students from rural high schools attending higher education can be partly attributed to the limited electricity services.

s is also highly dependent on electrification, frigeration of medical drugs and vaccines, ghting will also improve the safety, security fication of clinics provides major benefits to the surrounding communities.

Access to clean water is a fundamental requirement for health and hygiene in rural communities. Non-electrified communities may be short of clean water even for basic needs; electricity is an ideal energy source for water pumping. Other essential public services which would receive a priority for electrification could include: telecommunication stations, tinkhundla, Rural Development Areas (RDAs), rural veterinary services, and rural police stations and posts.

Government will ensure that all schools, clinics and essential public services in rural areas are provided with electricity.

4.5.1.2 Agricultural, commercial and industrial development areas

For agricultural, commercial and industrial development, priority needs to be given to the electrification of specified growth areas. A rural electrification programme must be integrated with the development of small to medium scale enterprises, linking with programmes aimed at stimulating the rural economy, for example SEDCOs, rural growth centres etc. Important user groups include irrigation, water pumping, shops and other large and small power users. These user groups are expected to consume more than the average household thus contributing to the financial viability of the programme.

Government will ensure that agricultural, commercial and industrial development areas are provided with electricity.

4.5.1.3 Residential areas/ domestic dwellings

Electrification of homesteads is vital to the quality of life of the rural population. It is intended that grid-extensions to public institutions be routed, where viable, through resettled areas. Resettlement will facilitate increased access to the grid and reduce costs for future reticulation. Domestic reticulation may come later on a demand basis.

Government will facilitate the reticulation of domestic dwellings in an affordable manner in conjunction with the utilities.

The programme for implementing the above policies will be outlined in the Rural Electrification Master Plan.

4.5.2 Planning and targets

In view of the vast demand for electricity supply infrastructure in rural areas compared to the resources available, a thorough planning procedure is required. The overall purpose

me of rural electrification meets the policy

nt of the differing goals and objectives in relation to the time scale, long-term and short-term. The long-term plan will define the overall programme and the targets required to meet the vision of access to electricity for all by 2022. Short-term electrification planning will be based on a three-year rolling plan to be updated annually. The plan will identify a broad range of potential projects to be implemented each year for the entire period. Targets will be set annually according to the resources available. Short-term planning will also deal with specific implementation issues.

Targets will include estimated connections per year through rural electrification, with specific estimated targets for schools, clinics, households etc.

The electrification plan would be made public in order to allow individuals, particularly those in rural areas to be able to make informed decisions regarding their energy supply options.

4.6 Rural Electrification Master Plan

A Rural Electrification Master Plan is necessary to detail an implementation framework for electrifying rural areas. Government will manage and direct the implementation plan through the setting up of an institutional mechanism with key stakeholders and the strong involvement of the private sector.

Government will develop a Rural Electrification Master Plan.

4.6.1 Rural Electrification Agency

Where there have been successful rural electrification programmes throughout the world, they have been initiated and supported by governments. Power utilities have been unable to carry out these activities alone due to the non-commercial nature of rural electrification. The challenge of rural electrification calls for an inclusive and integrated rural development approach involving all stakeholders.

A Rural Electrification Agency will be established to implement and monitor rural electrification.

The Rural Electrification Agency will carry out the planning and be responsible for overseeing the implementation and monitoring of rural electrification and ensuring that targets are met.

Fund

ication is very expensive and the returns are various sources of financing in order to meet the goal of improving access to electricity.

A dedicated fund will be established and used to provide financial support to rural electrification.

The operational mechanisms and structure of the fund will be outlined in the Rural Electrification Master Plan.

Although access to electricity is an important prerequisite for rural development, this alone may provide little development unless co-ordinated with other types of services. Continuing intra-Governmental co-operation, co-ordination and communication is vital for the success of rural electrification.

SUES

5.1 Security of supply

5.1.1 Overview

Swaziland is a land-locked country and is heavily dependent on the import of electricity, petroleum products and coal. This dependency on energy imports is a potential problem both in the short and longer term. It can lead to price fluctuations, and supply problems in the case of disruptions in the supply chains due to factors outside of national control. Natural disasters and technical problems could also affect the supply situation. Energy supply problems will impact upon the agricultural, industrial, and commercial sectors as well as the general public.

In 1999, all coal used for energy purposes was imported from South Africa. On the other hand, substantial quantities of Swazilandôs coal were exported for industrial use. All petroleum products were imported from South Africa. In total, 44% of available energy supplies were imported, however this average disguises the fact that 100% of petroleum products are imported as well as 58% of the electricity supply. The remaining electricity supply is attributed to a few main industries producing for their own purposes and SEBôs hydropower plants. It is therefore clear that Swaziland is heavily dependent on imported fuels from few sources. Wood fuel, bagasse and other such products are available domestically.

Swaziland holds no known reserves of oil and all petroleum products are sourced from South African refineries. Most of the products are distributed from the commercial storage facilities in Matsapha, although distribution directly from South African refineries to consumers and filling stations in Swaziland also takes place. These storage facilities in the country are very limited in terms of security of supply. The stocks held by the companies are part of their normal operations and not intended for emergency situations. In the past, Swaziland used to import all her petroleum products from Mozambique. This route was however discontinued due to supply disruptions. In 2001, the vulnerable supply situation was accentuated as a result of accidents in South African refineries causing some local shortages of diesel.

Swaziland used to import electricity through three 132 kV lines. The establishment of the 400 kV line added to the security of supply for electricity. Swazilandôs participation in the Southern African Power Pool (SAPP) offers yet other supply alternatives.

Security of supplies can be increased by various means such as: increased use of indigenous resources, diversification of supplies and energy conservation. Strengthening of the regional and international co-operation will also improve the situation. In some cases, especially for petroleum products, establishment of emergency stocks is also a relevant option.

m products is not a problem unique to merica, Japan, Australia, New Zealand and dependent on imported petroleum products and would face the same problems as Swaziland in case of supply problems. Consequently, OECD countries have entered into a co-operation agreement to alleviate the effects of possible supply disruptions.

An important part of this agreement is an obligation to hold emergency petroleum stocks corresponding to at least 90 days of net import. Built into the agreement is an obligation to share available supplies in case of supply problems and co-operation on crisis management. Within the European Union the countries are furthermore obliged to hold stocks corresponding to at least 90 days of consumption of petroleum products. These arrangements were made in the light of the international supply disruptions in the 1970ôs and 1980ôs.

5.1.2 Main issues

The main challenges in ensuring an adequate security of supply in the country are:

- Dependence on imported petroleum products from one source;
- Commercial petroleum stocks are relatively limited and not intended to cope with major supply disruptions;
- The major part of electricity supply is imported and domestic production (except for hydro power plants) is dominated by a few large industries producing for their own needs;
- Bituminous coal is imported for energy use while domestic anthracitic coal is exported for industrial uses. Swaziland holds considerable reserves of anthracitic and semi-anthracitic coal;
- There is a potential for an increased use of indigenous resources of biomass such as bagasse and wood waste in industry;
- Energy could be used more efficiently and savings introduced and thereby increasing security of supply;
- Need for a contingency plan to deal with supply disruptions; and
- Diversity of supply.

5.1.3 Strategic stocks for oil products

Presently, Swaziland only stores oil products for operational needs. As a landlocked country, Swaziland has few alternatives in cases of supply disruptions. In July 2001, the disruptions in diesel supplies accentuated the problem.

Part of the stocks could be held by the industry through increasing operational stocks, which are relatively low. Such arrangements could be made through voluntary agreements with the oil industry or through regulation stipulating certain stock levels. Such arrangements would however require a control system to ensure that the stocks are actually there. Another problem is that the possibilities to expand the present facilities in Matsapha are restricted due to physical constraints.

on commercial stocks is not enough. A pre-
with various models for construction and
dy could still form the background for an
strategic stocks.

There has been a strong need for strategic stocks of petroleum products in Swaziland. The oil industry or the Government or the two in co-operation could establish such stocks. The planned feasibility study on strategic stocks to be developed shall address the questions of ownership, operations and organisation of the stocks. Government will also develop plans for dealing with supply disruptions in co-operation with the private sector.

Government will ensure that strategic stocks for petroleum products are established in the country.

A feasibility study will be carried out and is necessary before a final decision to implement this policy is made.

Government will ensure that contingency plans are in place to deal with supply disruptions in the country beyond the normal established reserves.

Government will require commercial companies to store a minimum quantity of stocks to add to the security of supply.

Alternative import possibilities from Mozambique could also be investigated to improve diversity of supply. However, procurement of petroleum products remains the responsibility of the oil industry.

The possibilities of blending ethanol, a by-product from the sugar industry, would also help to reduce imports.

5.1.4 Increasing security of supply for electricity

The major means for increasing security of supply for electricity are the diversification of supplies and increased indigenous power generation.

The new 400 kV line is improving the situation in conjunction with the countryôs participation in the SAPP. With regard to increased indigenous production various options will be explored for the utilisation of bagasse, wood waste and coal.

With regard to coal, it is stated that a cost-benefit analysis should be conducted on increased use of indigenous coal in the industry. A feasibility study on the establishment of a coal-fired thermal power station shall also be carried out.

Depending on the results of the analysis such initiatives may benefit the overall economy, bring employment opportunities and contribute significantly to security of supplies.

n of renewable energy sources and IPPs for y of supplies. Mechanisms are required in the ducers (IPP) to enter the market. A strategy on a regular basis.

Government will investigate opportunities for increased local power generation and will endeavour to take advantage of the availability of cheap power in the region through the SAPP.

Government will investigate other supply chains regionally and internationally to ensure diversification of energy supply to improve security.

5.1.5 Energy conservation

Security of supply is not only a question of providing the necessary energy supplies. In the end use sector, initiatives on increased energy efficiency and energy savings benefit the economy and the environment. Such initiatives also contribute to the security of supply by reducing the dependency on imported energy.

Energy efficiency and conservation measures have proven that capital investment on new energy supplies can be delayed when applied effectively.

Government will develop an energy efficiency programme amongst the energy sub-sectors of the economy.

Increasing energy conservation and efficiency could assist the country to use its energy resources in a cost-effective manner, reduce energy shortages, lower the countryôs reliance on energy imports, mitigate the impact of high energy prices and reduce pollution. Government will have to collect and disseminate accurate information on energy consumption and encourage industries to use more energy efficient technologies.

5.2 Environment

5.2.1 Overview

It is the duty of all nations to ensure that the resources of each and every country are used in a sustainable manner that is not detrimental to the populace of that country or its environment. The impacts of damage to the environment can be felt both locally and globally and there is plenty of evidence world-wide to lay claim to this fact. Many areas in Swaziland are now suffering the effects of deforestation and land degradation; pollution in a number of rivers has built up to such a level that many species of aquatic life are disappearing and the waters are becoming a health hazard.

Climate change and global warming, once a hotly debated subject, is now becoming a reality. It is foreseen that major shifts in climate and weather patterns throughout the planet may result, however the effects are not fully understood.

of initiatives aimed at stemming the damage ., Government established the Swaziland Environment Authority (SEA), which has developed environmental regulations and the Swaziland Environmental Action Plan, and there has been an emergence and strengthening of NGOs with environmental agendas. On a global level, a number of significant international initiatives have been developed and agreed upon, such as the three Rio Conventions, namely Biodiversity, Desertification, and Climate Change, which resulted in the Kyoto Protocol. The increased awareness of these issues has also stimulated greater corporate environmental responsibility in a number of large companies and organisations.

Presently, the pricing of energy does not take account of the environmental costs associated with its generation, distribution and utilisation. However, such ñtrue-costò pricing will require accurate and comprehensive environmental data. It is also important to ensure that this is not in conflict with the objectives of ensuring access to energy for all and stimulating economic growth.

5.2.2 Main issues

The main issues in developing a policy which takes cognisance of the environment are:

- ensuring the promotion of energy related products which are not damaging to the environment;
- control of emissions;
- development of ñclean technologyò power generation;
- lack of comprehensive environmental data and distribution of data;
- the pollution caused by the energy sector;
- Conversion of waste products to energy; and
- Mainstreaming environment in the development process.

5.2.3 Energy and environment linkages

Energy activities can impact both directly or indirectly on the environment. Much of the damage to the environment can be as a result of a lack of awareness of the implications and consequences of these activities.

Government will investigate and promote the use of environmentally friendly fuels, energy products and technologies.

Awareness, regarding the energy sectorôs impacts on the environment, will be continuously increased amongst energy stakeholders (generators, transmitters, distributors and consumers). All energy projects in the country should only be implemented following a thorough environmental assessment and environmental management is built into all energy projects.

Once the Energy Regulatory Authority (ERA) is established, it will have powers to control the activities of players in the energy sector. There are therefore opportunities to

ly acceptable environmental principles. The the SEA on environmental issues.

l standards and principles are included in the guidelines, regulations and licensing procedures of the Energy Regulatory Authority.

Licensing for all energy projects will be conditional on meeting environmental requirements.

5.2.4 Emissions

The utilisation of energy resources and generation of power produces many emissions and waste products. Presently, these have not yet been quantified, especially with regard to vehicle emissions.

Government will conduct a study on identifying harmful emissions from all sub-sectors in the energy sector and methodologies and prioritisation on how to reduce them.

Opportunities for the trading of emissions, such as sulphur and NOx will be investigated. More work to assess the environmental implications of acid emissions from power plants should be undertaken.

The phasing out of lead in petrol and sulphur in diesel are major priorities for Government in the near future. In the medium to long term, all new vehicles will be mandated to use unleaded petrol and a maximum of 0.05% sulphur in diesel. Government will strictly control the fuel specifications in the country.

5.2.5 Waste

There is potential for the generation of power and heat from waste products, for example through the utilisation of landfill gas or incineration. Good landfill management is essential to avoid leachates and water pollutions. It is also important that measures to detect hazardous wastes are in place to prevent pollution.

Government will investigate opportunities for energy from waste.

Disposal of waste oil in rivers is of major concern in terms of river pollution. At present there is a mechanism to prosecute and penalise those who dump oil in the rivers, but it is not enforced.

Government will develop legislation to ensure that all stakeholders in the oil and transport industry manage their waste oil in an environmentally friendly manner.

Government will adhere to the Basel Convention (see Annex 1) and other conventions aimed at trans-boundary waste oil exports. In the medium to long term, Government will

l recovery and processing systems within

ted. This requires that those causing adverse effects pay the full social and environmental costs of avoiding, mitigating, and/or remedying those adverse effects.

5.3 Health and safety

5.3.1 Overview

The Government has a responsibility to ensure that the health and safety of the population is maintained. There are many activities, relating to peopleôs employment or day to day life that can seriously impact on their health and safety. The consequences of illnesses and accidents also have large economic impacts in terms of the provision of health care and reduced productivity.

There are many unsafe work practices that may cause injury. Some of these activities are related to poorly maintained equipment, others are a result of poor training on the part of the employer and a general lack of awareness. In the home, many fuels used on a daily basis are very hazardous, for example: paraffin is both toxic and highly inflammable; LPG is explosive; wood smoke can cause respiratory illnesses; and the unsafe use of electricity causing electric shocks.

5.3.2 Main issues

The main issues in ensuring health and safety for the population are:

- indoor and outdoor air pollution from wood fuel use;
- poor quality equipment; and
- energy related projects and their impact on public health and safety.

5.3.3 Households

Many households continue to use paraffin stoves and wood fuel on a daily basis. Household energy studies conducted in 1995 found that many households were affected by particulate pollution resulting in respiratory problems. The study also found that pollution levels in some areas were at unacceptably high levels.

Government will investigate and promote the safe use, storage and transport of fuels and energy technologies in all sectors.

Health and safety for energy activities in the households and for energy products can be developed through awareness raising and through legislation. Energy products, for example paraffin stoves, which are below international standards should not be allowed in local markets. Improper usage of candles, LPG and paraffin can be hazardous in terms of potential accidental fires and poisoning.

coal, should be used as a substitute for bituminous coal. It is necessary to ensure that all new power plants and coal burning equipment, as a requirement, install clean air apparatus even at the design stage. Improved ventilation in industrial areas should be enforced and so should the installation of correct chimneys, to reduce health risks.

Government will assess the appropriateness of present legislation to ensure the health and safety of the population, for both the employees in the energy sector and consumers and users of energy products.

5.4 Energy efficiency and savings

5.4.1 Overview

Energy efficiency and savings aim to reduce energy consumption at the end use level as well as in the supply system. Energy efficiency is about reducing losses within a technical energy system by optimising energy use, while energy savings cover a broader conservation methodology, including behavioural and operational issues.

Achieving energy efficiency and energy savings is more of a behavioural problem than a technical one. Consumers of energy are primarily focused on their individual activities and only secondarily on the implications of those activities: for example, the energy required and energy wasted to implement the activity is not usually an issue. In order to fully understand and obtain appropriate solutions, data is required for effective monitoring and evaluation of energy with a view to forecasting future use and planning appropriately.

SADC, through the Energy Sector Technical and Administrative Unit, implemented an Industrial Energy Management Project which carried out energy audits in industry and recommended energy efficiency measures. Another component involved training engineering consulting companies and engineering technical colleges. The objective was to sustain the energy management training and the activities of energy management. Training continued under consulting companies, while tertiary institutions received support to conduct training and to incorporate energy efficiency/management into their curricula. The project also involved the establishment of a National Energy Management Committee (NEMCO), where industrialists met to discuss issues of interest on energy efficiency/management.

5.4.2 Main issues

The main challenges in achieving a more efficient use of energy are:

- Maximising energy savings and efficiency without compromising the policyôs prime objectives of access to energy for all and job creation;

monitoring and analysis procedures are in

issues;

- Encouraging investment in energy efficiency programmes;
- Encouraging consultancy expertise at a local level;
- Identification of energy saving potentials; and
- Removing the barriers to energy efficiency: information, institutional, social, financial and market, and technical.

5.4.3 National Energy Savings Association (NESA)

There is need for an organisation to oversee energy savings activities within the country (demonstrations and awareness raising activities, promotion of energy efficient appliances and equipment) and to advise Government on policy direction.

Government will facilitate the establishment of the National Energy Savings Association (NESA) to promote and implement energy savings activities across all sectors in the country.

NESA would also act as an umbrella organisation for similar bodies with a more narrow focus. NESA would also be the body responsible for the development and issuing of incentives and guidelines, such as energy efficiency awards, stars and charters.

The private sector will be encouraged to take a lead in this forum, although Government will provide support and assistance. It is essential that any such organisation established should be fully sustainable in terms of capacity and funding.

5.4.4 Awareness raising and information dissemination

It is essential that effective data collection, monitoring and analysis is in place before awareness raising activities are carried out. It is acknowledged that data collection throughout the region is a difficult task, hence the need for adequate capacity to achieve this exercise.

Appropriate and sustainable programmes are required to raise awareness in all sectors on issues related to energy savings and energy efficiency, including the available solutions. However, there is need for co-operation and consultation with all stakeholders concerned.

Government will formulate and implement programmes on awareness raising and information dissemination on energy savings.

Emphasis should be put on active rather than passive information, information which will enhance other initiatives that actively empowers actors in the market. Information activities can be successful if they are carefully targeted, are positive, and enduring. Workshops, information centres, mass media campaigns training and audits are typical instruments.

energy efficiency into the educational

tertiary education. In the education of new generations, awareness and understanding of these issues should become the norm, which can easily be translated into practice both in the home and work environment. Capacity building is also required in order to train and empower locals to establish their own consultancies in the field of energy management.

5.4.5 Energy management

Energy management is being able to account for and optimise all energy use. Nominating positions with accountability for energy use should be encouraged in all medium-scale and large organisations.

Government will promote energy management skills and energy accountability in organisations across all sectors.

Industry will be encouraged to establish energy managersô positions, which will enhance accountability in energy use and effective management of energy resources.

5.4.6 Building standards

Large amounts of energy are used in the heating, cooling and lighting of buildings. Through the adoption of certain practices and often simple variations to standard designs, large amounts of energy can be saved in the operations and functioning of a building.

The greater utilisation of natural light could reduce the need for artificial lighting and create a more comfortable environment for the users of a building. Likewise, correct orientation and the use of shading and insulation can dramatically reduce energy requirements for heating and cooling. This will result in direct financial benefits to whoever pays the bills.

Government will ensure that building standards and regulations, which promote energy conservation in both commercial and domestic buildings, are in place.

In order to encourage individuals and companies to adopt energy efficient building practices, Government should lead by example in the design and construction of her own energy efficient buildings.

5.4.7 Energy efficiency within Government institutions

There is a high wastage of energy within Government institutions, emanating from lighting, air conditioning (heating and cooling), computers and other equipment, and hot water requirements. In many Ministry buildings, lights are left on all through the night, as are computers, air conditioners and heaters. Added to this, electric water heaters are left on 24 hours per day, 365 days per year, when they are actually only needed for a

eated when not required and the heat is lost

meaningful national programme on energy efficiency and energy savings, it is first necessary to get her own house in order to set an example to businesses and individuals.

Government will establish a long-term programme for implementing energy efficiency and energy savings throughout her institutions.

A demonstration programme will be established within a major Government institution. The demonstration will also include the installation of solar water heaters, to assess their effectiveness, with the aim of establishing a large-scale programme. Such a programme will include institutions such as boarding schools, clinics, institutional housing etc.

5.4.8 Energy appliance labelling

Labelling provides purchasers with information about the performance and energy consumption of the equipment. Labels can provide information helpful in determining the life-cycle cost of appliances and other energy consuming equipment. Rather than just being aware of the initial price, purchasers are informed on relative operating costs. Labelling can also motivate manufacturers to produce more efficient products. A labelling programme could be best developed within the regional context since it requires the co-operation of all manufacturers.

Government will encourage development of an energy appliance labelling programme at a regional level.

The Ministry will initiate, in co-operation with the local manufacturers and the Swaziland Standards Authority, a programme for labelling their products as a way of encouraging a regional programme.

5.4.9 Demand Side Management

In order to use the energy resources efficiently, the utilities in the country will be encouraged to adopt Demand Side Management (DSM) and Integrated Resource Planning (IRP). These tools are part of a broader concept of resource planning that includes both demand- and supply-side options to meet consumersô needs for energy services. IRP explicitly incorporates energy efficiency and load management programmes as well as energy and capacity resources.

Application of Demand Side Management principles will be promoted within the electricity utilities.

Use of different electricity tariffs can also be a way of DSM because peak consumption can be reallocated to off peak periods in some cases. Thereby costly investments in peak capacity can be saved.

vestment in the application of these tools and

DSM requires an extensive database before any detailed programme can be initiated. A training programme will be developed to assist the utilities in data collection and management to effectively utilise these tools.

5.4.10 Removal of barriers

Historically, it has been shown that most of the gains predicted in energy efficiency measures are not realised in practice. This is due to the various stakeholders, including customers, manufacturers, financiers, utilities, regulators and Government agencies, not using energy efficiently. This poses serious challenges because strategies may be required to reduce or remove barriers that may prevent the full realisation of energy efficiency measures.

Government will develop a programme to remove the barriers to the realisation of energy efficiency.

The major barriers to implementation of energy efficiency can be grouped as information barriers, institutional barriers, social barriers, financial and market barriers, and technical barriers.

5.5 Accessibility to energy for low-income groups

5.5.1 Overview

Access to energy by all citizens of the country is one of the key objectives of the energy policy. Ensuring access to modern forms of energy to low-income households is a complex task. Selecting interventions for this group requires careful analysis in order to ensure sustainability and that the chosen method suits both the target group as well as Governmentôs social objectives.

It can be said in general that the majority of low-income households are in rural areas and in peri-urban areas. Since the majority of the population lives in rural areas it can also be inferred that efforts to widen access to modern forms of energy services for low-income groups should focus mainly on rural communities.

Furthermore, policies aiming at widening access should go hand in hand in hand with those aimed at improving affordability of these services. Modern forms of energy services are useful only to those who can adopt them. Historically, subsidies have been used to promote wider use of such energy carriers. However, ensuring exclusivity of the benefits of these subsidies to the target group has been almost impossible, resulting in abuse of

fluent. Examples of this are the subsidies on

issue as most energy prices, including those regulated by Government, already reflect the economic cost of supply. As a result, most consumers and industry are conscious of energy costs. However, there are structural adjustments which still need to be made in areas of electricity and product pricing to improve incentives for efficient energy use.

5.5.2 Main issues

Some of the main issues with regard to widening of energy access are:

- Affordability and energy pricing;
- High investment and low returns in increasing access;
- Finding and pursuing least cost energy mix options to best serve low-income households;
- Providing financial assistance for the development of energy infrastructure for serving low-income groups;
- Design and implementation of policies aimed at raising income levels of low-income households;
- Dispersed settlements, which do not encourage the development of infrastructure to improve access to energy services; and
- Ensuring availability of appropriate micro-finance schemes to benefit the low-income group.

5.5.3 Energy options for low-income households

Electricity is the most preferred energy carrier even to low-income households. Other energy options such as LPG, paraffin, and solar energy are already in use to varying degrees. For rural households the ñthreeï stoneò cooking technology is the most prevalent, whilst paraffin based technologies are the most prevalent among the low-income urban and peri-urban households. In general cooking technologies that use modern energy carriers are available even in small towns throughout the country. Awareness and experience with high efficiency improved wood fuel cooking-stoves is very limited. The widespread take-up of energy options such as LPG and paraffin is restricted in many rural areas by high prices.

Government will promote and facilitate adoption of sustainable energy options in an effort to assist low-income households.

This will include capacity building at a local level through the development of commercial and technical skills necessary to support dissemination of these technologies. Such technologies could also include programmes to reduce electricity connection costs, for example, local manufacturing and assembling of components, low cost reticulation technologies such as Single Wire Earth Return (SWER) and ñready-boardsò (low cost alternative to internal wiring).

nologies such as solar cookers and briquettes
projects and demonstrations.

elopment strategy and the dispersed nature of homesteads in the country, Government will focus on the deployment of stand alone systems in rural areas and encourage utilities to use pre-payment meters or load limiters.

5.5.4 Financing energy for low-income households

Energy infrastructure and equipment is expensive and often beyond the means of low-income households. If the availability of modern forms of energy services is to be achieved, transparent and targeted financial assistance for energy infrastructure and equipment will need to be developed.

Means for absorbing all or part of investment as well as future investment costs of energy infrastructure for low-income households will be investigated.

Access to micro-finance to low-income households is also made difficult by the high non-repayment risk. Therefore it is almost impossible for low-income households to acquire even small loans to finance energy investments at a household level. Existing efforts, for example through some NGOs, to assist in small loans provision for the low-income are not enough and need to be strengthened.

Government, in collaboration with other agencies, will continue to search for the best ways of making micro-finance available to low-income households.

5.5.5 Affordability and energy pricing

Improving accessibility of energy supplies, implies finding means and ways by which energy services can be delivered reliably and affordably in an environmentally sound and socially acceptable manner. Adoption of tariffs that will assist low-income groups is practised in many countries. The energy policy will investigate means of introducing modern forms of energy at affordable but realistic energy prices. Subsidies aimed at assisting certain categories will be clearly defined and accounted for, as part of the social responsibility for Government.

Government will promote and encourage access to affordable energy services for low-income groups.

Energy prices for low-income groups will take into consideration affordability to ensure access to energy for all. This could be done by analysing the prices for all potential consumers in relation to available income, in line with Governmentôs income and expenditure surveys.

Energy and the roles of women and men are socially and culturally linked in many diverse ways. These linkages evolve over time and vary across income groups, between urban and rural households and from region to region. Some of these variations affect both men and women in the same way. However, the role of women in energy provision and their participation in different facets of the energy sector have not been sufficiently addressed. Therefore, in addressing the issue of energy and gender, the focus is mainly on improving the situation of women.

Swaziland like most African countries is a patriarchal society. It is also a society with strong cultural and religious practices. There are still restrictions for women in terms of ownership of property, inheritance and credit.

Government has acknowledged the need to address gender inequalities. The NDS articulates a number of priorities ñ*aimed at eliminating gaps and offering equal opportunities to all citizens irrespective of their sex*ò. A comprehensive Gender Policy is being formulated. The long-term objective of this Policy is to contribute to the process of mainstreaming gender equality in plans and programmes of various ministerial sectors, NGOs, the private sector and other agencies involved in national development. The main issues, as defined in the Gender Policy, are equal access, equal ownership, equal control and equal benefits.

The livelihoods of most people in rural areas depend on the availability of energy resources, primarily wood fuel. The effects of the shortage of wood fuel resources affect women more than it affects men, since mainly wood fuel gathering is primarily the womanôs job. However in areas with acute shortages, wood fuel becomes a manôs problem, as the purchase and carting of firewood must be done from areas outside the community.

Beyond the home, energy is also a key productive asset. Many women are engaged in activities such as food processing, commercial vegetable growing, and sewing. All these are greatly facilitated by the availability of energy and can significantly improve a womanôs economic standing and consequently, the standard of living in her household.

With regards to professions in the energy sector, it is notable that few women are employed within energy institutions such as the electricity utility and other energy service industries. Of those women who are employed within the sector, very few hold key positions.

5.6.2 Main issues

The issues and challenges relating to gender and energy, include:

- Limited awareness on gender issues in general in the society;

men to enrol for energy related educational
n to pursue careers in energy related fields;
the energy sector with the countryôs overall
agenda on gender issues; and

- Encouraging the meaningful participation of both men and women in making energy choices.

5.6.3 Participation of women in energy programmes

Despite being a relatively new concept in Swazi society, there is an increasing acceptability of the need for mainstreaming gender within the countryôs national policies. Valuing the contribution of women and improving their involvement in various facets of the energy sector is important for ensuring successful policy implementation.

Government will ensure that women are motivated to participate in energy programmes and activities.

Guidelines and strategies for inclusion of gender concerns in energy programmes will be developed and disseminated.

5.6.4 Energy careers for women

The low representation of women in the energy industries and agencies is of concern and steps to improve this situation will need to be taken. There are existing efforts to encourage females to take science subjects in schools. These need to be complemented by a more ardent promotion of the uptake of science-related disciplines in tertiary institutions. Similarly in the workplace, there is a need to continue to encourage equal opportunities, in terms of employment and promotions, to deserving candidates regardless of whether they are men or women.

Government will promote greater enrolment of women in energy related disciplines.

Furthermore, Government will vigorously promote that equal opportunities be availed in energy agencies and energy-related industries.

5.7 Employment creation

5.7.1 Overview

With reference to the energy sector, employment creation can be either directly in the sector itself or created indirectly by the sector. Employment creation is a key Government objective and a major objective of the energy policy. Direct employment prospects within the industry include the electricity utility, the petroleum industry, electrical contractors and other smaller service industries within the sector.

ent creation are the following:

- the field of energy, the lack of which is perpetuated by the absence of a human resources development programme;
- Increasing the number of energy related subjects in the institutes of learning;
- Increasing engineering courses in the tertiary institutions ï to discourage companies outsourcing skills and services from outside the country;
- Encouraging the small and medium scale energy related companies; and
- Developing a consultancy based system for local empowerment within the energy sector.

5.7.3 Increasing employment opportunities

The energy sector is a high skills area and Government should promote the development and implementation of capacity building programmes. These programmes should address energy matters and the appropriate means required to encourage job creation within the energy sector. Comprehensive strategies should be developed to build knowledge and entrepreneurial skills to encourage the development of small and medium scale energy related companies.

Government will facilitate the development of a human and institutional capacity building programme for the energy sector.

This can be implemented through investigating the potential for running appropriate courses at colleges and tertiary establishments, and how this would be viewed and supported by the major employers.

Programmes will be developed which support employment creation. In particular, opportunities for local manufacture of components required for rural electrification will be investigated.

5.8 Quality assurance and quality standards

5.8.1 Overview

A quality assurance framework and quality standards are essential to ensure that appropriate equipment is used for the correct purposes, and that health and safety standards are upheld and the environment is protected. Quality standards give consumers an assurance that a technology will perform as advertised and will not fail immediately or be a danger to the user.

Standards and regulations related to energy efficiency are mainly applied to buildings, cars and household energy-using appliances. Regulations also provide a basis to establish label protocols. Standards and labels affect the market for energy efficient products in

m efficiency value or ban certain appliances red standard.

fective, however the economic and energy effects of traded products extend beyond national borders. They can have trade implications and raise issues of competitiveness. As a result, regional and international co-operation is important.

The Standards and Quality Act 2001 provides for the establishment of the Swaziland Standards Authority (a national standards body). The Standards Authority will prepare, promulgate and implement national standards by adopting relevant international standards in various disciplines as stipulated in the World Trade Organisation Agreement on Technical Barriers to Trade Article 2.

5.8.2 Main issues

The main issues relating to quality assurance and quality standards are:

- Development of quality standards and assurance mechanisms in the country for energy related products;
- Ensuring wiring of public buildings and homesteads is to a satisfactory standard. There are presently no wiring standards in the country; and
- Developing an infrastructure for testing of energy related products;

5.8.3 Standards and testing

One way of maintaining a certain standard and quality of products is to develop and or adopt quality assurance practices in the energy sector.

Government will develop and adopt appropriate quality standards for energy related equipment and activities.

Such equipment could include solar PV and solar hot water systems, electrical wiring, filling of LPG bottles, paraffin storage and bottling etc. It is also necessary that accredited testing stations are available to ensure that standards are being followed. Government may choose to develop her own standards or adopt international standards or legislation as necessary.

Swaziland imports most of its products and there is a need to ensure that these products are safe for use and meet the required specifications.

Government will facilitate the establishment and accreditation of quality testing units within the country.

This will require the involvement of tertiary institutions, Government bodies and the private sector. The Standards Act also provides for the establishment of accredited testing and measurement facilities to calibrate equipment against national standards and to determine the quality of commodities (locally produced goods and imports).

ency has been Voluntary Agreements (VAs). nt and industries for wide range of actions by gotiated agreements, self-regulation, codes of conduct, and eco-contracts. VAs are increasingly common, as energy efficiency is seen more as a useful means to reduce greenhouse gas emissions and meeting other environmental and economic objectives.

5.9 Research and Development (R&D)

5.9.1 Overview

As a developing country, the main focus for Research and Development (R&D) is on applied research rather than basic research. Priority areas of applied research and development include the following:

- Energy systems and technologies;
- Renewable energy technologies;
- Energy efficiency at end-use, supply and generation levels;
- Integrated decentralised systems (e.g. solar, diesel etc);
- Policy and regulation; and
- Linkage between environmental issues and energy.

Currently, no formal energy research programme is being undertaken by Government, NGOs or the private sector. This is partly because of the lack of capacity to undertake such research. Some energy related research is being carried out by industry as part of normal operation strategies. In addition, some small firms are active in R&D for commercial interests. Some NGOs and Government extension services have also been involved in R&D on wood fuel stoves.

It is important that R&D is carried out internally within the country to ensure that it is focused and can directly address the needs of consumers, businesses and Government policy. R&D can also facilitate employment creation, through the establishment of research centres. R&D taking place within the country, should be in line and in collaboration with regional and international research practices to avoid duplication and to learn from experience.

5.9.2 Main issues

The following key issues should be addressed in relation to research and development:

- Developing and communicating a clear prioritisation of research needs in the energy sector;
- Limited capacity to implement research;
- Finding effective ways of collaborating more closely with tertiary institutions and supporting their research agenda;
- Supporting the National Research Council; and

NGOs, tertiary institutions, energy suppliers earch projects and funding of R&D.

5.9.3 Research strategy and programme

Local capacity and resource constraints dictate that a strategy be developed to channel and focus energy research activities. This strategy will in turn facilitate the development of a programme detailing priority activities and funding responsibilities. The programme will in particular allow for international collaboration and assistance.

Government will facilitate development of an energy R&D strategy and programme based on national priorities and taking advantage of research agendas of other sectors and institutions.

The National Energy Policy will require periodic review to identify areas requiring amendments. There will be need also to conduct pilot projects for the purposes of assessing various energy technologies. This will require extensive consultations with stakeholders in the design and implementation of this strategy. Such a research strategy could be developed and implemented in collaboration with the National Research Council. The strategy will also need to be updated from time to time to reflect the nationôs R&D needs. The active players in the energy sector would be encouraged to participate in and fund these activities.

5.9.4 Policy research and development

Policy R&D is crucial in the monitoring and identification of needs which require policy interventions and reviews, as may arise from time to time. Policy research can identify gaps and weaknesses of the energy policy and highlight the need for revision of the policy. Policy research is cross-cutting in nature and requires sensitivity to social, political, technological, environmental and economic factors.

Government will establish a Policy Research Unit within the Energy Department that will be responsible for planning and undertaking policy-related research and development.

The Policy Research Unit, in co-operation with other stakeholders, will be responsible for gathering basic data, identification of policy issues and identification of suitable policy options and their implications. The Unit will be part of the National Research Council, which is the umbrella body for the country.

5.10 Energy planning

5.10.1 Overview

Energy planning is a function within the mandate of the Energy Section of the Ministry of Natural Resources and Energy. The tasks include: the monitoring and identification of

yses of different options for the supply of of introducing energy savings and energy ing to the concrete implementation of the be seen as the result of such analyses finally leading to the development of the future energy system of Swaziland.

In day-to-day operations, analyses are performed to identify the means to increase security of supply, optimise the energy system from an economic point of view and to introduce means of reducing the harmful environmental impacts of energy generation and consumption. Such analyses are necessary when considering relevant investments in the energy system and also in prioritising and directing the resources available from international assistance programmes. The introduction of Demand-Side Management (DSM) and Integrated Resource Planning (IRP) are also closely related to the planning function.

The availability of up-to-date and precise data on energy supply and consumption is a precondition for assessing the impact of the energy policy and for performing analysis on the consequences of different policy options and finally on the revision, monitoring and evaluation of the energy policy. The dissemination of information on energy matters also requires that quality data on supply and demand are available.

The Ministry performs the task of collecting and processing statistical data for the supply and demand of energy. The data collection comprises of existing data from the Department of Statistics on imports and exports, as well as questionnaires to the main energy suppliers and consumers followed up by interviews as and when necessary.

Response to these questionnaires and inquiries has in many cases been positive from the industries and consumers approached, even though there is no legislation on compulsory data collection. On the other hand, not all have responded. There may therefore be a need for legislation authorising Government to perform such surveys on a regular basis and for the public to respond. Such legislation would need to guarantee that the responding companies are protected with regard to sensitive data. Once received, this data needs to be evaluated and processed in order to be usable for analytic purposes and information to the stakeholders and the general public.

5.10.2 Main issues

The main issues regarding energy planning are:

- Compulsory provision of energy data;
- Capacity to monitor and evaluate the sector;
- High quality data is a prerequisite to carry out a reliable analysis and to prepare the Energy Balance for the country; and
- Reliable energy data will be an advantage for industries and suppliers, who can obtain a more precise picture of their performance.

planning capacity within the energy sector. The establishment and maintenance of effective management systems is essential in order to implement the energy policy and ensure rational planning for the future. There is also the need to maintain energy research and development programmes tailored to the energy policy.

Government will ensure that adequate means for collection of statistical data are available.

Due care will be given to companies in order to protect sensitive data from competitors. In conducting energy surveys, the Ministry will ensure co-ordination and communication with the Central Statistical Office.

It is also necessary that an appropriate energy planning model is adopted, in order to make simple assessments of the viability of potential energy projects. Sufficient capacity and training to implement and develop the model will also be required.

5.11 Regional and international energy trade and co-operation

5.11.1 Overview

The economy of Swaziland, as a landlocked country, is dependent on relations with its neighbours and their outlets to the regional and international markets. Swaziland imports a major part of its electricity, and all petroleum products and coal utilised in the local industry from her neighbours. Exports of goods to the region are sent via the harbours in Maputo in Mozambique, and Richards Bay and Durban in South Africa. Coal produced in Swaziland is exported to its neighbours and internationally.

The SADC region has a huge potential in terms of energy resources, most notably hydropower. There is presently surplus power available and more if all the hydropower potential could be developed.

The Southern African Development Community Energy Protocol was developed in 1996. Its goal was to develop regional energy co-operation amongst its members. Other areas of focus are information and experience exchange, training and organisational capacity, and energy investment and financing.

Regionally, the energy sector is changing with liberalisation, in line with international global trends being undertaken by all Member States. The energy sector is being opened up for new players, especially the private sector, to enter the markets and to off-load

his will facilitate energy trade in the region

morandum of Understanding was formally established. This resulted in the SADC Inter-Utility Memorandum of Understanding, which established the Southern African Power Pool (SAPP). The energy sector of Swaziland is integrally linked with the region, and is characterised by influences of international trade and events.

5.11.2 Main issues

The main issues associated with regional and international trade and co-operation include:

- Ensuring increased energy trade regionally and internationally to maximise economic and social opportunities and benefits for the citizens;
- Reducing trade barriers;
- Increasing skills and technology transfer and enhanced information exchange;
- Facilitating energy investment in projects and co-operation; and
- Reducing the impact of political risk insurance on energy projects.

5.11.3 Regional energy trade

Regional relations are crucial to the well being of Swaziland and its economic stability and success. The energy supply depends on imports in the region, which are in some sectors influenced by international pressures, especially the oil markets. Swaziland is actively involved in energy trade and participates in all regional forums in order to increase supply diversity and be a player in the regional markets.

Government will promote and take full advantage of regional co-operation and will ensure the development of legal, regulatory and institutional frameworks that are in harmony with regional agreements.

To obtain the maximum benefit from regional co-operation, Government will require a strong institutional capacity. Continuous monitoring of regional developments, especially those embraced by the agreements Swaziland has entered into, is required. Communication with other Governments in the region should be enhanced to facilitate the exchange of information and experience. Furthermore, it will be necessary to promote capacity building and the training of specialists to implement the policies on international energy trade and co-operation.

5.11.4 International energy trade

International energy markets have a serious influence on regional markets. Swaziland has previously been exporting coal to the international markets. There are a number of international agreements that Swaziland has entered into. It would be beneficial to the country to feature in all international energy organisations in order to follow global trends in the energy markets. There is a need for Government to establish prioritisation of

nal organisations and conventions. There is emoval of barriers to energy trade.

e a member of international energy bodies and will establish national committees to pursue international energy trade and co-operation.

The country could obtain maximum benefit from membership of international organisations or bodies backed by strong local committees. Hence, there is a need to establish a National Committee of the World Energy Council. In the long-term a national energy council or forum could be established with strong involvement of the private sector and other key stakeholders.

5.11.5 Reducing trade barriers

The country imports most goods and services from the neighbouring countries and abroad. Increased participation in energy trade benefits the countryôs development and also, in terms of diversifying the sources of supply ensures security of supply. There are however, many barriers in the importation of energy equipment and products which need to be relaxed. Renewable energy technologies and energy efficient equipment that are environmentally friendly require special attention.

Government will reduce trade barriers on energy products addressing employment and environmental issues for the country.

5.11.6 Energy investment and political risk insurance

Investment in energy activities by the private sector can enhance regional and international energy trading. Support for investors is essential and an enabling environment should be created and maintained. An enabling legal, regulatory, and fiscal and tax environment, infrastructure capacity and proper controls should be in place. There is need for the establishment of instruments to cover political risks of energy investment in the country, which are now a requirement of large investors. If such tools are not in place, energy investments will be unaffordable for most developing countries and the potential for energy investment will be reduced.

Government will investigate the necessary instruments to increase energy investment and to cover possible risks to ensure maximum benefits without having a serious detrimental effect to the economy as a whole.

Political risk insurance will need to be investigated by the Government to handle this important investor requirement on large energy infrastructure projects. There is also a need to develop capacity in the country to handle international agreements, involving political risk insurance.

6.1 Overview

The Ministry is dedicated to the development of the energy sector of the country for the benefit of the countryôs economy and its citizens. In the design of the policy project, every effort was made to identify the institutional framework and the means to implement the policy. All stakeholders emphasised that Government should have an ñimplementableò National Energy Policy. Such a policy would require a strong support base to carry it forward from the public sector, private sector, donors, organisations like the NGOs, CBOs, etc and the public. A strong co-ordination and communication role is essential throughout the life of the policy.

6.2 Main issues

The main issues include

- Lack of institutional framework;
- Limited capacity; and
- Poor communication and co-ordination.

6.3 Establishment of institutional framework

The Ministry is committed to developing an implementation strategy and plan in order to make the policy a reality. It is necessary that once the plan is in place, the institutions involved in the energy sector should use it in co-ordinating their activities. The strengthening of existing, and the establishment of new institutions should be a priority for implementing the policy, in conjunction with an awareness drive to all people of the country.

Government will create an institutional framework to implement the National Energy Policy and to improve co-ordination.

6.4 Means for implementation of the policy

The means to be used in this energy policy can be divided into the following categories:

tor (i.e. institutional changes, relationships to
o-operation, local participation, development
ration projects);
- Regulatory means (i.e. legislation, efficiency standards, safety and environmental standards, standards for quality assurance of products);
- Voluntary and legal agreements between Government and the key stakeholders, e.g. the industry and the petroleum sector;
- Economic means (i.e. pricing mechanisms, economic incentives, fiscal allocation for specific programs, levies and taxes); and
- Information activities (i.e. labelling of appliances, information and awareness campaigns, demonstration projects).

Government will prioritise and assess an appropriate and effective means for implementation to meet the National Energy Policy objectives and priorities.

However, implementation of many of the initiatives contained within the Policy will require substantial resources with regard to both capital and human input. All the required resources might not be available at the adoption of the policy but may in some cases materialise when the policy is developed further. A prioritisation of the initiatives is necessary in order to allocate the scarce resources to the most important initiatives and in order to obtain the most effective benefit from the resources available.

The allocation of national economic resources and implementation of supporting legislation needs to be approved by Government. The prioritisation should provide a sound planning structure for the policy implementation. In general, the role of Government in the energy sector should be limited to regulatory and policy intervention. There is need for legislation, which will provide incentives for more efficient performance and at the same time enhance an efficient industry structure based on private sector principles. Governmentôs monitoring and legislative leadership is required in order to protect consumers and to compensate for social and undesirable effects, which may result from the profit oriented actions of the private sector.

Policy goals and measures should be understood in the light of the limitations on the national resources and the energy market.

The current players in the energy sector are listed in Annex 3.

6.5 Strengthening and establishment of energy governance institutions

6.5.1 Overview

The Ministry is responsible for the general governance of the energy sector. The Ministry is responsible for the development and implementation of the National Energy Policy and is accountable to Cabinet, Parliament and the general public.

a mandate to formulate long-term energy plans for projects. The Section has to communicate with all stakeholders involved in energy activities, which include the Parliamentary Portfolio Committee, Government departments, parastatals such as SEB, energy suppliers and consumers, NGOs, researchers, and the tertiary institutions.

The Ministry is tasked with the management and investigation of demonstration projects. It also has a mandate to improve and maintain regional and international co-operation with bodies such as SADC, WEC, AFREC and foreign governments and organisations with whom agreements have been entered into. The Ministry should establish strong links with other policies that have a bearing on energy policies. There is need for stronger co-ordination with the environmental agencies of Government and with agencies dealing with poverty, health and safety. Emphasis will also be placed on gender issues.

The Ministry needs to formulate legislation to govern and supervise the Government owned energy institutions and to provide them with strategic direction on their operation activities.

6.5.2 Main issues

The main issues in ensuring a unified and appropriate governance framework are:

- Development of a clear and transparent governance framework;
- Strengthening of existing organisations;
- Establishment of new bodies, if and when appropriate; and
- Ensuring that the governance framework takes cognisance of rural and traditional issues.

6.5.3 Establishment of an Energy Department

The Energy Section within the Ministry of Natural Resources and Energy was established to be responsible for the fuels and energy portfolio for Government. According to the review of the Government structures by the Public Sector Management Programme (PSMP), the Energy Section was found to be hampered by a limited human resources capacity and required strengthening in a number of areas, in particular, with regard to the handling of petroleum issues and also data handling and analysis. It was also found necessary that a research unit is established.

Government will establish an Energy Department with an appropriate budget and expertise.

The policy recommends the establishment of a Management Board to provide independent capacity and monitoring of the Energy Department. In order for the Energy Department to function effectively, it should be headed by a Director who will report to the Management Board. The Board will advise the Energy Department and the Minister on energy issues in the country. The Department should be staffed with a multi-skilled

s, energy economists, and a legal advisor

ervices:

- provision of advice to the Minister and Principals;
- establishing legislation;
- developing and reviewing policy;
- managing the energy projects programme;
- overseeing the Energy Regulatory Authority, Rural Electrification Agency, parastatals and the energy industry; and
- administering energy acts, which includes exercising some regulatory functions.

To enable the energy sector to function effectively, a research unit should be established within the Department to monitor and evaluate the policy implementation, and/or recommend revisions when necessary.

6.5.4 Petroleum Inspection Unit

The import of petroleum products is an issue of major concern to Government. There are presently no mechanisms in place to ensure the accurate recording of products brought into the country, their transportation, storage, and quality. There is a major need for Government to inspect and monitor these products, for both ensuring correct payment of taxes and levies and to ensure a good quality and safe product is available to consumers.

Government will establish a Petroleum Inspection Unit whose role will be to oversee adherence and compliance to petroleum standards and legislation.

Qualified inspectors will be employed within the Energy Department and be provided with an adequate budget. The inspectors will monitor petroleum standards and fuel specifications for the country. They will also be involved in consulting with the Customs Department on all imports entering the country.

6.5.5 Regional Energy Units

The Energy Section is responsible for many rural energy issues. However, the present infrastructure does not have the capacity to address needs, projects and programmes at a local level.

Government will establish Regional Energy Units.

The Regional Energy Units will carry out extension work and assist in ensuring information is disseminated to a broad spectrum of the populace. The Units will be situated in regional offices to address specific local energy issues and respond to queries from stakeholders. They will form part of the Energy Department and report to the relevant Senior Officer.

al Energy Forum

orum will provide independent platform to ment on policy issues. This will also ensure that the development and implementation of the policy is consultative and responds to the needs of the public. The participants in the forum should be from a broad cross-section of society and should include representatives from NGOs, CBOs, gender based organisations and disadvantaged groups, and representatives from the different sectors of industry, agriculture and commerce. Such a forum will also assist in raising awareness of energy issues.

Government will establish a National Energy Forum, involving independent organisations to advise Government on energy policy.

Specific legislation will be required to create the National Energy Forum, defining its powers, functions and structures.

6.5.7 Intra-Governmental planning

It is essential that co-ordination between Government departments and Ministries is improved. Many issues relating to energy are relevant to other Ministries, for example petroleum impacts upon the issues of finance and customs and excise.

Government will ensure there is greater co-ordination and integration of planning of energy issues and policy implementation.

The Public Policy Co-ordinating Unit is responsible for co-ordinating planning and the harmonisation of policies.

6.5.8 Fuel Pricing Committee

Proposals for changes in prices of controlled petroleum products are discussed and recommended by a Fuel Pricing Committee. The Fuel Price Controller in consultation with the Minister approves prices based on the Committeeôs recommendations.

The Fuel Pricing Committee will be strengthened to effectively assess and advise on pricing in the petroleum industry.

The role of the pricing committee will be reviewed periodically until an Energy Regulatory Authority is established, which may take over the functions. Specific training may be required for members on petroleum issues regarding pricing.

6.5.9 Clean Development Mechanism (CDM) Secretariat

The Clean Development Mechanism has been developed through the Kyoto Protocol and the United Nations Framework Convention on Climate Change (UNFCCC). It allows industrialised countries to purchase ñcertified emissions reductionsò from projects in developing countries which mitigate climate change. Developing countries can also

ed for projects that focus on sustainable sions reduction projects. In order to develop infrastructure is required to administer and d verification.

Presently the National Meteorological Services are co-ordinating the Governmentôs involvement in climate change issues.

Infrastructure shall be established in the country to facilitate and encourage developments under the Clean Development Mechanism and other similar arrangements.

A Secretariat will be established in close consultation with the National Meteorological Services and the Swaziland Environment Authority.

6.5.10 Establishment of local energy committees and use of traditional structures

Local people are best suited to address energy issues pertinent to specific communities/ areas. These groups can set up forums within the area to educate and raise awareness on energy issues and also provide feedback to national or regional committees and to Government.

Government will facilitate the establishment of local energy committees within communities.

The committees will be established by the local authorities and assisted by the Regional Energy Units in co-operation with relevant NGOs. These committees can either be new committees or integrated within existing structures, e.g. Natural Resource Management Committees.

The energy policy also needs to recognise the existing traditional authorities and structures in order for energy projects to be successful. This will increase local participation, raise awareness and minimise potential conflicts.

Government will involve traditional structures in the development and implementation of the energy policy.

The Government will have a mandate to update the public on energy issues through the established traditional structures.

6.5.11 Strengthening of local energy organisations

There is a need to promote and encourage independent energy agencies and institutions that enhance the effectiveness and efficiency of the energy sector. Such organisations may include educational establishments, such as VOCTIM, SCOT and UNISWA, and

ssociation of Swaziland (REASWA). The
jects, research, demonstrations etc

The capacity of local organisations, with an interest in energy issues, will be strengthened.

There is also a need to develop capacity within local consulting companies. Private sector activities should be delegated to these entities. Funds for training will be sourced to enhance our local consultancy companies and institutions.

6.5.12 Swaziland National Committee for the World Energy Council

This committee was established in 1989 in order for the country to benefit from the World Energy Council. This included participation in forums and research, and access to literature on energy related activities throughout the world. The membership of the World Energy Council comprises more than 100 countries.

Government will ensure that the Swaziland National Committee for the World Energy Council is strengthened.

6.6 Energy Regulatory Authority

6.6.1 Overview

An Energy Regulatory Authority (ERA) will be established to oversee the energy sector within Swaziland. Initially, its scope will be restricted to the ESI, however as other energy industries are restructured (e.g. liquid fuels, coal, renewables etc), they can be added to the schedule. The ERA will be responsible for the issuing of licences to generators, the monitoring of the performances of the utilities and IPPs, monitoring and controlling the selling cost in the chain, and new distribution (e.g. rural electrification). The ERA will also be responsible for addressing complaints and queries from energy consumers.

6.6.2 Main issues

The main issues surrounding the proposed ERA are:

- Ensuring a shift from a monopoly electricity market towards liberalisation;
- Allowing fair and transparent access to the market;
- Ensuring affordable energy services for all;
- Ensuring certain standards of performance by the industry;
- Bringing on board liquid fuels and coal when the time is right and ensuring the correct legislation is in place; and
- Decreasing the regulatory role for Government and parastatals.

ations

ed as part of the electricity supply industry
ty Act of 1963 will be replaced with a new Electricity Act, an Energy Regulatory Authority Act and an SEB Act.

The Energy Regulatory Authority (ERA) will be established through the Energy Regulatory Authority Act. The ERA will report to the Minister of Natural Resources and Energy and Parliament. The main source of funding for the ERA will come from licence fees and levies from the companies being regulated, in order to ensure the independence of the organisation.

Government will establish the Energy Regulatory Authority and ensure it has appropriate budgetary requirements to fulfil its functions.

Prior to the establishment of the ERA, Government needs to ensure that all of the appropriate guidelines and regulatory instruments are in place. The ERA will be designed in such a way that it could be integrated into an overall regulatory authority for the country, which could regulate all sectors.

S, MONITORING AND EVALUATION

7.1 Policy priorities

The development of a National Energy Policy sets out to enable the Government and private sector to provide reliable, affordable and environmentally sound energy production and distribution for the country. The challenge facing Swaziland as a landlocked country is to expand its economy to support a growing population and to increase the standard of living of all citizens.

In light of the Governmentôs limited financial and human resources, the various policy options presented have been prioritised for implementation in the short to medium/long term. The prioritisation exercise will be monitored and co-ordinated with other Government policy statements and directions. The policy implementation is a dynamic process. Basic assumptions may change over time (such as energy prices) and priorities may change as society develops. It is therefore necessary to review the energy policy regularly and evaluate if changes or improvements are necessary.

The short to medium/long term goals are guidelines to indicate the priorities for the energy sector, which Government needs to focus on to meet the overall vision of the energy sector, which is:

Ensuring that the development goals of the country are met through the sustainable supply and use of energy for the benefit of all the citizens of the country.

In order for Government to implement the National Energy Policy a comprehensive implementation plan will be developed. The plan will focus on realistic fulfilment of the policy statements and elaboration of strategies as well as a time frame for implementing the policies during the short and medium/long term.

Each policy statement relates to the objectives, as stated in Section 1.6.

A. Ensuring access to energy for all;
B. Enhancing employment creation;
C. Ensuring security of supply;
D. Stimulating economic growth and development; and
E. Ensuring environmental and health sustainability.

Priorities have been formulated, based on the policies and grouped according to the policy objectives. These have been separated into short term priorities and medium/long term priorities. Short-term is considered to be up to five years, medium to long term is considered to be from five to twenty years, in line with National Development Strategy.

ıcentrate on the priorities listed below. The that the Government will take up in the implementation programme.

A. Ensuring access to energy for all

- Developing a Rural Electrification Master Plan;
- Providing electricity to all schools, clinics and essential public institutions in rural areas and facilitate the reticulation of domestic dwellings;
- Developing a mechanism that will make prices affordable to rural areas;
- Developing effective means of ensuring adequate access to energy services throughout the country, including financing systems;
- Supporting dialogue and co-ordination among agencies and communities involved in rural development;
- Establishing new electricity and regulatory legislation for liberalising the electricity supply industry;
- Consolidating all relevant petroleum legislation into a Petroleum Act;
- Establishing a detailed inventory for mini and micro hydro power sites and the ranking of the sites with the highest potential;
- Developing wood fuel demonstration programmes and information dissemination for sustainable energy use; and
- Developing a conceptual framework on how to use sustainable energy to tackle poverty.

B. Enhancing employment creation

- Facilitating the energisation of rural areas and create SMEôs to assist locals to gain entry to the energy industry;
- Facilitating the development and implementation of a human and institutional capacity building programme;
- Establishing energy research and development in line with the vision of the National Research Council; and
- Improving the participation of women in energy programmes and activities and greater enrolment in energy related disciplines.

C. Ensuring security of supply

- Investigating the establishment of a coal fired thermal power station for the country;
- Promulgating a regulation from the Fuel Oil Levy Act 1980, that will require the petroleum companies to store a minimum quantity of stocks;
- Developing mechanisms for ensuring diversification of the sources of petroleum products imported into the country;

s for petroleum products sufficient to sustain
ays;
n African Power Pool (SAPP) to benefit from
the increased electricity trade in the SADC region; and

- Maintaining co-operation with regional and international bodies dealing with energy.

D. Stimulating economic growth and development

- Improving energy governance and institutional capacity framework to implement the policy;
- Restructuring the Energy Office into an Energy Department;
- Facilitating the removal of barriers to energy trade and investment;
- Establishing an Energy Regulatory Authority (ERA);
- Establishing fully transparent and cost reflective electricity tariffs;
- Liberalising the Electricity Supply Industry and investigate the various commercialisation opportunities for the utility;
- Investigating means of achieving least cost retail prices of LPG and paraffin;
- Conducting a cost-benefit analysis regarding increased use of indigenous coal;
- Establishing infrastructure in the country to encourage developments under the Clean Developments Mechanism (CDM) and other similar arrangements;
- Developing and adopting appropriate quality standards for energy related equipment and activities; and
- Developing an annual energy policy statement targeted at stakeholders, politicians, investors and the general public, to be published by the Minister.

E. Ensuring environmental and health sustainability

- Developing programmes promoting the utilisation of renewable energy resources;
- Establishing a centre for demonstration and education on renewable energy and sustainable energy;
- Encouraging and enhancing where applicable, topics on renewable energy and energy in general in educational and training curricula;
- Encouraging a wider use of solar water heaters in residential and commercial buildings;
- Formulating and implementing programmes on awareness raising and information dissemination on energy savings;
- Developing and implementing quality control measures that will ensure that marketers of oil products adhere to agreed product specifications ï including environmental considerations ï and that these conform to regional and/or international standards;
- Developing legislation to ensure that all stakeholders in the oil and transport industry manage their waste oil in an environmentally friendly manner; and
- Introducing safety standards for LPG and paraffin equipment.

nitiatives that will be implemented in the

A. Ensuring access to energy for all

- Ensuring that there is adequate access to all appropriate forms of energy;
- Developing sustainable financing mechanisms for the extension of the electricity grid throughout the country;
- Maintaining programmes on the manufacturing and utilisation of briquettes to satisfy energy needs;
- Facilitating and promoting the adoption of sustainable energy options in an effort to assist low-income households; and
- Ensuring that energy prices for low-income groups take into consideration affordability to ensure access to energy for all

B. Enhancing employment creation

- Continuing and maintaining the development of energy R&D strategies and programmes;
- Supporting the development and implementation of capacity building in the energy sector; and
- Encouraging the promotion of entrepreneurship in the sector in co-operation with players in the energy sector.

C. Ensuring security of supply

- Investigating the resource potential for coal-bed methane and its use for energy purposes;
- Conducting further research on the coal resources of the country;
- Developing and implementing the blending of ethanol with petrol, with a focus on reducing petroleum imports and improving the environment;
- Establishing a comprehensive study to evaluate the future energy supply options;
- Developing and implementing demand side management; and
- Promoting and taking full advantage of regional co-operation and ensure the development of legal, regulatory and institutional frameworks that are in harmony with regional agreements.

D. Stimulating economic growth and development

- Introducing and encouraging competition within energy markets;
- Encouraging the integration, harmonisation and implementation of the various national policies;
- Facilitating the establishment and accreditation of quality-testing units within the country;

management programmes for Government

odies; and

- Establishing mechanisms to increase investment and to cover political risk insurance;

E. Ensuring environmental and health sustainability

- Reviewing and updating the Renewable Energy Action Plan every five years;
- Encouraging the use of clean coal technologies;
- Encouraging development of an energy appliance labelling programme;
- Promoting programmes supporting sustainable wood fuel use;
- Promoting efficient and environmentally sound technologies for utilisation of indigenous resources for electricity production;
- Encouraging the production of charcoal for the household cooking market where it can be clearly shown that it will be environmentally sustainable;
- Establishing efficiency standards for charcoal kilns;
- Conducting a study to identify harmful emissions from all sub- sectors in the energy sector;
- Monitoring and assessing the appropriateness of present legislation to ensure the health and safety of the population; and
- Phasing out leaded petrol and high sulphur diesel.

7.2 Revision, Monitoring and Evaluation of the Energy Policy

7.2.1 Policy review and revision

Elaboration of a National Energy Policy is not a one-time exercise. Basic assumptions and priorities may change over time. The Policy priorities will require a substantial amount of resources in order to be implemented and available resources may also change. The Policy will therefore have to be reviewed regularly in line with the national three-year rolling plan.

The energy sector is in constant transition and development. The international oil crises in the 1970ôs and 1980ôs are examples of a politically influenced impact on the supply sector. Based on the experiences from these crises, security of supplies, diversification of supplies, energy efficiency and savings remain high on the energy agenda. The global trend of liberalisation of electricity and natural gas markets are examples of commercial developments with huge consequences.

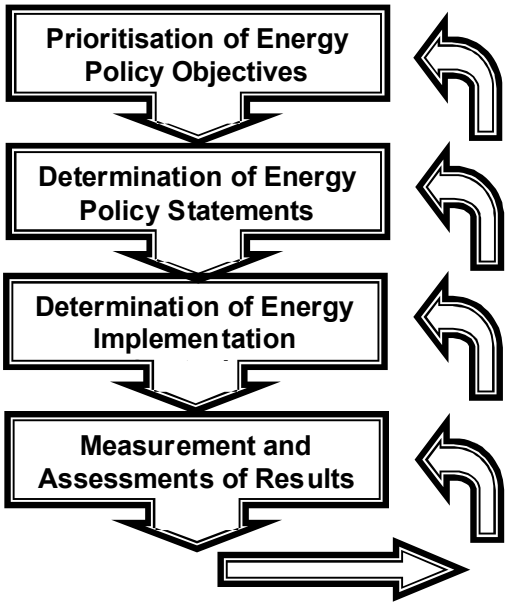
ronment is also an example on how the
s concentrating on environmental issues in a

It must therefore be realised that the energy sector is constantly developing, both with regard to technology, policy and management. These changes will naturally affect the stated policies, which with regular intervals will have to be reviewed and revised if necessary.

Progress on the stated policies will also have to be monitored regularly to ensure that the policy is actually implemented, and if this is not the case, the reasons should be considered.

Figure 9 describes the process required to review the policy. This should be carried out at regular intervals by the Policy Research Unit.

Figure 9: Policy review



The national energy balance, supplemented with other indicators to describe the present situation (e.g. the present use of indigenous resources, the size of the national stock of petroleum products, the emissions from the energy system of pollutant gases etc), can be used as a base line for measuring the results of the National Energy Policy in the future.

At regular intervals (i.e. every year) the selected indicators should be assessed, and the policy decision makers should then consider if there is a need to adjust the means for implementation. At greater intervals (e.g. every fourth ï sixth year), the energy policy

should be discussed and adjusted if found

7.2.2 Monitoring

Monitoring entails maintaining a regular analysis of the implementation of the policy and its impact. Monitoring provides a useful feedback loop to the policy development process so that future activities and strategies can be modified, if necessary, in the light of past experience.

Monitoring of the stated policies should be carried out once a year. Some of the policy statements can be easily measured and quantified. For example, the level of households connected to the electricity grid, or off-grid demonstration projects can be quantified. The stocks of petroleum products can also be relatively easily quantified. However, other policy initiatives may require a more complex or qualitative approach.

A monitoring system for the National Energy Policy will be put in place.

Annual monitoring reports will be produced containing details of implementation progress, effects and impact of the policy.

Since all energy initiatives have a consequence on the energy supply and demand, a regular update of the energy statistics will be an important monitoring tool. It will therefore be essential that the energy statistics and the energy balance are updated every year.

7.2.3 Evaluation

There is a need for periodical evaluation of the policy. Evaluation is a structured procedure applied in an objective way in order to assess if the policy has actually brought about the expected benefit. Such an evaluation on a regular basis should be a natural part of policy implementation. In many cases, major energy projects are based on comprehensive feasibility studies stating expected benefits for the specific project, i.e. energy savings or reduced costs. Such projects should later on, when experiences have been gained, be evaluated compared to the original expectations.

The National Energy Policy will be subjected to a comprehensive evaluation in five year cycles.

This evaluation exercise is not only intended to raise criticism but also to gain knowledge on how projects or policies could be better planned in the future. The monitoring reports will be major inputs to the evaluation.

Energy Statement

by the Minister for Natural Resources and Energy will represent a good opportunity to inform the public and stakeholders on recent energy developments.

An Annual Energy Statement targeted at stakeholders, politicians, investors and the general public will be published by the Minister.

The Statement could include an update on the policy prioritisation plan to keep track on progress of the policy initiatives. Adding the latest energy statistics and energy balance would also be of benefit to the Annual Statement.

ıstainable supply and use of energy in the country, in an environmental, economically and socially acceptable manner.

The Energy Sector has large sub-sectors, hence the need for a strong institution, and co-ordination and communication strategies. To make the implementation effective, there is need to increase capacity, both in the public and the private sector to achieve the goals and the vision of the energy sector. The policies will be translated into action plans in a comprehensive National Energy Policy Implementation Strategy. This Strategy will detail the methodologies and programme for implementation of the activities, the key organisation to will carry out these activities and the resources required.

Several policies have strong linkages with the energy sector (besides the NDS). The interrelations between these need to be borne in mind in order to improve co-ordination and avoid contradictions:

a) National Transport Policy

A transport policy is now in place. This policy does not include explicit strategies on fuel-efficiency for vehicles. Since the transportation sector constitutes about 18% (1999) of total final energy demand, the proper linkage between the transport policy and the energy policy is important. Transportation policy will directly influence the consumption pattern of transportation fuels in the country.

b) National Forest Policy

A policy on forestry and forestry legislation is underway. Since the household sector depends heavily on biomass fuels, the forest policy will have an impact on the energy policy and vice versa. For example the draft Forest Policy also includes a statement that ñmeasures have to be taken to ensure sustainable supply of wood fuel to meet the needs of communitiesé ò. Additionally, both the Forest Policy and the Energy Policy have interests in the development of industrial forestry, the latter being interested in generation of energy from forestry residues.

c) National Environment Policy

Environmental protection has evolved to be key to sustainable development. The draft national Environment Policy and the Environmental Management Bill 2001 are aimed at enhancing, protecting and conserving the environment and hence support the attainment of sustainable development. The most significant environmental issues with regard to energy use are: deforestation resulting from wood fuel collection; air-pollution resulting from combustion of wood and fossil fuel combustion; human health and safety due to burning of firewood for indoor cooking and visual impacts of energy infrastructure projects. As such, the environmental policy will influence the energy policy.

d) National Land Policy

A draft land policy has been prepared. The goal of this policy is to address and redress land matters with a positive framework that inspires public confidence and encourages development towards the vision of national development. Land policy is important particularly in consideration of the provision of energy in rural areas. Land tenure structure has also been identified as of importance when considering the sustainability of forest reserves and hence wood fuel supply.

e) Resettlement Policy

A Rural Resettlement Task Force under the Ministry of Agriculture and Co-operatives has drafted the National Resettlement Policy. The purpose of this policy is to guide the planning, implementation and monitoring of rural resettlement. For rural electrification,

ic viability of many projects and hence
eas.

A project to formulate a mining policy is underway. One of the key objectives of the project is to establish a modern policy, legal and institutional framework for exploration and mining activities in Swaziland, taking into account investorôs concerns and goals as well as the objectives and interests of the country. The mining policy and the energy policy will overlap in term of coal use and therefore coal policies have to be harmonised.

g) Privatisation Policy

Four main objectives describe the aims of the proposed privatisation policy in terms of the energy sector. First, the policy intends to relieve Government of the burden of funding public enterprises. Second, the policy will provide for raising of finance for the Government through divestiture of ownership of these enterprises. Third, the policy aims to increase private individual and corporate participation in public enterprises. This could be achieved through private ownership of shares by local Swazi individuals, groups of individuals, or by private companies. Private participation could also mean privatisation of certain functions or services being undertaken by the public enterprises thereby generating business opportunities for locals (outsourcing). Fourth, privatisation is also expected to improve the efficiency of public enterprises through pressure from private sector return requirements and competition (where possible). This policy will have a significant impact on the electricity industry in Swaziland since it will provide guidance for the possible privatisation of SEB.

h) Gender Policy

A Gender unit has been established within the Ministry of Home Affairs. A Gender policy is not yet in existence. There are gender-related concerns in the energy sector, particularly the burden women disproportionately bear in providing the energy needs of (rural) households e.g. gathering wood fuel. For this reason the gender policy will impact on the energy policy and vice-versa. Considerations could also be given to other energy sub-sectors to investigate their gender sympathy e.g. transport energy.

i) Climate Change Convention

The National Meteorological Services (NMS) is the focal point for the United Nations Framework Convention on Climate Change (UNFCCC) which was established in Rio and ratified by Government in 1996. The objective of this Convention is to achieve stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The Convention supports the concept of sustainable development, and calls for the development and sharing of environmentally friendly technologies and information. The Kyoto Protocol to this Convention provides for flexible mechanisms in North-South co-operation in mitigating climate change. The Clean Development Mechanism (CDM) allows industrialised countries to purchase ñcertified emission reductionsò by investing in projects contributing to sustainable development of developing countries and at the same time mitigating climate change. Since energy contributes over 50% to climate change,

ce for projects which contribute to climate
eloped to establish a CDM Secretariat in the

j) Convention to Combat Desertification (CCD)

Swaziland ratified the CCD in 1996. A National Action Programme (NAP) has been formulated. This convention is relevant to the energy sector due to the contribution of the sector to deforestation. Therefore the energy policy needs to be cognisant of the NAP and the CCD in order to improve the efficiency of dealing with this problem. The Ministry of Agriculture and Co-operatives Land Use Planning Section is the focal point for the Convention.

k) Convention on Biological Diversity (CBD)

The CBD was ratified in 1994. It comprises three main components: 1) biodiversity conservation; 2) sustainable utilisation; and 3) access to the benefits arising from biodiversity conservation.

l) NGO Policy

Many energy issues relate to improving access to energy services for rural communities. NGOs are often best placed to interact with these communities to assess their needs and ensure the appropriate services are provided at affordable costs.

m) Health and Safety

Many activities and technologies relating to energy can be hazardous to health, especially when not used correctly. It is essential that consumers and users of such are protected. A National Environmental Health Policy is presently being drafted. This is viewed as an addendum or adjunct to the National Health and Social Welfare Policy Document. It addresses health issues across all sectors including clean water supply, disposal and handling of wastes, food safety, and pollution, to name but a few. Issues relating to Health and Safety at Work are contained in three laws: the Factories, Machinery and Construction Works Act, 1972, the Workers Compensation Act of 1984, and the. Occupational Safety and Health Act 2001.

n) Law of the Sea Convention

Articles 125 and 129 of the convention give landlocked countries access to the sea. This is of major relevance to countries such as Swaziland when addressing security of supply issues. For example, there may be opportunities for importing petroleum directly to the country.

o) Basel Convention

The Basel Convention addresses the issue of trans-boundary transfers of waste. Presently, Swaziland has not signed up to this convention. The major consequence is that the country can not export its waste oil, some of which finds its way into the ground and river when storage facilities are overflowing.

p) Population Policy

was developed to ensure a nation of healthy, people where population dynamics are as envisaged in the National Development Strategy.

q) Resettlement Policy

A draft Resettlement Policy is underway in order to facilitate rural development and economic growth. This will address key issues such as: land acquisition; the concept of land use rights; relinquishment of land; rational land use practices; choice of resettlement model; linking objectives and methods of resettlement; institutional framework; role of authorities; management of land disputes; and compensation.

r) Poverty Reduction Strategy

The overriding objective of Swazilandôs Poverty Reduction Strategy and Action plan is to reduce the incidence of poverty in the Kingdom of Swaziland by more than half from the current level of 66% to 30% by the year 2015 and to eliminate it altogether by 2022.

s) Stockholm Convention on Persistent Organic Pollutants

The Stockholm Convention on Persistent Organic Pollutants was opened for signature in 2001. It aims to reduce the emission of organic pollutants such as dioxins, PCBs, furens etc.

ENERGY BALANCE 1999 **Unit: TJ**

				Kerosene	LPG	Jet fuel	Fuel oil	Electricity	Wood fuel	Bagasse	Other	Total
Total primary Energy supply	**6461**	**3747**	**4099**	**520**	**413**	**58**	**423**	**3007**	**12270**	**9382**	**269**	**40649**
Production	12950							705	12270	9382	269	35576
Imports	6461	3747	4099	520	413	58	423	2302				18023
Exports	12950											12950
Total transformation	**-587**		**-10**					**551**	**-1103**	**-2105**		**-3254**
Public power plants			-10					5				-5
Self generation	-587							950	-1103	-2105		-2845
Distribution losses								-404				-404
Total final energy consumption	**5874**	**3747**	**4089**	**520**	**413**	**58**	**423**	**3558**	**11167**	**7277**	**269**	**37395**
Sectorial consumption												
Agriculture		58	450			26		491				1025
Industry and mining	4375	340	348		12		423	2528	5184	7277		20487
Transport		3349	3291			32						6672
Commerce & services												
Households total	1499			520	401			539	5983		269	9211
Households urban	1498			260	306			484	437		1	2986
Households rural	1			260	95			55	5546		268	6225

Jet fuel includes aviation gasoline.
Other comprises: candles, agricultural wastes and animal wastes.
Kerosene includes illumination paraffin and power paraffin.
Woodfuel includes: Firewood (comm. and non. comm), industrial wood waste, bark and "Black liquor".
Please note that electricity consumption in industry and commerce and services is not statistically well separated.

are briefly described below.

(a) Ministry of Natural Resources and Energy

In 1992, an Energy Office was established in the Ministry, responsible for all energy related matters. Its mandate was to administer, manage and regulate all energy issues in the country. In order to achieve this mandate the Energy Office, referred to as the Energy Section, has initiated, monitored and evaluated various projects and feasibility studies over the years. Notably, projects in the field of solar energy, rural electrification, molasses-based ethanol production, household energy, coal utilisation, energy management and electricity supply options have been carried out to obtain technical and economical information required to be able to achieve its goals and formulate policies on energy issues.

The Energy Section also collects and analyses statistical information on energy consumption and supplies, and advises Government, public institutions and the private sector in all energy related matters. Various energy models have been applied to establish energy balances and forecasts.

(b) The Swaziland Electricity Board (SEB)

SEB is the state owned electricity utility. SEB is responsible for most of the generation and supply, import, transmission and distribution of electricity. Presently SEB is also the authority responsible for granting licenses to other electricity producers (industry co-generation and small hydro). The Ministry of Natural Resources and Energy is presently restructuring the electricity supply industry and developing a new regulatory framework, which will apply to SEB.

(c) Ministry of Finance

The Public Enterprise Unit (PEU) of the Ministry of Finance is presently regulating and monitoring the activities and financial performance of SEB as a Government enterprise, through the Public Enterprises (Control and Monitoring) Act of 1989. PEU is also mandated to establish performance contracts with all parastatals and to advise the line Ministries responsible for the utilities.

(d) Swaziland Environmental Authority (SEA)

SEA was established in 1992 to address environmental issues within the country. SEA is also responsible for the issuance of Environmental Compliance Certificates for any projects, both small and large. The Environmental Management Bill, 2001, was developed to provided for and promote the enhancement, protection and conservation of the environment and where appropriate, the sustainable management of natural resources.

(e) Fuel Pricing Committee

This Committee assists the Ministry on an ongoing basis in matters related to the pricing and supply of petroleum products. It comprises stakeholders from the petroleum industry, consumer associations, transport associations and Government departments involved with petroleum issues. The committee meets monthly to review local, regional and international fuel prices and their impact on the national economy.

stry in matters pertaining to their general interests and participates in negotiations with all regulatory authorities affecting the industry. The association represents all dealers in the country supplied by the different oil companies.

(g) Independent Power Producers

Some of the major industries produce electricity for use in their production process and for adjacent company towns. These are the Ubombo, Mhlume and Simunye sugar industries and the Sappi Usutu pulp industry. Swaziland Plantations also operates a hydro generator.

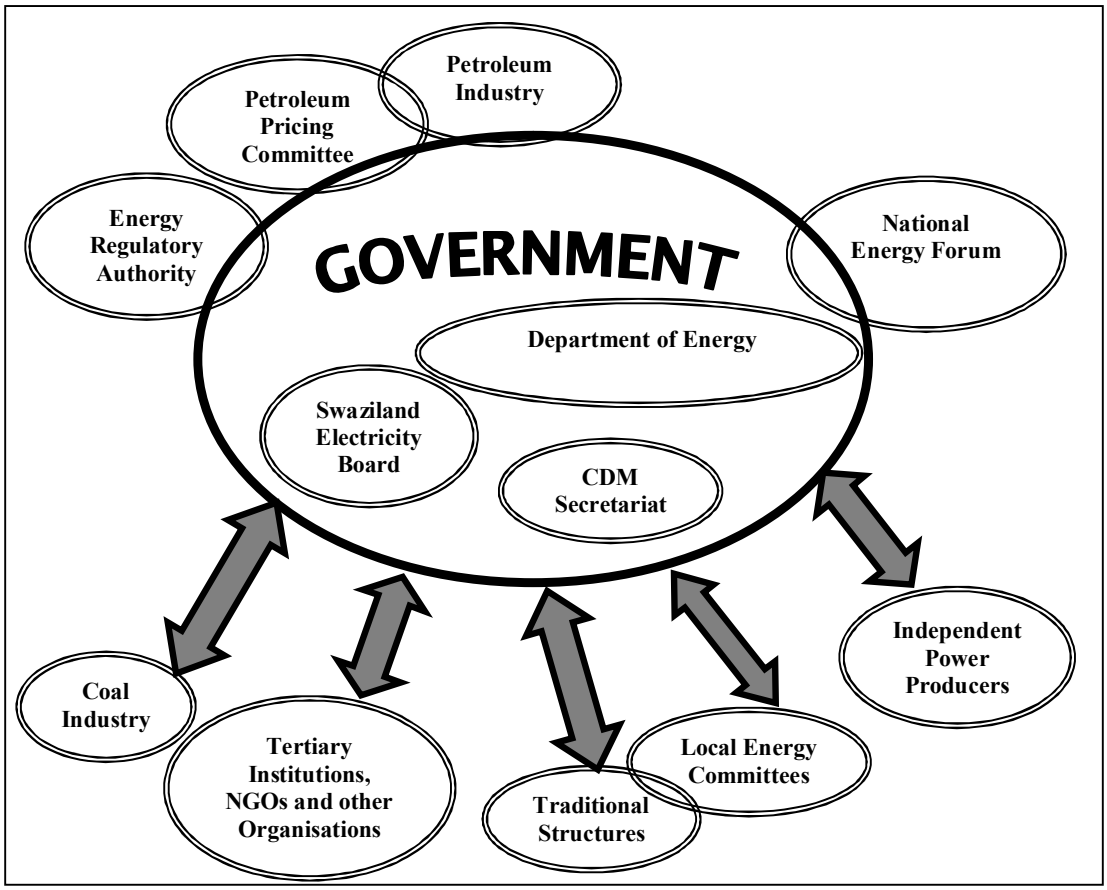
In the light of global energy liberalisation throughout the world, the role of Government in the management of the energy sector should be limited to a regulatory role and policy development. This would provide for a more efficient performance of the sector and could enhance an efficient industry structure rooted in the private sector.

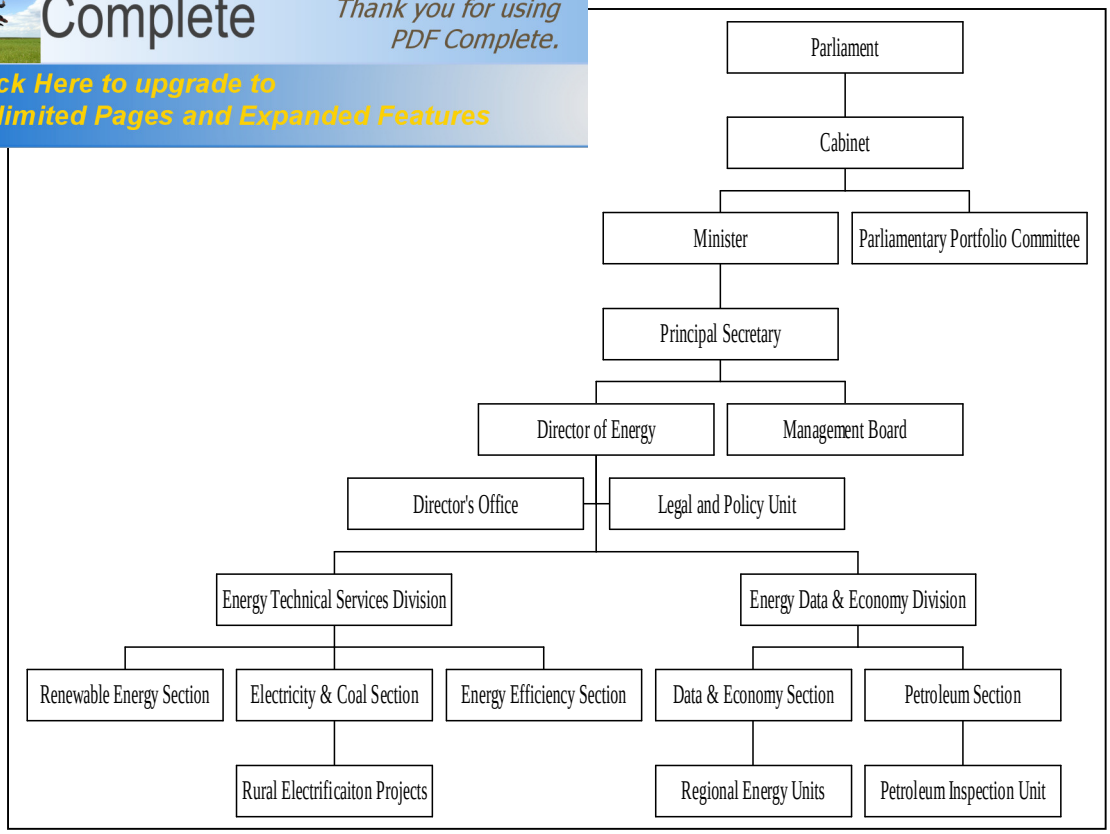
(h) Tertiary institutions and NGOs

There is a long history of collaboration and co-operation between Government and the tertiary institutions and NGOs on energy projects and energy research.

work Organograms

uture institutional framework and the linkages between the relationship between Government and the relevant energy related organisations. The second organogram describes the internal structure within the Department of Energy.





ve efficiency of energy use in agriculture, such as the provision of information and use of low-energy equipment (2.1.3)

- Government will ensure there is adequate access to all appropriate forms of energy to support rural farming (2.1.4)
- Government will ensure continued improvement of the electricity supply infrastructure for the industrial sector as part of the overall strategy for attracting investment (2.2.3)
- Government will initiate an energy efficiency and conservation programme to encourage energy savings (2.2.4)
- Government will implement an awareness-raising programme for the commerce and services sector on energy efficiency and conservation measures (2.3.3)
- Government will ensure that an energy management programme for all her institutions is implemented (2.3.3)
- Government will integrate and harmonise implementation of the various national policies related to the transport sector (2.4.3)
- Government will promote fuel saving measures in the transport industry (2.4.4)
- Government will progressively introduce tighter maintenance and inspection procedures so as to stimulate development of more energy efficient and environmentally friendly modes of transport (2.4.4)
- Government will ensure the participatory establishment of multipurpose woodlots and individual tree growing so as to increase rural wood fuel supply (2.5.3.1)
- Government will promote the development and dissemination of improved cooking technology as part of a wider strategy on the reduction of wood fuel consumption (2.5.3.2)
- Best means of availing suitable alternatives to wood fuel, such as LPG, paraffin, electricity, wood fuel briquettes and solar cookers will be advocated (2.5.3.3)
- Government will ensure meaningful integration of energy within broader rural development interventions through forging dialogue and co-ordination among agencies and communities involved (2.5.3.4)
- Government will encourage the use of credit schemes for energy projects for rural households (2.5.3.4)
- National awareness raising programmes and action strategies aimed at improving education and information dissemination on energy technology options, costs and technical know-how will be developed and implemented (2.5.3.5)
- The electric power system in urban areas will be upgraded and maintained in order to deliver quality and reliable service to urban households (2.5.4.1)
- Government will encourage utilities and service providers to increase connectivity of urban households (2.5.4.1)
- An awareness creation programme and action strategy aimed at improving energy savings and conservation in urban households will be developed and promoted (2.5.4.2)
- The energy needs and characteristics of peri-urban areas will be examined and the means of improving access to appropriate energy services will be determined and applied (2.5.5)
- Government will conduct a cost-benefit analysis regarding increased use of indigenous coal in the industry and households taking due consideration of the environmental and health consequences (3.1.3)

coal fired thermal power station will be conducted

ane and its use for energy purposes will be

- Government will investigate the appropriateness of various pricing incentives and taxation so as to encourage the use of clean coal technologies (3.1.6)
- Government will facilitate sustainable and expedient utilisation of the coal resources by private sector interests, in line with sustainable human development goals articulated in the NDS (3.1.7)
- Price regulation shall be maintained in the short term and will be subject to review so as to ascertain its appropriateness and relevance in the longer term (3.2.3)
- Government will investigate deregulation options in the medium to long term (3.2.3)
- Regulation of service stations and fuel outlets by means of the Rationalisation Plan will be maintained, and modifications to the Plan will be effected every five years (3.2.4)
- Government in collaboration with the oil industry (including LPG suppliers) will develop effective means of ensuring adequate access to petroleum products (3.2.4)
- Government will require commercial companies to store a minimum quantity of stocks to ensure fuel availability (3.2.5)
- Government will put in place quality control measures that will ensure that marketers of oil products adhere to agreed product specifications ï including environmental considerations ï and that these conform to regional and/or international standards (3.2.6)
- Government will ensure diversification of the sources of petroleum products imported into the country so as to enhance security of supply as well as take advantage of competitively priced fuels available in the international markets (3.2.6)
- Government will ensure the oil industry increases the involvement of locals (3.2.7)
- Government will conduct further investigations on blending ethanol with petrol with a focus on introducing products in the local markets (3.2.8)
- Government will monitor pricing of LPG products more closely and will facilitate a closer dialogue between herself, suppliers and dealers (3.2.9)
- Government will continue with the present restructuring process and will investigate the various commercialisation opportunities for the electricity supply industry (3.3.3)
- Government will continue to facilitate improvement of the electricity supply infrastructure and thus improve the energy supply service (3.3.4)
- Government will ensure there are clear guidelines for opening access to the national grid (3.3.5)
- Government will carry out investigations and promote efficient and environmentally sound technologies for the utilisation of indigenous resources for electricity production (3.3.5)
- Government will support programmes promoting the utilisation of renewable energy resources for electricity production (3.3.6)
- Government will establish and support demonstration plants aimed at promoting the utilisation of the various technologies (3.3.6)
- Government will create an enabling environment to allow the establishment of IPPs in the country and support projects to be implemented (3.3.7)
- Government will ensure that electricity tariffs are fully transparent and cost reflective (3.3.8)
- Government will develop a renewable energy information programme and will establish and maintain an appropriate renewable energy information system (3.4.4)

ssemination of information and demonstration of
4.4)
nstration and education on renewable energy and

- Appropriate financing mechanisms will be further investigated and facilitated (3.4.5)
- Government will introduce and enhance where applicable, topics on renewable energy and energy in general in educational and training curricula and will encourage the provision of specialised courses in renewable energy (3.4.6)
- The capacities of development agencies, which promote and implement sustainable programmes on renewable energy, will be strengthened (3.4.6)
- An appropriate centre for quality assurance and standards for energy applications, in particular renewable energy technologies will be established (3.4.7)
- Government will promote demonstration units to display these technologies, for example through Tinkhundla centres (3.4.8)
- Government will encourage a wider use of solar water heaters in residential and commercial buildings through promotional means and support for private sector initiatives (3.4.9)
- Government will develop a programme to install solar water heaters on all her institutional buildings (3.4.9)
- The general production of charcoal for the household cooking market will be encouraged if it can be clearly shown that it will be environmentally sustainable (3.4.10)
- Government will investigate a framework for establishing efficiency standards for charcoal kilns (3.4.10)
- Government will further investigate the manufacturing and utilisation of briquettes to satisfy energy needs (3.4.11)
- Government will investigate the opportunities for the adoption of other clean and renewable energy technologies (3.4.12)
- Government will pursue grid electrification particularly in densely populated resettled areas and areas with high development potential (4.4.1)
- Off-grid electrification options may be more appropriate and could be implemented in areas remote from existing grid lines and less densely populated, where grid connection may be too costly (4.4.2)
- Government will encourage the development of demonstration projects for the various off-grid technologies (4.4.2.)
- Government will investigate the appropriateness of sustainable renewable energy technologies to assess their potential future application for off-grid electrification (4.4.2)
- Government will ensure that all schools, clinics and essential public services in rural areas are provided with electricity (4.5.1.1)
- Government will ensure that agricultural, commercial and industrial development areas are provided with electricity (4.5.1.2)
- Government will facilitate the reticulation of domestic dwellings in an affordable manner in conjunction with the utilities (4.5.1.3)
- Government will develop a Rural Electrification Master Plan (4.6)
- A Rural Electrification Agency will be established to implement and monitor rural electrification (4.6.1)
- A dedicated fund will be established and used to provide financial support to rural electrification (4.6.2)

s for petroleum products are established in the

ns are in place to deal with supply disruptions in erves (5.1.3)

- Government will investigate opportunities for increased local power generation and will endeavour to take advantage of the availability of cheap power in the region through the SAPP (5.1.4)
- Government will develop an energy efficiency programme amongst the energy sub-sectors of the economy (5.1.5)
- Government will investigate and promote the use of environmentally friendly fuels, energy products and technologies (5.2.3)
- Government will ensure that environmental standards and principles are included in the guidelines, regulations and licensing procedures for the Energy Regulatory Authority (5.2.3)
- Government will conduct a study on identifying harmful emissions from all sub-sectors in the energy sector and methodologies and prioritisation on how to reduce them (5.2.4)
- Government will investigate opportunities for energy from waste (5.2.5)
- Government will develop legislation to ensure that all stakeholders in the oil and transport industry manage their waste oil in an environmentally friendly manner (5.2.5)
- Government will investigate and promote the safe use, storage and transport of fuels and energy technologies in all sectors (5.3.2)
- Government will assess the appropriateness of present legislation to ensure the health and safety of the population, for both the employees in the energy sector and consumers and users of energy products (5.3.2)
- Government will facilitate the establishment of the National Energy Savings Association to promote and implement energy savings activities across all sectors in the country (5.4.3)
- Government will formulate and implement programmes on awareness raising and information dissemination on energy savings (5.4.4)
- Government will investigate introducing energy efficiency into the educational curricula (5.4.4)
- Government will promote energy management skills and energy accountability in organisations across all sectors (5.4.5)
- Government will ensure that building standards and regulations, which promote energy conservation in both commercial and domestic buildings, are in place (5.4.6)
- Government will establish a long-term programme for implementing energy efficiency and energy savings throughout her institutions (5.4.7)
- Government will encourage development of an energy appliance labelling programme at a regional level (5.4.8)
- Application of Demand Side Management principles will be promoted within the electricity utilities (5.4.9)
- Government will develop a programme to remove the barriers to the realisation of energy efficiency (5.4.10)
- Government will promote and facilitate adoption of sustainable energy options in an effort to assist low-income households (5.5.3)
- Means for absorbing all or part of investment as well as future investment costs of energy infrastructure for low-income households will be investigated (5.5.4)
- Government, in collaboration with other agencies, will continue to search for the best ways of making micro-finance available to low-income households (5.5.4)

ess to affordable energy services for low-income

tivated to participate in energy programmes and

- Government will promote greater enrolment of women in energy related disciplines (5.6.4)
- Government will facilitate the development of a human and institutional capacity building programme for the energy sector (5.7.3)
- Government will develop and adopt appropriate quality standards for energy related equipment and activities (5.8.3)
- Government will facilitate the establishment and accreditation of quality-testing units within the country (5.8.3)
- Government will facilitate development of an energy R&D strategy and programme based on national priorities and taking advantage of research agendas of other sectors and institutions (5.9.3)
- Government will establish a Policy Research Unit within the Ministry that will be responsible for planning and undertaking policy-related research and development (5.9.4)
- Government will ensure that adequate means for collection of statistical data are available (5.10.3)
- Government will promote and take full advantage of regional co-operation and will ensure the development of legal, regulatory and institutional frameworks that are in harmony with regional agreements (5.11.3)
- Government will actively participate and be a member of international energy bodies and will establish national committees to pursue international energy trade and co-operation (5.11.4)
- Government will reduce trade barriers on energy products addressing employment and environmental issues for the country (5.11.5)
- Government will investigate the necessary instruments to increase energy investment and to cover possible risks to ensure maximum benefits without having serious detrimental effect to the economy as a whole (5.11.6)
- Government will create an institutional framework to implement the National Energy Policy and to improve co-ordination (6.3)
- Government will prioritise and assess an appropriate and effective means for implementation to meet the National Energy Policy objectives and priorities (6.4)
- Government will establish an Energy Department with an appropriate budget and expertise (6.5.3)
- Government will establish a Petroleum Inspectorate whose role will be to oversee adherence and compliance to petroleum standards and legislation (6.5.4)
- Government will establish Regional Energy Units (6.5.5)
- Government will establish a National Energy Forum, involving independent organisations to advise Government on energy policy (6.5.6)
- Government will ensure there is greater co-ordination and integration of planning of energy issues and policy implementation (6.5.7)
- The Fuel Pricing Committee will be strengthened to effectively assess and advise on pricing in the petroleum industry (6.5.8)
- Infrastructure shall be established in the country to facilitate and encourage developments under the Clean Developments Mechanism and other similar arrangements (6.5.9)

of local energy committee within communities

es in the development and implementation of the

- The capacity of local organisations, with an interest in energy issues, will be strengthened (6.5.11)
- Government will ensure that the Swaziland National Committee for the World Energy Council is established (6.5.12)
- Government will establish the Energy Regulatory Authority and ensure it has appropriate budgetary requirements to fulfil its functions (6.6.3)
- A monitoring system for the National Energy Policy will be put in place (7.2.2)
- The National Energy Policy will be subjected to a comprehensive evaluation in five year cycles (7.2.3)
- An Annual Energy Statement targeted at stakeholders, politicians, investors and the general public will be published by the Minister (7.3)

Bagasse	Organic residue from sugar processing. It is frequently used as a fuel for power generation.
Biofuels	Fuels derived from organic matter that can be used to substitute other fuels.
Biomass	Organic, non-fossil material of biological origin constituting an exploitable renewable energy resource.
Carbon Dioxide (CO_2)	The gas formed in the ordinary combustion of carbon, given out in the breathing of animals, burning of fossil fuels etc. It is a major contributor to climate change.
Coal	A readily combustible black or brownish-black rock formed from plant remains that have been compacted, hardened, chemically altered, and metamorphosed by heat and pressure over geologic time. The most common types found in Swaziland are anthracite and semi-anthracite.
Cogeneration	The production of electricity and another form of useful energy (such as heat or steam) used for industrial, commercial, heating, or cooling purposes.
Cost-reflective	In relation to electricity tariffs, whereby the price is representative of the actual cost of supplying electricity. For example, industrial electricity tariffs should be lower than those for domestic customers, as they do not involve the lower voltage networks.
Cross subsidy	When prices are not cost-reflective, one sector is supporting lower prices in the other. Present trends are to phase out cross subsidies, however they may sometimes be necessary for social reasons.
Electricity generation	The process of producing electric energy or transforming other forms of energy into electric energy. The amount of electric energy produced is expressed in watt-hours (Wh/kWh/MWh/GWh).
Energy	The capacity for doing work. Energy has several forms, some of which are easily convertible and can be changed to another form useful for work. Most of the worldôs convertible energy comes from fossil fuels that are burned to produce heat that is then used as a transfer medium to mechanical or other means to accomplish tasks. Electrical energy is usually measured in kilowatt-hours, while heat energy is usually measured in British thermal units.
Eskom	The parastatal electricity utility for the Republic of South Africa.

ufactured frequently from molasses, and used as a

Fossil fuel	Any naturally occurring organic fuel formed in the Earthôs crust, such as oil, coal and natural gas.
Geothermal	Utilisation of heat energy from deep inside the earth. Wells are drilled to exploit the steam or hot water. This is either converted to electricity or utilised directly.
Greenhouse gases	Gases which, when concentrated in the atmosphere, prevent solar radiation trapped by the Earth and re-emitted from its surface escaping. The result is a rise in the Earthôs near surface temperature. Carbon dioxide is the largest in volume of the greenhouse gases and others include halocarbons, methane, nitrous oxide, hydrofluorocarbons, perofluorocarbons, and sulphur hexafluoride.
Gross Domestic Product (GDP)	The total value of goods and services produced by labour and property in the country.
Hydropower	The production of electricity from the kinetic energy of falling water.
In-Bond-Landed-Cost (IBLC)	Model used by SACU countries to determine petrol retail prices.
Independent Power Producer (IPP)	Wholesale electricity producers (other than the Government parastatal SEB) that are unaffiliated with the utility. Unlike traditional electric utilities, IPPs do not possess transmission facilities and in most cases sell power to the grid.
Lilangeni/emalangeni	The legal currency of the Kingdom of Swaziland. This is currently fixed at par with the South African Rand.
Member States	Countries which are members of SADC.
Methane	Hydrocarbon gas, can be formed through the breakdown of organic matter in the absence of oxygen, for example when organic waste is buried.
Ministry	The Ministry of Natural Resources and Energy with the Government of Swaziland.
Off-peak	Electricity usage patterns vary throughout the day. Early in the morning and early evening, the demand is high, and the cost of electricity is expensive. During periods of low usage (off-peak), the cost of supplying electricity is cheaper. It is therefore in the interest of the utility to

	o change their patterns and use more during off-
	ty generated from the sunôs rays through solid state semiconductor devices that have no moving parts.
Poverty	The state of having insufficient income, consumption possibilities, and human development, and a lack of access to and control over assets, with consequent insufficient education and health.
Renewable Energy	Energy obtained from sources that are essentially inexhaustible (unlike, for example, fossil fuels, of which there is a finite supply). Renewable sources of energy include conventional hydroelectric power, wood, waste, geothermal, wind, photovoltaics, and solar thermal energy.
Southern African Customs Union (SACU)	Involves Botswana, Lesotho, Namibia, South Africa and Swaziland. The aim of SACU is to provide co-operation in terms of trade.
Southern African Development Community (SADC)	Angola, Botswana, Democratic Republic of Congo, Malawi, Mauritius, Mozambique, Namibia, Lesotho, Seychelles, South Africa, Swaziland, Tanzania, Zimbabwe and Zambia.
Tindvuna Tetinkhundla	Councillors for constituencies.