

White Paper on the Energy Policy of the Republic of South Africa

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1. Ministerial foreword

South Africa is a country endowed with abundant energy resources. Fossil fuels, such as coal, uranium, liquid fuels, and gas, play a central role in the socio-economic development of our country, while simultaneously providing the necessary infrastructural economic base for the country to become an attractive host for foreign investments in the energy sector. Biomass forms the main energy source in the rural domestic sector, while other renewable energy development opportunities are already being explored in the fields of solar power, wind power, pumped storage and in hydro-power schemes.

Successful tapping of all possible energy carriers in our country is vital for sustainable economic growth and development. We are fortunate in South Africa to be in a position to utilise such a broad spectrum of energy carriers. Various economic sectors that contribute to the GDP of our country are practically driven by these energy carriers.

For instance, the manufacturing sector, which accounts for about 25% of GDP, and the mining industry, which accounts for about 10%, are both heavily reliant upon electricity. In fact, industry as a whole consumes approximately 40% of the total electricity generated. This means that electricity is one energy carrier that makes a significant contribution to our economic growth and development. This is made possible by the fact that industry alone accounts for a sizeable proportion of local capital investment.

As government pursues its macro-economic policy on growth, employment and redistribution, as well as its policy of reconstruction and development, changes take place within the energy sector that continue to present us with interesting challenges. These challenges include the transformation of state-owned entities, the reshaping of governance principles, the enhancement of socio-economic welfare within communities, and even changing people's attitudes towards the use and importance of national energy resources.

Government is committed to the promotion of access to affordable and sustainable energy services for small businesses, disadvantaged households, small farms, schools, clinics, in our rural areas and a wide range of other community establishments. As provided for in our Constitution, the state must establish a national energy policy which will ensure that the national energy resources shall be adequately tapped and developed to cater for the needs of the nation. Energy should therefore be available to all citizens at an affordable cost. Energy production and distribution should not only be sustainable, but should also lead to improvement of the standard of living for all of the country's citizens. For this to become a reality, the state should ensure that energy production and utilisation are done with maximum efficiency at all times.

In view of all of the above, our energy policy should preserve an appropriate balance between energy demand and supply. It should pronounce itself on short, medium and long term priorities. It should also balance the use of natural energy resources with environmental considerations.

The state should establish a clear difference between its primary role as a policy making and regulatory entity of the energy sector, and its secondary role as a facilitator in the supply of energy services.

This White Paper has been written so as to clarify government policy regarding the supply and consumption of energy for the next decade. The policy strengthens existing energy systems in certain areas, calls for the development of underdeveloped systems and demonstrates a resolve to bring about extensive change in a number of areas. It addresses international trade and co-operation, capacity building, and the collection of adequate information. The document is comprehensive, addressing all elements of the energy sector as practically as it can.

Considering the complexity of some of the priority policy changes, it will not be possible to implement the whole body of new policy in the short to medium term. The executive summary gives an indication of the government's priorities.

The White Paper was developed by an active process of consultation, beginning with the publication of the *Energy Policy Discussion Document* in August 1995. This process was concluded in December 1998 when Cabinet approved this White Paper as Government policy on Energy. The Introduction and the Appendix give more information on this consultation process.

The White Paper is intended for parliamentarians, those involved in the energy sector and any other concerned and interested parties, including energy suppliers, and consumers, employees in the energy sector, researchers, academics, environmentalists, policy makers, contractors, product developers and manufacturers. The White Paper takes a broad approach, but provides specific policy statements on what Government intends for the energy system as a whole. It does not attempt to deal with strategies, for implementation. Indeed, such issues are part of the core functions of my Department. It should be borne in mind that my Department is not dealing with energy matters from a 'greenfields' approach. We are continuously engaged in strategic planning and review regarding the implementation of our functions in the delivery of energy systems to communities in the country on a day-to-day basis. The White Paper will not therefore serve as a means to 're-invent the wheel', but will constitute a formal framework within which the energy sector will operate within the broad national strategy for reconstruction and development. It will serve to bring more focus and direction to what is already being achieved.

This document is the product of an intense process in which a large number of dedicated people participated. They are the authors of the Energy Policy Discussion Document, the organising committee of the consultation process, commentators on the Energy Policy Discussion Document and members of my Department, to list but a few.

I would like to thank the Parliamentary Portfolio Committee on Minerals and Energy for having called public hearings and for the positive public response. The response on the draft White Paper by the public was also positive. The NEDLAC discussions have assisted in clarifying and understanding the policy issues from labour and business perspectives and have enhanced the White Paper.

Special thanks are due to the International Energy Agency and the United States Department of Energy for their dedicated evaluation documents, direct participation in a variety of workshops and detailed advice and support. To all of you I would like to convey my thanks for the hard work that you have put into this important project. I trust that your reward will be to see that the energy policy that we implement in the future is the best one for our country. We want it to achieve our main goal: the socio-economic development of all our people.

Dr P M MADUNA
MINISTER OF MINERALS AND ENERGY

2. DEPUTY MINISTER'S FOREWORD

Energy is the life-blood of development. Development is about reducing poverty and about increasing access to basic needs so as to allow people the freedom of self development. Communities do not exist in a vacuum but within a framework of government policies, laws and institutions. It is therefore incumbent on us to present an energy policy that will achieve our desired objectives.

South Africa has a relatively strong energy supply industry, to the extent that we export energy in the form of coal, electricity and liquid fuels. Previous policy neglected the energy demand sector, and especially that of our poor communities. This energy White Paper endeavours to redress that state of affairs. Without the opportunity for all citizens to participate in the mainstream energy economy, our national and personal development is limited. In this area we need to explicitly address the previously disadvantaged and especially the circumstances of the rural poor.

South Africa has a successful electrification programme, with over 2.4 million households electrified during the period 1991 and 1997. Currently approximately 60% of households are electrified. Recently, pilot projects have been undertaken for the electrification of rural areas using solar energy through photovoltaic systems. Through an integrated programme incorporating inter alia both grid and non-grid technologies, electrification can be sustained.

Notwithstanding the successes of our electrification campaign, renewable energy for such applications as solar hot water heating, wind generated electricity shall also be addressed. Energy efficiency needs to be promoted, especially in households where such measures will increase disposable income. These issues are important not only from a financially viable energy supply aspect but also from an environmental aspect.

The technicalities of energy policy are important, but more so are the social dimensions. The building of human resources is paramount to the effective utilisation of energy and the ensuing benefits. This White Paper therefore addresses these issues as an integral part of the energy policy. This also brings into perspective the important role that women play in our energy economy.

S SHABANGU
DEPUTY MINISTER OF MINERALS AND ENERGY

3. Executive Summary

3.1 Introduction

The South African government last published a white paper on energy policy in 1986. With the end of apartheid South Africa experienced fundamental shifts resulting in significant changes in the energy policy context. The election of a new government necessitated a review of existing policy.

In response to democratisation, a number of negotiating processes began spontaneously within the energy sector, usually in stakeholder-based forums such as the Liquid Fuels Industry Task Force and the National Electrification Forum. Government's wish to integrate these and provide policy stability led to it formally launching the energy policy white paper process in 1994.

The general approach to policy formulation has also changed and places greater emphasis on transparency, inclusiveness and accountability. The energy white paper process has therefore attempted to make government's approach more *transparent*; to build public *confidence*; to *clarify* organisational roles; to *communicate* policy effectively; and to *integrate* policy processes.

The process commenced with the drafting of an Energy Policy Discussion Document by a multi-disciplinary team of experts. It described the energy sector and identified 111 major energy policy issues. Informally known as the 'Green Paper', it was released by the Minister of Mineral and Energy Affairs in August 1995 for analysis and comment. Formal and informal workshops were then held with interested parties (see the appendices). In August 1995, a team of expert 'issue rapporteurs' was appointed to draw up the first draft white paper. Their contributions were then edited for review by an editorial committee. The Draft White Paper was revised during 1997/98 in the Department and Cabinet approved its release in July 1998. The general approach to policy formulation is to recognise problems; to identify causes and solutions; to analyse their implications and make choices; and to implement, monitor and evaluate the effects of policy.

In his historic, budget speech in Parliament on 21st May 1997, the Minister of Minerals and Energy, Dr P M Maduna, set forth a new vision for energy, especially for the liquid fuels industry. He identified the opportunity which exists to restructure and consolidate the state's assets in the industry, whilst achieving maximum value for them. Such restructuring was to be informed, *inter alia*, by the need to redress economic and social power imbalances. Emphasis was also placed on the pursuit of cooperation among African countries and the need for a Pan-African energy strategy. This speech has helped to illuminate South Africa's policy challenges.

Broadly speaking the energy sector can be viewed from demand and supply perspectives. The South African energy sector has historically tended to promote policies, which predominantly address supply side issues. In South Africa the demand side is generally analysed in terms of the energy requirements of households, industry, commerce, mining, transport and agriculture. Supply sub-sectors include the coal, electricity, nuclear, liquid fuels, gas and renewables industries.

From a policy perspective, social problems can arise in both demand and supply sub-sectors. Identifying the causes of these problems can be difficult. Causal linkages may extend beyond the energy sector. Energy policies must, therefore, be carefully co-ordinated with other social sectors and also be co-ordinated between energy sub-sectors.

To cope with multiple causal linkages, energy policy analysis usually commences with the demand side by means of the process entitled- 'integrated energy planning'. This recognises that energy is not an end-good but is rather consumed as a means to an end. Policy must facilitate optimal energy consumption and production to meet social needs. This requires consumer choice and the operation of market forces.

Integrated energy planning suffers from the same drawbacks as other ideal models. It requires a great deal of data and analysis to implement, of which South Africa has a scarcity. Nonetheless, this white paper identifies integrated energy planning as the most suitable base for planning purposes and also addresses the issue of data scarcity.

The logical components dealt with in each demand, supply and cross cutting section are: a *background* to the sector; the key policy *challenges*; government's proposed *policies* with *motivations* where necessary; *implementation*; and *monitoring* and *evaluation*. Clear policy objectives have been established.

3.2 Part 1: Context, Objectives and priorities for energy policy

3.2.1 *The context for energy policy*

Nearly every aspect of social and economic policy in South Africa is being re-examined, reformed and redrafted. As government sets out on a path of growth with redistribution, many economic sectors require bold, new thinking. More than most, the energy sector presents a challenge of transforming specific industries and governance systems.

Before deriving detailed energy policy objectives, however, it is necessary to understand the energy policy context and energy sector challenges. Three aspects are considered:

- economic, social and environmental policies and forces;
- the nature of the South African energy sector and its linkages with broader forces; and
- what the sector needs to achieve overall policy goals.

3.2.1.1 *International context*

International relations had a profound effect on South Africa's energy sector during the apartheid era. South Africa's energy sector is still influenced, albeit differently, by international pressures. As the economy opens up, energy sector decisions must ensure appropriate energy supply and use. Local policy developments inevitably acknowledge international trends.

Significant international shifts have occurred in post-oil-crisis energy policies. South Africa can learn from abroad. Perhaps the most significant shift is that energy security is now being achieved through greater diversification and flexibility of supply. One of the implications is that the energy sector is relying increasingly on market-based pricing. The state is placing greater emphasis on commercialisation and competition. Competitive energy markets need sophisticated regulatory regimes.

Global financial markets are also changing. Private finance is becoming increasingly important. Government needs to create policy that attracts investment, while ensuring the achievement of national policy objectives.

The energy sector has larger environmental impacts than most other economic sectors. Energy policies are reducing emissions as energy investments are subjected to greater environmental scrutiny. There is a greater focus on energy end-use. The research and development of alternative and renewable energy sources is also being promoted.

The Southern African Development Community (SADC) has adopted an energy co-operation policy and strategy. South Africa's energy policy must therefore seek to be compatible with regional energy policy.

3.2.1.2 *National context*

Since 1994, the interests of the South Africa majority have found expression through new social and economic policies, particularly the *Reconstruction and Development Programme* (RDP). The government's

new macro-economic strategy - *Growth, Employment and Redistribution* (GEAR) - places emphasis on two core strategies:-

- promoting growth through exports and investment; and
- promoting redistribution by creating jobs and reallocating resources through the budget.

The energy sector can contribute to economic growth and employment creation, as well as providing infrastructure for households. The RDP base document included a number of policy proposals, especially the electrification of 2,5 million households by 2000, which the industry is well on its way to achieving. By contrast, the RDP white paper and the *Growth, Employment and Redistribution* macro-economic strategy have not set out detailed sectoral strategies.

Government has also prepared a protocol on corporate governance of state-owned entities, including the energy sector. This includes a programme of asset restructuring at the national level, which is being undertaken in terms of the Government policy on rationalisation of State-owned assets.

Sectoral policies recognise linkages and overlaps in related economic sectors. White papers in many of these areas have been, or are in the process of being, developed.

Energy policy must also take into account the provisions of the Constitution of the Republic of South Africa, 1996, which has created new organs of government and demarcated specific powers and functions for the various spheres of government.

Having established the international and national policy context for the energy sector, the white paper examines the sector's problems and challenges to determine energy policy objectives.

3.2.1.3 *The South African energy system*

It is not easy to provide a coherent and comprehensive overview of the energy sector. Perhaps even more difficult to understand are its linkages to, and impact on, the rest of the economy. The white paper gives an overview of the South African energy sector's contribution to GDP, employment, taxes and the balance of payments. It concludes that the sector can greatly contribute to a successful and sustainable national growth and development strategy.

3.2.2 *Energy sector policy objectives*

3.2.2.1 *Increasing access to affordable energy services*

- Government will promote access to affordable energy services for disadvantaged households, small businesses, small farms and community services.

3.2.2.2 *Improving energy governance*

- Governance of the energy sector will be improved. The relative roles and functions of the various energy governance institutions will be clarified, the operation of these institutions will become more accountable and transparent, and their membership will become more representative, particularly in terms of participation by blacks and women.
- Stakeholders will be consulted in the formulation and implementation of new energy policies, in order to ensure that policies are sympathetic to the needs of a wider range of stakeholder communities.
- Co-ordination between government departments, government policies, and the various spheres of government will be improved in order to achieve greater integration in energy policy formulation and implementation.
- Government capacity will be strengthened in order to better formulate and implement energy policies.

3.2.2.3 ***Stimulating economic development***

- Government will encourage competition within energy markets.
- Where market failures are identified government will intervene through transparent, regulatory and other carefully defined and for time delineated mechanisms, to ensure effective delivery of energy services to consumers.
- Government policy is to remove distortions and encourage energy prices to be as cost-reflective as possible. To this end prices will increasingly include quantifiable externalities.
- If subsidies are required these should be implemented transparently based on agreed criteria.
- Energy taxation will continue to remain an option within government's fiscal policy, but will be exercised with more consideration for the economic and behavioural impacts of such policies.
- Government will work towards an investor-friendly climate in the energy sector through good governance, stable, transparent, regulatory regimes and other appropriate policy instruments.

3.2.2.4 ***Managing energy-related environmental and health impacts***

- Government will promote access to basic energy services for poor households, in order to ameliorate the negative health impacts arising from the use of certain fuels.
- Government will work towards the establishment and acceptance of broad national targets for the reduction of energy-related emissions that are harmful to the environment and to human health.
- Government will ensure a balance between exploiting fossil fuels and maintenance of acceptable environmental requirements.

3.2.2.5 ***Securing supply through diversity***

- Given increased opportunities for energy trade, particularly within the Southern African region, government will pursue energy security by encouraging a diversity of both supply sources and primary energy carriers.

The above five policy objectives form the foundation for South Africa's new energy policy.

3.2.2.6 ***Energy policy priorities***

This document outlines specific policy priorities to achieve each policy objective, for both the short and medium term. It is acknowledged that as time passes it may be necessary to amend these priorities.

3.3 **Part 2: Demand Sectors**

3.3.1 ***Households***

The trends indicate the complexity of multiple-fuel use in many households. Beyond the home, energy is required for infrastructural services to communities. Energy services for low income households have not been adequate, since previous governments' emphasis was to create a modern industrial urban society to meet the needs of the industrial sector and a privileged white minority. Households suffering unemployment and poverty rely on less convenient and often unhealthy fuels. Grid electrification may not satisfy all the energy needs of low-income households. Although most household consumers are women, past energy policy has largely ignored their needs. Energy policy has also not adequately addressed energy conservation by high-income electricity-dependent households.

The environmental effects of household energy use are particularly severe on the rural poor, who use fuelwood as their primary energy source. Coal-use in urban areas also results in indoor air pollution with serious health consequences. With both fuels, pollution in many cases exceeds World Health Organisation standards.

Energy security for low-income households can help reduce poverty, increase livelihoods and improve living standards. Government will determine a minimum standard for basic household energy services and monitor progress over time. People must have access to fuels that do not endanger their health. Basic energy needs must consider costs, access and health. Technological interventions are only likely to be used if they are introduced in consultation with households.

Government will have to consider appropriate appliance/fuel combinations; households' abilities to acquire these fuels and appliances; the availability of efficient and safe appliances and fuels; and the effect of pricing and financing on affordability.

Building thermally efficient low cost housing presents an opportunity to promote energy efficiency and conservation. There is also great potential to stimulate energy demand management and other strategies in middle and high-income households. Energy savings would free resources and delay the need for further investment. Government commits itself to the promotion of energy efficiency awareness in households. An initiative is needed to inform householders on how to use appliances and fuels.

3.3.2 Industry, commerce and mining

The overview of the use of energy by this sector also addresses the development of large primary industrial, mining and minerals beneficiation sectors, all of which are energy-intensive. Whilst large industry has been well supplied with energy, a major priority is to provide lesser supplied areas with energy access.

Past governments devoted little attention to energy efficiency in industry, mining and commerce. Greater efficiency will provide financial and environmental benefits, with industry becoming more internationally competitive. Government needs to tap this potential.

Cheap energy benefits our foreign exchange earnings, but there are harmful environmental and health effects, which are not included in the price. Changing international environmental standards may have an adverse effect on some of South Africa's future exports. Government needs to balance energy prices with sustainable environmental standards. Many energy supply/demand issues do not require regulatory intervention. The regulatory framework must, at the same time, stimulate large industry's growth and competitiveness. Productive activities in underdeveloped areas will economically empower the poor. Energy, particularly electricity, is a key requirement for these productive activities.

It is estimated that greater energy efficiency could save between 10% and 20% of current consumption. Government needs to facilitate increased energy efficiency. Obstacles include:

- inappropriate economic signals;
- lack of awareness, information and skills;
- lack of efficient technologies;
- high economic return criteria; and
- high capital costs.

Government commits itself to facilitate greater energy efficiency.

Cleaner energy end-use technologies, environmental performance auditing and incorporating environmental costs could reduce the environmental impacts of energy use by industry, mining and commerce. The Department will collaborate with other departments and public authorities to improve the management of these environmental impacts.

Government will continue to monitor international environmental standards. It will then formulate policies preventing loss of exports due to unwitting violations of the environmental policies of our trading partners. Economic implications of environmental agreements will be properly assessed.

The Department will develop a comprehensive energy demand database that, subject to sensitive commercial interests, will be available to all.

3.3.3 Transport

Liquid fuels play a prominent role although supply security is less important than it was. South Africa now needs equitable access to affordable public transport. Fuel diversity within the transport sector needs to be increased.

Past land policies resulted in the poor being located furthest from work. In addition to being a burden on the poor this results in the inefficient use of transport energy. The Energy White Paper has only limited scope for addressing transport issues, although it comments on several energy-related challenges.

Liquid fuel prices consist of costs and government imposts. Pricing enables government to influence the fuel mix by adjusting taxation levels. A suitable differential between diesel and petrol will be determined, through research and negotiation, and will be phased in.

The Department of Minerals and Energy will advise other departments, particularly Transport and Finance, on the energy efficiency implications of alternative transport modes and subsidy policies. It will also help in formulating fiscal and transport policies to promote energy conservation and efficiency.

Government needs to co-ordinate and integrate transport, energy, land use, economic development, environment and other policies. This may be more difficult under the new constitutional dispensation, since transport functions have been devolved to provincial and local government.

Past policies' failure to consider transport energy efficiency implications resulted from a lack of adequate co-ordination. Government policy instruments, including fiscal measures, have been used to generate revenue without considering their effect on energy efficiency. An inter-departmental Transport Energy Co-ordinating Committee will be established to co-ordinate and integrate policy. It will also co-ordinate and communicate transport energy policies between national, provincial and local government. The Committee will formulate guidelines to assist metropolitan and other authorities to consider the transport energy use impacts of land use, transport and traffic management plans.

3.3.4 Agriculture

Agricultural energy use both in commercial and traditional agriculture are reviewed. Commercial farmers have access to energy supplies and technologies. The main issue is energy efficiency since energy inputs have increased for the same agricultural output.

Smallholder agriculture requires improved energy services, rural schools, clinics, roads, communication infrastructure and well-trained people. Relevant energy policies include: access to diesel (government seeks to facilitate the removal of market barriers so as to provide access to bulk supplies for small-scale farmers); the electrification of farm worker households; and providing agricultural, forestry and agro-forestry products, by-products and residues as raw-materials for bio-fuels.

3.4 Part 3: Supply Sectors

3.4.1 Electricity

Primary challenges are outlined, the development of electricity policy over the past few years is described and government's vision for the industry is presented.

The distribution industry faces a number of challenges if it is to meet electrification targets and continue to provide low cost, equitably priced, quality supplies to consumers. The distribution industry will accordingly be restructured into regional electricity distributors. Government will establish a transitional processes that will lead up to the establishment of independent regional electricity distributors.

The present state of the electrification programme is reviewed and government is committed to implementing reasonable legislative and other measures, within its available resources, to progressively realising the goal of universal household access to electricity. Detailed policies are described to achieve this goal.

The criteria for pricing policy are stated. Government expects electricity tariffs to become increasingly cost-reflective at all levels of the industry. Approaches to meeting growth in electricity demand are also discussed. In future government will expect greater public participation in decisions on large public sector electricity investments, and will require evaluations using integrated resource planning (IRP) methodologies.

Some of the debates around competition within the electricity sector are raised. Government supports gradual steps towards a competitive electricity market while investigations into the desired form of competition are completed. Eskom will be restructured into separate generation and transmission companies. Government supports the development of the Southern African Power Pool (SAPP). Various measures to improve governance effectiveness within the sector are presented.

3.4.2 Nuclear energy

An overview of the nuclear energy sector is given, both in South Africa and internationally. Whether new nuclear capacity will be an option in the future will depend on the environmental and economic merits of the various alternative energy sources. Nuclear energy governance is described. Government will review and assess the Atomic Energy Corporation's activities and future plans as a basis for decisions on the desirability of its restructuring and further fiscal support for its activities. The Department of Minerals and Energy will investigate and clarify the functions of other bodies associated with the nuclear industry, such as the Council for Nuclear Safety, as well as the implications of separating nuclear energy governance from issues associated with the use of nuclear materials. The complete nuclear fuel cycle, in particular the issues of spent nuclear fuel, nuclear fuel procurement and radioactive waste management will be investigated by the Department.

3.4.3 Oil and gas: Exploration and production

South Africa's situation and Soekor's role in particular are described. Government's policy approach to the promotion, development and regulation of oil and gas exploration and production is set out. Key among these are the "use it and keep it" principle and the "polluter pays" principle. Offshore rights will continue to vest with the state. Government will determine the need to introduce dedicated oil and gas legislation or to make specific requirements in the existing legislation where appropriate.

3.4.4 Liquid fuels

A brief overview of the liquid fuels sector is given and the policy challenges set out. Government believes that the desired attributes for the liquid fuels industry can ultimately best be met in an environment of minimum governmental intervention and regulation. Its vision emphasises international competitiveness and investment in a rapidly globalising economy as a contribution to low cost and widely available products. Appropriate environmental and safety standards along with sustainable employment and the accommodation of local black interests are also a part of the vision. This vision underpins the identified cornerstones of government policy.

Policy statements covering all facets of the industry are made. Crude oil procurement and refining are effectively deregulated. Government will promote a refining and petrochemicals hub at the coast. Price control will be removed and the Service Station Rationalisation Plan phased out. Legislation will be introduced to secure full service and the retail sector for small business. Import and export control will be phased out although quality standards will be compulsory. Protection afforded to the synfuels industry will be reviewed prior to mid 2000.

Progress towards these policy goals will be in three phases. Phase one will be preparatory and will phase in certain elements so that key milestones are achieved. The milestones are set out and include significant black economic

empowerment. Phase two will commence once the milestones have been achieved and will witness the simultaneous removal of price control, import control and governments support for the Rationalisation Plan. Phase three will involve monitoring and corrections for price distortions. Generally applicable legislation such as competition law will be applicable.

The CEF group of companies will be restructured to effect a separation of the three kinds of activities it is engaged in, namely; strategic, regulatory and commercial. Soekor's promotional, data management and regulatory functions will fall under the auspices of the Department of Minerals and Energy. Its exploration and production activities will be commercialised. Government will seek to optimise its investment in Mossgas and does not intend to embark upon any new synfuels projects. Government will determine the country's strategic crude oil requirements and will ensure that supply security is maintained.

3.4.5 Gas

An overview of the existing gas industry in South Africa is provided. Gas resources within South African, Mozambique and Namibia are described, and the importance of stable policies is outlined. From an energy policy point of view natural gas is an attractive option and government is committed to the development of this industry. Government is attempting to harmonise regional gas policies and establish bi-national agreements. Key policy challenges are outlined. Coal-bed methane mining will be promoted at both the exploration as well as the production stages.

Government will legislate for the transmission, storage, distribution and trading of piped gas. The legislation will provide for a minimal regulatory regime consistent with the orderly development of a competitive gas industry. Limited vertical integration will be permitted. Gas regulation will require transmission pipelines to provide open access to uncommitted capacity, transparent tariffs, and disclosure of cost and pricing information. The Department of Minerals and Energy will assist the Department of Labour to develop national health and safety standards for gas infrastructure. The Gas Regulatory Authority will be established to regulate the gas industry.

3.4.6 Coal

An overview of the existing coal industry in South Africa is provided. The industry will remain deregulated and its performance will be monitored. Whilst coal will probably remain the major source of energy for the foreseeable future significant scope exists to reduce the environmental impacts of coal with clean coal technologies. The resource potential of coal bed methane will be investigated. Government will continue to investigate options for the utilisation of coal discard streams and will promote these as appropriate.

3.4.7 Renewable energy sources

The advantages of renewable energy are set out, particularly for remote areas where grid electricity supply is not feasible. Government believes that renewables can in many cases provide the least cost energy service, particularly when social and environmental costs are included, and will therefore provide focused support for the development, demonstration and applications of renewable energy. In particular, government will facilitate the sustainable production and management of solar power and non-grid electrification systems, such as the further development of home solar systems (SHS), solar cookers, solar pump water supply systems, solar systems for schools and clinics, solar heating systems for homes, hybrid electrification systems, wind power. All of the above will be largely targeted at rural communities. Power from the Cahora Bassa hydro-electric scheme, and other similar options, in southern and central Africa will be tapped, provided that suitable agreements can be worked out between the participants at government level. Government will also promote appropriate standards, guidelines and codes of practice for renewable energy and will establish suitable renewable energy information systems.

3.4.8 Transitional Fuels: Low-Smoke Fuels

Government will promote research into low-smoke fuels as a transitional product that may be utilised as an energy source for remotely located and rural households. Investigations will be made into simple strategies that may be used in order to reduce the production costs.

3.5 Part 4: Cross-Cutting Issues

3.5.1 *Integrated energy planning*

Integrated energy planning (IEP) entails many technical functions that are listed and require institutional capacities, which currently do not exist. Government believes that it should be playing this role and will provide the necessary resources to establish IEP so as to facilitate future energy policy development.

3.5.2 *Statistics and information*

Good data is required for the energy policy process and integrated energy planning. A database needs to cover a number of areas, as outlined in the White Paper. Government will provide information to the public at a reasonable price in a manner, which does not compromise legitimate commercial interests.

3.5.3 *Energy efficiency*

Significant potential exists for energy efficiency improvements in South Africa. In developing policies to achieve greater efficiency of energy use, government is mindful of the need to overcome shortcomings in energy markets, but without unduly interfering with market forces. Government will create an energy efficiency consciousness and will encourage energy-efficiency in commerce and industry. Government will establish energy efficiency norms and standards for commercial buildings and industrial equipment, and voluntary guidelines for the thermal performance of housing. A domestic appliance-labelling programme may also be introduced. Publicity campaigns will be undertaken to ensure that appliance purchasers are aware of the purpose of appliance labels.

Government will promote improved combustion techniques and appliances for fuelwood and other traditional fuels and will implement an energy efficiency programme to reduce consumption in all its own buildings. Government's capacity to implement energy efficiency programmes is currently limited. Government will investigate the establishment of appropriate institutional infrastructure and capacity for the implementation of energy efficiency strategies. The functions of such an institution are outlined. Targets for industrial and commercial energy efficiency improvements will be set and monitored.

3.5.4 *Environment, health and safety*

There is an inevitable interaction between environmental and development goals. The key policy challenge is thus to maintain an acceptable balance by utilising an integrated approach. The immediate priority for energy-environment policy is the negative environmental and health effects of air pollution arising from coal and wood use in households. A set of measures to address these problems is outlined. Government will continue to encourage household electrification, whether grid or non-grid, and will introduce safety and performance standards for paraffin retail and paraffin stoves.

Government will monitor international developments and participate in negotiations around response strategies to global climate change, in order to balance its environmental responsibilities and development interests in these processes. The Department of Minerals and Energy will follow a 'no regrets' approach that minimises environmental impacts commensurate with cost effectiveness and positive cash flow. The Department will also access international funding in re-directing development projects towards more favourable environmental effects.

3.5.5 *Research and development*

The state of energy related research and development in South Africa are outlined. Government spending on energy research has decreased steadily since 1990. The challenges in developing policy on research, development and demonstration are described. Government expects energy suppliers and the private sector to carry out appropriate research.

3.5.6 *Human resources*

Government recognises the integral nature of human resource development to its industrial strategy for the energy sector. To transform and develop appropriately trained and skilled human resources, the Department of Minerals and Energy will develop policies to redress the inverse skills profile and increase access to institutions, resources and opportunities. The Department of Minerals and Energy will facilitate investigations to establish the sector's skill requirements, assess current training provision and recommend human resource development strategies and programmes.

The Department of Minerals and Energy will develop an employment equity plan to assist with attracting appropriately skilled people and correcting imbalances of the past. It will attempt to increase the number of women and black people on all policy development structures, forums, parastatal boards and similar structures. The target is at least 30% women, 2% people with disabilities and 50% black participants by the year 2000. The Department will ensure increased support and access for black and women businesses providing services or contracting with the Department and energy parastatals. This is in line with the White Paper on Affirmative Action Policy that was launched by the Public Service Minister in April 1998.

3.5.7 *Capacity building, education and information dissemination*

Government will support capacity building, education and information dissemination. The Department of Minerals and Energy will monitor energy awareness and assess communication strategies and will allocate funding and staffing for this purpose. The Department will, wherever possible, seek to integrate energy issues into other government communication programmes.

3.5.8 *International energy trade and co-operation*

The major policy challenges in this area are stated. Government will develop strategies to reduce trade barriers, facilitate regional co-operation, and establish energy sector co-operation with other countries and international bodies.

3.5.9 *Fiscal and pricing issues*

Fiscal and energy policies need to be aligned, since fiscal policies can either promote or hinder the accomplishment of energy policy objectives. The five categories of fiscal transfer and their impact on the energy sector are dealt with.

Government may consider the use of special-purpose levies earmarked on the budget to fund regulatory and other agencies, provided the additional costs are borne by those benefiting from the activities of the relevant agency, the agency so funded is accountable to government and these levies are managed in a responsible manner that promotes the principles of accountability, transparency and fiscal integrity. These levies will be dedicated to the special purposes for which they were designed while retaining parliamentary responsibility for appropriating the required expenditure. Government will fund a National Electrification Fund from a dedicated electrification levy, the level of which will be determined annually, as part of the budgeting process.

Tax differentials may be used to support government's policy of promoting more efficient and environmentally sound transport modes, such as diesel-driven motor vehicles where they form part of a holistic approach and are simultaneously underpinned by other supporting measures. Government will investigate an environmental levy on energy sales, together with appropriate fiscal support for more environmentally benign and sustainable energy options including energy efficiency.

3.5.10 *Governance and institutional capacities*

The range of players and the complexity of their inter-relationships makes energy sector governance difficult to understand, and even harder to manage. Key challenges facing government are spelt out. The roles of the various institutions involved in energy sector governance are described.

The Department of Minerals and Energy will create mechanisms to improve communication with national, provincial and local government.

• 4 Introduction

4.1 The need for a new white paper on energy policy

South Africa's external and internal environments have experienced fundamental shifts which, not surprisingly, have resulted in significant changes in the context for energy policy. The apartheid-inspired United Nations oil embargo, for instance, was lifted following moves towards democracy within the country. The adoption of broad government policy frameworks, such as the Reconstruction and Development Programme, also necessitated a review of existing energy policies. Given that government's last white paper on energy policy was published in 1986 it is clearly high time that the sector's policies undergo a major re-evaluation.

In response to the process of democratisation a number of negotiating processes began spontaneously within the energy sector, usually in stakeholder-based forums. These processes have examined problems facing individual sub-sectors, with policy positions being developed within the Liquid Fuels Industry Task Force (1993–) eventually under Nedlac, the National Electrification Forum (1993–95), and the Nuclear Fuel Cycle Initiative (1994–96), among others.

Recognising the need to integrate these energy policy processes and, furthermore, the need to provide policy stability for energy suppliers, investors and consumers alike, government formally commenced the energy policy white paper process in 1994.

4.2 *The process of energy policy formulation*

Not only has the context changed for South Africa's energy policy, but so has the general approach to policy formulation. Democratisation of the country's political system has resulted in greater emphasis being placed on transparency, inclusiveness and the accountability of elected officials and their appointed managers. The energy white paper process has therefore attempted to achieve the following:

- to make government's approach to energy policy formulation more *transparent*;
- to build public *confidence* in the policy formulation process;
- to clarify *accountability* and organisational roles through the process of policy formulation;
- to *communicate* policy in a manner which is clear and understandable for all; and
- to *integrate* various government policy processes.

The process commenced with the drafting of an Energy Policy Discussion Document by a multi-disciplinary team of experts. This 220-page document describes the energy sector and identifies 111 major energy policy issues. These were divided into sections dealing with energy governance, energy demand, energy supply, and cross-cutting issues. Policy alternatives and implementation strategies were identified and discussed for each issue.

The Energy Policy Discussion Document, informally known as the 'green paper', was intended to be used as a resource for the policy consultation process and was released by the Minister of Mineral and Energy Affairs in August 1995 for study and written comment by interested parties.

Following the release of this document a number of formal and informal workshops were held with interested parties.

More than one hundred individuals and organisations, including ten international organisations, responded to the Energy Policy Discussion Document with formal submissions.

A team of individuals were subsequently appointed in August 1995 to write the first drafts of the various sections of the white paper. Known as 'issue rapporteurs', these individuals were selected on the basis of their knowledge of specific issues. As far as possible rapporteurs were drawn from within government and the academic and research communities in order to reduce the potential for conflicts of interest. Their tasks were:

- to read and synthesise the written submissions stemming from the Energy Policy Discussion Document and other relevant documents;
- to interact with stakeholders through the medium of formal and informal workshops;
- to develop a draft policy document (or 'straw dog') for discussion at the National Energy Policy Summit;
- to record the outputs of the summit and all other discussions; and
- to prepare a section for the draft white paper.

The contributions by the various issue rapporteurs were then edited into a draft white paper for review by an editorial committee to ensure consistency, clarity, practicality, appropriateness, balance, and comprehensiveness. The members of this committee were selected on the basis of their specific areas of expertise, backgrounds in energy policy development, and availability. The editorial committee was deliberately established as a non-stakeholder body in order to avoid the difficulty of ensuring proportional representation from the large, diverse and fragmented energy sector. The process followed in formulating this White Paper is summarised in the Appendix.

4.3 *The approach to policy formulation*

In many ways the approach to policy formulation for the energy sector is identical to that taken for any other sector of society, namely:

- to recognise problems;
- to identify the underlying causes;
- to identify potential solutions, analyse their implications and make choices; and
- once implementation of the policies has commenced, to monitor and evaluate their effects.

This process is, however, somewhat complicated by the nature of the energy sector itself. Broadly speaking the sector can be divided between demand and supply. Although one may intuitively expect activities on the supply side to arise as a result of expressed demand this is not automatically the case. In fact a dominant feature of the South African energy sector has been a tendency to promote policies which address issues predominantly from the supply side.

Analysis of the energy sector typically commences with the identification of different demand and supply sub-sectors. In South Africa's case the demand side is generally analysed in terms of the energy requirements of households, industry, commerce, mining, transport and agriculture. Supply sub-sectors would include the coal, electricity, nuclear, liquid fuels, gas and renewables industries. Both demand and supply sub-sectors can be broken down into smaller and smaller divisions as required.

When approaching the sector from a public policy perspective, analysts are faced with the reality that problems can arise in both demand and supply sub-sectors. For instance, a financially unsustainable state-owned energy-supply institution, or energy poverty in rural households, could both be constituted as problems requiring policy decisions on the part of government. Identifying the causes of these problems can, however, present policy analysts with an extremely difficult task. The problem of rural energy poverty, for instance, may stem from insufficient energy supply by multiple supply sub-sectors. Causal linkages may well extend beyond the energy sector itself. For instance, problems to do with liquid fuel consumption for transport purposes may arise as a result of broad fiscal policies.

Energy policies must, therefore, be carefully co-ordinated with other sectors to avoid unwanted side effects. For instance a policy of rural electrification will not resolve rural energy poverty on its own. It must be complemented by other policies and programmes, such as social forestry programmes, education and job creation, to have the desired effects. Energy policies must also be co-ordinated between energy sub-sectors. Using the example of rural electrification again, it is necessary to recognise that poor households cannot afford expensive electrical appliances

and hence continue to utilise wood, paraffin and other fuels. Supply-side initiatives are therefore also required in other energy sub-sectors too if rural energy poverty is really to be addressed.

In order to cope with the analytical problem of multiple causal linkages energy policy analysis usually commences with the demand side. This approach, commonly known as 'integrated energy planning', recognises that energy is not an end-good in itself, but is rather consumed as a means to some end. Since technology generally allows fuels to be treated as substitutes there are almost always multiple solutions to any one energy service need. The role of policy is thus to facilitate the optimal consumption of energy resources to meet social needs. This obviously requires a recognition of consumer choice and the need to open up the energy sector to market forces where appropriate.

Despite its intuitive appeal the integrated energy planning approach suffers from the same drawbacks as other ideal models, in that it requires an enormous amount of data and analysis to implement. For various reasons South Africa has very limited energy data and, furthermore, very limited capacity to perform this sort of policy analysis. Nonetheless, this white paper has attempted to follow the integrated energy planning approach, as reflected by the structure of the paper, which deals firstly with the demand sectors, secondly with the supply sectors, and finally with the broader cross-cutting issues which affect the sector as a whole.

4.4 ***The expression of policy***

In expressing government's energy policies for the particular demand, supply and cross-cutting sectors, care has been taken to present the following logical components within each section:

- a brief *background* to introduce the reader to the major features of the sector under discussion. This could include a review of pertinent statistics, the historical development of the sector and a brief analysis of the over-arching problems faced by the sector;
- the key *challenges* that government sees for itself in presenting policies for the sector;
- government's *policies* for the sector;
- where necessary short *motivations* for particular policies;
- necessary details on the *implementation* of the policies; and
- mechanisms for the *monitoring* and *evaluation* of policies.

In keeping with any good policy formulation process a set of clear policy objectives have been established at the outset to guide policy choices. These are presented in the following section, which deals with the context, challenges and objectives for energy policy.

• ***Part 1: Context, Objectives and priorities for energy policy***

5.1 ***The context for energy policy***

Nearly every aspect of social and economic policy in South Africa is being re-examined, reformed and created anew. As government sets out on a path of growth with redistribution, many economic sectors require bold, new, imaginative thinking. More than most, the energy sector presents a challenge of transforming industries and governance systems in order to pursue new policy goals.

Before deriving detailed energy policy objectives, however, it is necessary to understand the context within which energy policy must be formed and the major challenges confronting the sector. This is achieved by considering, firstly, broader economic, social and environmental policies and forces, from both local and international sources; secondly, the dimensions and nature of the South African energy sector, as well as the linkages between the sector and the broader forces; and hence, thirdly, the challenges that have to be overcome in order for the sector to contribute successfully to the achievement of the overall policy goals.

5.1.1 *International context*

International relations had a profound effect on South Africa's energy sector during the apartheid era. The energy sector, dependent on oil imports for fuelling transport, and faced with a UN-led oil embargo and an international ban on nuclear materials, embraced patterns of investment shaped by a preoccupation with self-sufficiency. Massive, skewed and uneconomic investments were made in synthetic fuel plants and in the nuclear fuels chain. This legacy presents the sector with large and complex challenges, including a nuclear related industry which consumes two-thirds of the Department of Minerals and Energy's state budget, and a petroleum sector with a labyrinthine set of regulatory controls.

South Africa's energy sector is still influenced by international pressures, but in very different ways. As the economy opens up to global competition, energy sector policy and investment decisions need to ensure the availability of abundant, easily sourced, and competitively priced oil and nuclear fuel supplies. Other more subtle international influences are also being experienced as local policy developments inevitably acknowledge international trends in trade relations, foreign investment criteria, knowledge and information flows, and political and economic ideologies.

Significant shifts have occurred in energy policies internationally in the post-oil-crisis era and South Africa has the opportunity to learn from best practices from abroad. Perhaps the most significant international shift in consciousness is a realisation that commercial energy sources will not become scarce in the short or even the medium-term. The 'limits to growth' school of thought has receded. Energy security is now being achieved, not through self-sufficiency, but through greater diversification and flexibility of supply, including increased cross-border energy trade. One of the implications of this trend is that national, uneconomic energy industries are no longer being protected. Increasingly the energy sector is relying on cost-reflective or market-based pricing. As a consequence of these trends, the role of the state in the energy sector is being redefined and restructured. Greater emphasis is being placed on commercialisation, corporatisation and, in some cases, privatisation. Energy markets are generally being restructured to encourage greater competition, even in the grid-based electricity and natural gas industries traditionally regarded as natural monopolies, which has necessitated the development of increasingly sophisticated regulatory regimes. This does not mean that state involvement in the sector has disappeared; rather that it is changing and being redefined to maximise the achievement of national policy goals.

Global financial markets are also changing. The World Bank and other multi-lateral lending agencies have traditionally played a major role in financing the energy sectors of developing countries. Private finance is, however, becoming increasingly important, which has profound effects on the structure of energy investments and energy markets. The challenge for government is thus to create a policy framework with appropriate legal, fiscal and regulatory regimes which attract domestic and international investment, while ensuring that national policy objectives are achieved.

Another significant international issue is the physical environment. The energy sector has larger environmental impacts than most economic sectors, with associated greenhouse gas emissions feared to be a major contributor to global warming. Energy policies are already responding to pressures to reduce emissions as energy investments are subjected to greater environmental scrutiny. Other responses have included a greater focus on energy end-users, with policies to encourage energy efficiency and demand-side management being put into place. The research and development of alternative and renewable energy sources is also being promoted. As a signatory to the Framework Convention on Climate Change, South Africa intends to play a constructive role in the alleviation of environmental emissions. It is also possible that direct pressure will be placed on South African exports through environmental conditionalities.

Closer to home, South Africa is a member of the Southern African Development Community (SADC), which has adopted an Energy Protocol, which addresses issues such as energy trade (electricity, oil, gas and coal), information and experience exchange, training and organisational capacity building, and investment and funding. National energy policy must therefore seek to be compatible with regional energy policy.

5.1.2 *National context*

The enfranchisement of all South Africans in 1994 has resulted in a profound reshaping of the country's political economy as the material interests of the majority find expression through new social and economic policies. These new policies were first expressed in the ANC's comprehensive Reconstruction and Development Programme (RDP)

which was subsequently further developed into white papers by the Government of National Unity. Central to the RDP are two imperatives recognised by most South Africans: the urgency of achieving more rapid economic growth; and, likewise, the urgent need for growth to contribute to development, particularly the eradication of poverty. Subsequently, Government elaborated the Growth, Employment and Redistribution (GEAR) strategy as one of its principal instruments for the realisation of the policy objectives contained in the RDP. At the heart of GEAR are two core strategies. Firstly, the framework looks at promoting economic growth through exports and investments. Secondly, it intends to promote redistribution by creating jobs and reallocating resources through the budget.

The energy sector has both economic and social functions, in that it powers productive activity and also provides basic energy services for households. The sector therefore has the potential to contribute to economic growth and employment creation, as well as providing an important component of social infrastructure for households. The RDP base document included a number of policy proposals in this regard, the most influential of which has been the electrification target of 2,5 million household connections by the year 2000, which the industry is well on its way to achieving. By contrast, the RDP white paper and the Growth, Employment and Redistribution macro-economic strategy have not set out detailed sectoral strategies. The macro-economic strategy does, however, recognise that progress in meeting public infrastructure needs, such as household electricity, adds to the quality of life in communities, while simultaneously building productive economic capacity. The provision of basic household infrastructure is seen as a relatively low-cost and effective form of public intervention in favour of the poor, and consistent with the policy of reducing income inequalities.

Government has also prepared a protocol on the corporate governance of state entities, including those in the energy sector. This includes: formulation of dividend policies; performance objectives and appraisal norms; a revised policy regarding government guarantees; appropriate regulatory policies to ensure that pricing policies are fair and fully cover operating costs, while also promoting competition and protecting consumers against monopolistic practices; and a programme of asset restructuring with respect to the ownership and governance of state entities. The latter process is being undertaken in terms of the Government policy on rationalisation of State-owned assets.

Macro-economic policy creates the overall framework within which sectoral policies are developed. Sectoral policies also have to take cognisance of linkages and overlaps with policy developments in related economic sectors, such as industry, mining, agriculture, and transport; in related basic needs and infrastructure sectors, such as housing, water, health, education, telecommunications, and the urban and rural development strategies; and in cross-cutting areas such as environment and science and technology. White papers in all of these areas have been, or are in the process of being, developed.

Energy policy must also take into account the legal framework provided by the Constitution of the Republic of South Africa, 1996, which has created new organs of government and demarcated specific powers and functions for the various spheres of government. For instance, the Constitution empowers municipalities with executive authority in respect of, and the right to administer, gas and electricity reticulation, subject to provincial and national legislation as provided for in the Constitution.

One of the spin-offs of the movement to democracy has been the greater participation of stakeholders in policy debates. Experience has shown, however, that there is a need for government to take a stronger lead in finalising policy decisions.

Having established the policy context for the energy sector, both international and national, it is now necessary to examine the problems and challenges internal to the sector, in order to be able to determine appropriate energy policy objectives.

5.1.3 *The South African energy system*

It is not easy to provide a succinct overview of the energy sector, combining as it does more than six different fuel types, multiple supply institutions and various categories of users. In some ways energy is rather like money in the economy, in that it flows through and empowers all social and economic sectors. Perhaps even more difficult to understand than the complexity of this large sector are its linkages to, and impact on, the rest of the economy, not least because this is a very under-researched topic.

Including energy-related taxes and levies the energy sector contributes around 15% of South Africa's GDP, and employs about 250 000 people. Eskom, Sasol and Mossgas together have accounted for a significant proportion of Gross Domestic Fixed Investment in the past, and investment in the energy sector will inevitably continue as supply capacity increases to meet growing demand. Taxes on oil industry products contribute about 10% of fiscal revenue. Coal exports and savings on crude oil imports, due to local synthetic fuel production by Sasol and Mossgas, contribute significantly to the balance of payments.

In some ways the energy sector has performed well. We have amongst the cheapest coal and electricity in the world and the Sasol synfuels process has spawned a massive downstream petro-chemicals industry. The size of the sector brings with it significant opportunities for contributing to economic growth, redistribution and human development. Economic, social and environmental distortions currently embedded within the sector can also be looked at as opportunities for improvement. There is thus considerable potential for the energy sector to contribute towards making the step change to a successful and sustainable national growth and development strategy.

5.2 Energy sector policy objectives

Having described the context for South Africa's energy sector, it is now possible to examine the overall challenges facing it, and consequently the key objectives that energy policy must pursue.

5.2.1 Objective 1 - Increasing access to affordable energy services

The RDP base document notes that:

Although energy is a basic household need, the vast majority of South Africans depend on inferior and expensive fuels... Future energy policy must concentrate on the provision of energy services to meet the basic needs of the poor, stimulate productive capacity and urgently meet the energy needs of community services, such as schools, clinics and water supplies.

Since the RDP was written the national electrification programme has achieved significant successes in addressing the electrification backlog. Nonetheless, some 40% of South Africans are still without access to electricity and relatively little has been done to improve access to other fuels. The social costs of current energy usage patterns are enormous, such as those imposed by the collection of scarce fuelwood resources. The majority of South Africans simply do not have access to affordable and convenient fuels of choice.

Moreover, even where access to fuels has been provided, it is often the experience of suppliers that consumption levels are low, and hence the benefits of more modern and convenient fuels are not felt. Clearly a range of complementary factors need to be understood and addressed in order to maximise the benefits of improved access to fuels.

Government will promote access to affordable energy services for disadvantaged households, small businesses, small farms and community services.

The achievement of this objective is fundamental to government's reconstruction and development programme, and to the future socio-economic development of our country.

In pursuing this objective government acknowledges that the provision of energy services entails more than just the supply of fuels. Energy is only useful when it is affordable and sustainable, and when safe, easy-to-use, efficient appliances, consumer information and technical advice are available from service providers.

In formulating policies affecting household energy services, government also acknowledges the central role played by women in utilising these services.

5.2.2 Objective 2 - Improving energy governance

An important feature of the energy sector during the apartheid period was excessive secrecy, which made rational and public debate on energy policy nigh impossible. For instance, the Petroleum Products Act of 1977 prohibited the:

publication, releasing, announcement, disclosure or conveyance to any person of information or the making of comment regarding the source, manufacture, transportation, destination, storage, consumption, quantity or stock-level of any petroleum product acquired or manufactured or being acquired or manufactured for or in the Republic.

The penalties were severe, and secrecy was effectively maintained. The restrictions were only repealed in 1993 following the lifting of the United Nations oil embargo. An unfortunate by-product of these regulations has been a lack of attention on the part of government to collect and publish data on the energy sector, which has, in turn, inhibited the development of rational and balanced energy policies.

The strategic nature of the sector, and the concomitant secrecy requirements, also led to a blurring of the roles and functions of the state's various energy organs. Public policy processes were replaced by back-room decision making with minimal transparency. Inevitably such policy processes came to be dominated by energy industry managers who, by virtue of their knowledge and insight into the workings of the sector, were better placed to determine the strategic direction of their industries than government officials. This trend led to an imbalance in the power relations between central government officials and industry managers. This imbalance was further aggravated by a lack of stakeholder involvement in major policy decisions and a lack of representivity, particularly in terms of participation by blacks and women, within the energy sector generally.

The secretive nature of the sector also inhibited government's ability to integrate policy formulation and co-ordinate policy implementation between departments and tiers of government.

As a result of this history, governance within the energy sector suffers from a low level of accountability and transparency. The severe capacity limitations on the central government department responsible for energy policy formulation that existed in the past aggravated this condition and mitigated strongly against government's ability to undertake long-term planning and decisive policy processes.

Governance of the energy sector will be improved. The relative roles and functions of the various energy governance institutions will be clarified, the operation of these institutions will become more accountable and transparent, and their membership will become more representative, particularly in terms of participation by blacks and women.

Stakeholders will be consulted in the formulation and implementation of new energy policies, in order to ensure that policies are sympathetic to the needs of a wider range of stakeholder communities.

Co-ordination between government departments, government policies, and the different spheres of government will be improved in order to achieve greater integration in energy policy formulation and implementation.

Government capacity will be strengthened in order to better formulate and implement energy policies.

Not only must government increase its capacity to deal with the pressing needs of the day, but it must also improve its ability to address long-term issues, such as the development of renewable energy resources to achieve a more sustainable energy mix.

5.2.3 Objective 3 - Stimulating economic development

The state has become deeply involved in particular energy sub-sectors. In some respects, this is unsurprising. Energy projects typically involve huge investments and governments have traditionally played an important role in expanding essential infrastructure in developing economies. The scale of these investments, and the period over which a reasonable return could be expected, has often been such that the private sector was unable or unwilling to invest the necessary capital.

The impacts of apartheid policies on the structure of energy sector have sometimes been disastrous. For example, the electricity distribution industry, linked to a system of racially segregated local government, became hopelessly fragmented and effectively incapable of providing electricity to the majority of South Africans.

Beyond having a large share in the ownership of the energy sector, government has potential access to numerous control mechanisms within the various energy markets. The electricity industry is an effective state monopoly, as is the nuclear industry, and, along with the petroleum industry, they are all tightly regulated by government policies and government regulators. It is only recently that coal prices and coal distribution were fully deregulated. Woodfuel is possibly the only un-regulated energy sector, although even here a modicum of regulation exists through certain traditional tribal authorities. The lack of effective co-ordinated government action can best be understood in terms of the absence of a coherent policy framework and the foregoing discussion on the need to improve governance within the energy sector.

An immediate policy challenge is therefore to correct for apartheid-based economic and social distortions through the restructuring of energy sub-sectors where appropriate. Over and above these corrections the sector also faces the challenge of becoming more efficient in order to contribute towards economic, social and environmental policy goals. This will necessitate the restructuring of complex governance systems, regulatory regimes and market structures, and applies particularly to the electricity, oil, gas and nuclear sub-sectors.

South African energy prices, particularly for industry and mining, are low by international comparison, and could have been lower if more economically efficient investments had been made. South Africa has an above-average energy intensity, in the sense that more energy is used per unit of economic output than in many other countries. In fact only ten countries have higher commercial primary energy intensities. The high energy intensity of our economy is largely a result of the structure of the economy and its reliance on coal for production of electricity and liquid fuels. Both of these energy transformation processes are relatively inefficient in their conversion of primary energy. Furthermore, industry has yet to employ recent technological developments in energy efficiency and government energy policy has historically favoured supply-side actions, rather than encouraging more efficient use of energy.

The energy sector provides crucial inputs for all forms of productive activity. One means of lowering inputs costs and improving the competitiveness of our economy is to improve the operation of energy markets.

Government will encourage competition within energy markets.

Nonetheless, government recognises the existence of, and potential for, market failures within the energy economy.

Where market failures are identified government will intervene through transparent, regulatory and other carefully defined and time delineated mechanisms, to ensure effective delivery of energy services to consumers.

Government also recognises the fundamental importance of pricing to the efficient operation of energy markets.

Government policy is to remove distortions and encourage energy prices to be as cost-reflective as possible. To this end prices will increasingly include quantifiable externalities.

The price of energy services to poor households will, necessarily, have to be subsidised at times since the fulfilment of basic needs remains a higher priority for government than the achievement of cost-reflective prices for this market segment.

If subsidies are required these should be implemented transparently.

Whilst acknowledging the negative economic impacts on the productive sectors of the economy that arise from the taxation of energy inputs, government nonetheless faces the reality of having to balance multiple objectives for the overall social good.

Energy taxation will continue to remain an option within government's fiscal policy, but will be exercised with more consideration for the economic and behavioural impacts of such policies.

Government also recognises the need to stimulate fixed investment in the energy sector, from both local and foreign sources.

Government will work towards an investor-friendly climate in the energy sector through good governance, stable, transparent, regulatory regimes and other appropriate policy instruments.

5.2.4 Objective 4 - Managing energy-related environmental impacts

Energy production and utilisation result in significant environmental costs, partly due to the effects of poverty and the historic inequality faced by the majority of South Africans in gaining access to fuels of choice. Recent studies have indicated serious health risks associated with indoor and outdoor air pollution, resulting primarily from coal and fuelwood combustion. Consequent exposures to certain air pollutants have, in certain cases, been found to be many times higher than local and international health guidelines, with epidemiological studies observing higher incidences of respiratory and other illnesses in inhabitants of unelectrified houses.

Although some energy-related environmental damage is long term, contentious and hard to define or quantify, there are clear short-term energy-related environmental issues which government needs to address. The plight of poor households deserves particular attention in this regard.

Government will promote access to basic energy services for poor households, in order to ameliorate the negative health impacts arising from the use of certain fuels.

Government will work towards the establishment and acceptance of broad national targets for the reduction of energy-related emissions that are harmful to the environment.

To this end energy-efficiency targets will be established and programmes will be mounted to conserve energy.

5.2.5 Objective 5 - Securing supply through diversity

As indicated previously, energy policy under apartheid was governed primarily by the desire for greater energy security, which in turn led to very large investments in synthetic fuels and the nuclear sector. The cost to the economy has been significant and the opportunity for investment in more productive social infrastructure has been forfeited. South Africa has never become fully self-sufficient in either petroleum or nuclear fuels. When measured against the objective of self-sufficiency, energy policy under the apartheid government was a costly failure. Clearly, security of supply will have to be achieved through other measures.

Given the shifts in both the domestic and international situation, it is no longer necessary, or viable, to achieve energy security through policies of self-sufficiency.

Given increased opportunities for energy trade, particularly within the Southern African region, government will pursue energy security by encouraging a diversity of both supply sources and primary energy carriers.

The achievement of the energy policy objectives listed above will require the implementation of the many detailed policies, as spelt out in the following sections of this white paper. Given the context of scarce resources, and the need to provide direction for policy implementors, it is necessary to decide on relative policy priorities. Priorities have been divided into the short-term (1-2 years) and medium-term (3-7 years) and grouped as they relate to the various policy objectives. Where priorities address more than one objective they are listed under the most relevant objective.

5.3 Short-term policy priorities

In the short-term, government will concentrate on the following priorities (in no particular order):

5.3.1 Objective 1 - Increasing access to affordable energy services

- Improve the delivery of household energy services, including electrification
- Develop a national electrification policy, planning and financing system

- Treat off-grid electrification in the same way as grid electrification
- Facilitate the production and management of woodlands for rural households
- Establish voluntary guidelines for the thermal performance of low income dwellings

5.3.2 **Objective 2 - Improving energy governance**

- Improve government's capacity to govern
- Improve energy policy formulation processes
- Restructure the Department of Minerals and Energy's budget to reflect the new policy priorities
- Promulgate a new regulatory bill to consolidate the electricity regulatory regime
- Maintain the liquid fuel regulatory system until a re-regulated system, based on competition, has been planned and implemented
- Establish suitable energy information, statistical and database systems

5.3.3 **Objective 3 - Stimulating economic development**

- Encourage energy sector actors to facilitate economic empowerment, through the creation of SMMEs and by assisting previously disadvantaged people to gain entry to the energy sector
- Appoint an authority to oversee the restructuring of the electricity distribution industry
- Restructure the state's other energy assets
- Develop and implement strategies to remove energy trade barriers, improve the availability of information and facilitate investment in the energy sector
- Introduce special purpose levies to fund dedicated regulatory and energy development agencies in a transparent manner

5.3.4 **Objective 4 - Managing energy-related environmental impacts**

- Improve residential air quality
- Monitor the effect of electrification on the number and severity of fires caused by candles and paraffin
- Introduce safety standards for paraffin stoves
- Follow a no-regrets approach on energy-environment decisions

5.3.5 **Objective 5 - Securing supply through diversity**

- Develop the Southern African Power Pool to the mutual benefit of all of its members
- Actively pursue energy sector co-operation with appropriate countries and international bodies
- Stimulate energy research and development partnerships between local role players and international agencies
- Actively facilitate regional co-operation on energy matters

5.4 **Medium-term policy priorities**

In the medium-term government will concentrate on the following policy priorities (again in no particular order):

5.4.1 **Objective 1 - Increasing access to affordable energy services**

- Stimulate the development of new and renewable sources of energy
- Promote improved combustion techniques and appliances for fuelwood and other traditional fuels
- Support the development and implementation of capacity building, education and information dissemination programmes

5.4.2 **Objective 2 - Improving energy governance**

- Facilitate the development of a research strategy to improve energy research and development
- Develop and implement an appropriate system to co-ordinate energy research
- Restructure state energy assets
- Implement new regulatory arrangements within the nuclear sector
- Clarify the mandate and role of the various nuclear energy bodies, including the separation of governance and implementation functions, by means of appropriate legislation
- Establish suitable renewable energy information, statistical and database systems
- Create appropriate institutional capacity to implement energy efficiency programmes

5.4.3 **Objective 3 - Stimulating economic development**

- Adjust electricity market structures to achieve effective forms of competition
- Establish regulations which promote a cost-of-supply approach to electricity pricing for non-domestic consumers
- Re-regulate the liquid fuels industry to achieve higher levels of competition and unrestricted market access
- Promote energy efficiency in all sectors of the economy
- Establish the necessary legislative and regulatory arrangements for the development of the up and downstream natural gas industry
- Develop standards and codes of practice for the correct use of renewable energy systems
- Introduce a voluntary energy appliance labelling programme

5.4.4 **Objective 4 - Managing energy-related environmental impacts**

- Develop a policy on nuclear waste management
- Facilitate the monitoring, evaluation and demonstration of clean energy technologies
- Investigate options for the use of coal discards
- Monitor international developments and participate in negotiations on response strategies to global climate change
- Investigate an environmental levy on energy sales to fund the development of renewable energy, energy efficiency and sustainable energy activities

5.4.5 **Objective 5 - Securing supply through diversity**

- Utilise integrated resource planning methodologies to evaluate future energy supply options
- Reappraise coal resources and support the introduction of other primary energy carriers as appropriate

As time passes and more information becomes available it may be necessary to amend these priorities.

This concludes the sections on the context, challenges, objectives and policy priorities for the energy sector. The following sections present detailed policies designed to achieve the energy policy objectives, divided into demand, supply and cross-cutting issues.

6.

• **Part 2: Demand Sectors**

6.1 **Households**

South African households consume some 24% of the country's energy. By the end of 1997, about 60% of households had access to electricity, yet this energy source contributed only 20% of household energy consumption.

Most energy was obtained from fuelwood (65%). Other fuels used include coal (9%), illuminating paraffin (8%), and a small amount from liquid petroleum gas (LPGas) makes up the remainder.

To put these figures in context it is important to recognise that the percentage contribution of coal and illuminating paraffin to total household energy consumption is partly a function of access. In fact a majority of poorer households consume these fuels wherever they are available. Also, increasing amounts of coal, paraffin and liquid petroleum gas are used in areas where fuelwood has become scarce. These fuels are also used frequently for cooking and space heating in electrified households, where electricity is used only for lighting and entertainment.

These trends indicate the complexity of multiple-fuel use in households where fuels are required to meet a range of household energy services: cooking, water and space heating, lighting and access to electronic media being the commonest end uses. Energy is also required for productive activities such as informal home-based industries, and small-scale agriculture. Beyond the home, energy is required for the provision of infrastructural services to communities, such as rural water supply, health care, education, public lighting, community facilities and transport.

This range of basic needs requiring energy inputs shows that normal life would be impossible without energy. Without fuel for transport the economy would come to a standstill. Without energy to cook food a household would starve. This is particularly the case for poorer households who rely on cheap staple foods which are inedible without being cooked.

Just as energy is essential for industrial development and economic growth so, at the household level, energy services are essential for improving quality of life through access to services such as entertainment, lighting, home-based industries and small-scale agriculture. Modern development is not possible without energy. Everyday domestic life and activity in the home is inconceivable without energy. But poverty limits energy use, and so long as this situation continues, development will be hindered.

6.1.1 **Low-income households**

Despite the importance of energy services for low-income households, such services have not been adequately supplied in the past, the priority of government having been the development of a modern industrial urban society to meet the need of the industrial sector and a privileged white minority.

As a consequence there is a general service backlog, with the majority of people still not enjoying the benefits of electricity, and a significant proportion of electrified households at a stage where they are only using electricity for lighting and entertainment. Furthermore, the considerable inequalities in wealth which have resulted from past social and economic policies has meant that many people cannot afford to use electricity optimally, even if they have access to it. Such households have to rely on less convenient and often unhealthy fuels, such as paraffin, candles, coal, liquefied petroleum gas, batteries and fuelwood.

An important factor associated with the continued use of non-electric fuels is unemployment and poverty. Households facing low or unpredictable incomes tend to purchase fuels as and when cash resources are available. Whilst small amounts of paraffin are convenient for such users the benefits of bulk purchasing are foregone. Such unstable energy use patterns, characterised by the use of several fuels for different end-uses, clearly militate against the efficient and rational use of energy. Furthermore, low-income households tend to purchase cheap and unsafe appliances, thus increasing the risk to health.

A further important factor to consider when formulating energy policy is that most household energy users are women. The gendered division of labour traditionally means that women are a 'disempowered' class. They are responsible for managing household resources and doing the menial work in the home - using appliances to perform energy tasks and purchasing fuels. However, unless they are breadwinners and command power in the household by virtue of holding an income-earning position, it is often the man who makes the decisions about appliance purchases. Past formulation and implementation of energy policy has given virtually no consideration to women's needs in this context.

Household energy services are often provided through a mix of appliance/fuel combinations. For example, cooking can be done with a coal stove/coal, hot-plate/electricity, gas-stove/gas, paraffin-stove/paraffin, solar cooker/sun, or low-smoke fuel stove/low-smoke fuel combinations. The costs of these combinations vary widely. For poor

households the multi-functionality of appliances and fuels is often important. Paraffin and coal stoves can be used to cook food while heating a room at the same time, whereas two electrical appliances would be required to perform these tasks, at greater expense.

Research has shown that electrified low-income households continue to use a range of fuels because electricity is found to be less cost effective, and is less socially desirable than the alternatives. It is becoming apparent that, contrary to initial expectations, grid electrification may not satisfy all the energy needs of low-income households (or at least not in the short to medium-term electrification process). The high cost of electrical appliances, their lack of multi-functionality and the relatively high costs for thermal end uses like cooking and space heating are some obvious constraints to the greater application of electricity.

It is fair to say that the tendency to multiple fuel use and emphasis on traditional (fuelwood) and low-cost fuels (illuminating paraffin) is likely to prevail for the foreseeable future.

6.1.2 **High-income households**

On the other hand, higher-income households are almost entirely dependent upon electricity to meet their energy needs. Despite the high energy consumption of such users, energy policies have placed little emphasis on encouraging energy conservation.

6.1.3 **Environmental and health impacts of household energy use**

The environmental effects of household energy use are particularly severe on the rural poor, where three million households use fuelwood as their primary energy source. Studies have shown that fuelwood users are exposed to extremely high levels of particulate emissions from wood smoke, which result in adverse health effects, such as Acute Respiratory Illness in children. In addition to air pollution from wood smoke, many areas experience an over-harvesting of natural woodland resources, resulting in environmental degradation, soil erosion, and desertification.

Coal is used by about 950 000 households, mainly on the Highveld, but concentrated particularly in Gauteng. The resulting indoor air pollution has serious health impacts. As with fuelwood, it has been found that exposure to this pollution, especially particulate matter, exceeds World Health Organisation standards by a considerable margin.

6.1.4 **Access to energy services**

It is clear that all South African households require access to a basic level of energy services. Achieving a sustainable level of energy security for low-income households can play a central role in the reduction of poverty, the fostering of households' livelihoods and an improved quality of life.

Government will determine a minimum standard for basic household energy services, against which progress can be monitored over time and will facilitate the widening of access to such a basic level of energy services, including fuels and related appliances.

Basic needs are understood as those requirements essential for human survival. Defining exactly what constitutes a basic energy need, or rather what may satisfy such a need, is not an easy task however. It is also necessary to recognise that the use of some fuels causes intolerable levels of air pollution. From this it is apparent that people must have both access to fuels and that these fuels should not endanger their health in the conversion process.

As with minimum levels prescribed for other services, such as water and sanitation, the criteria for defining basic energy needs must include consideration of costs, access and health. The establishment of minimum standards could thus be achieved by analysing how a hierarchy of energy supply options could meet these criteria.

For instance access to a plentiful supply of fuelwood without the means to ensure that the appliance used to burn the wood keeps air pollution to an acceptable level would not meet these criteria. Indeed, the application of the health criteria would indicate that several existing fuel use practices, which endanger life,

such as three-stone open wood fires in rural areas and the use of bituminous coal, would not meet minimum standard, thus necessitating policy interventions. Other appliances and fuels, which seriously endanger life, will also have to be reviewed. Further detail is provided in the section on Environment, Health and Safety.

Any interventions using technological innovations must be introduced in consultation with households, for the simple reason that without this input households are unlikely to use them. The introduction of healthier and safer technologies has often been shown to be a more difficult process than the introduction of pricing and marketing measures aimed at controlling the supply and retailing of existing fuels.

Government supports the concept of "energisation", i.e. the widening of access to a safe and effective energy package within grasp of low-income households and will promote it's implementation where appropriate.

In implementing this policy government will have to consider:

- appropriate appliance/fuel combinations to meet energy service needs of households in different areas of the country,
- households' abilities to acquire these fuels and appliances,
- the availability of efficient and safe appliances and fuels,
- the impact of pricing structures and financing mechanisms on the affordability of fuels and appliances.

Considerable research and development has been undertaken nationally and internationally around household energy use, technical interventions, and pricing and financing mechanisms aimed at bringing safe and effective energy 'package' within the grasp of low income households. Much of this information can be utilised for the present exercise, but the monitoring and evaluation of the progress towards the basic energy service level will require a research and extension programme.

More specific policy measures pertaining to household energy access can be found in the relevant energy supply sections of this paper.

6.1.5 Energy efficiency and energy conservation

A significant opportunity exists to promote energy efficiency and energy conservation measures in building low cost housing at a time when the national housing campaign is still in its formative stages. There is also great potential to stimulate the adoption of energy demand management in middle and high income households, through strategies such as time of use electricity tariffs, energy efficient lighting, insulation, and solar water heating. Savings realised through these measures would free resources, and delay the need for further investment in plant. Detailed policies on this issue are provided in the sections on Energy Efficiency and Electricity.

Government commits itself to the promotion of energy efficiency awareness in households.

Detailed policies on the implementation of energy efficiency are provided in the section on Energy Efficiency.

6.1.6 Capacity building, education and information dissemination

There is a great need to supply all householders with responsible information about the efficient, safe and cost-effective use of appliances and fuels. Without such an initiative government and the energy supply industry alone would find it impossible to convey the information which people need to make knowledgeable decisions about energy use and appliances. Almost all energy users lack sufficient knowledge about energy as well as community leaders, development advisors in the NGO and professional sectors and government officials at all levels.

Specific policies on this issue are presented in the section on Capacity Building, Education and Information Dissemination.

6.2 Industry, commerce and mining

Industry, mining and commerce account for about 60% of commercial energy consumption in South Africa, at a cost of approximately R18 billion in 1995. The low price of coal and electricity in South Africa has contributed to the development of an economy with a large energy-intensive primary industrial sector. Mining and minerals beneficiation were responsible for 11% of South Africa's GDP and over 50% of South Africa's foreign exchange earnings in 1995.

Whilst large industry has been well supplied with all forms of energy, many urban and rural areas of South Africa have inadequate access to energy, particularly electricity, which has been a major obstacle to the development of small and micro-sized industrial, mining and commercial enterprises in these areas. A major priority is therefore to provide these areas with access to energy services.

In the past, government has devoted little attention to the promotion of energy efficiency in industry, mining and commerce, despite widely acknowledged potential for improvement. More efficient use of energy would have both financial and environmental benefits for the country, and could assist in making South African industry more internationally competitive. Government faces a challenge in mobilising resources to tap this potential.

Whilst cheap energy is a comparative advantage for South Africa's major foreign exchange earners, there are concerns that the production and use of energy has harmful environmental and health effects, the costs of which are not included in the price of energy. There is also concern that rapidly changing international environmental standards may have an adverse effect on South Africa's exports in the future. The challenge for government is therefore to balance energy prices with sustainable environmental standards.

Many energy supply/demand issues encountered by this sector are resolved between consumers and suppliers in the normal commercial manner, without requiring the intervention of government or regulators. In the electricity and gas sectors, however, where opportunities for competition are currently limited, regulation is required to ensure equitable access for consumers and avoid the abuse of monopoly power. The regulatory framework must, at the same time, stimulate the growth and competitiveness of large industry.

6.2.1 *Energy provision in previously disadvantaged and rural areas*

The development of commercial activities in underdeveloped areas will be a crucial factor in the economic empowerment of the poor. Commercial activity usually begins with small businesses and micro-enterprises, such as shops, entertainment facilities and agro-industrial activity. The development of commercial activity provides services and employment for people living in underdeveloped areas.

Modern energy services are an essential input for the development of commercial activity. Electricity in particular is a key requirement for commercial activity, which the electrification programme is addressing. Where the supply of grid electricity is impractical, costly or delayed, alternative electricity supplies are required.

Policies relating to these challenges are contained within the sections on Electricity, and Renewable Energy Sources.

6.2.2 *Energy efficiency*

Researchers have identified significant opportunities for energy efficiency improvements in South Africa. Typical conservative estimates of savings vary between ten and twenty per cent of current consumption. These findings clearly suggest a degree of market failure and the need for government to play a role in facilitating increased efficiency in the use of energy. Barriers to the adoption of efficiency measures include:

- inappropriate economic signals;
- lack of awareness, information and skills;
- lack of access to efficient technologies;
- high return on investment criteria; and
- the high cost of capital.

Government commits itself to the promotion of energy efficiency and the development of holistic programmes for industry, mining, and commerce.

Detailed policies around the implementation of energy efficiency programmes are provided in the section on Energy Efficiency.

6.2.3 Environmental management

The environmental impacts of energy use by industry, mining and commerce can be reduced by the use of cleaner energy end-use technologies, the enforcement of environmental performance auditing, and the internalisation of environmental costs. Effective implementation of these strategies does, however, require better co-ordination between organisations concerned with environmental issues.

The Department of Minerals and Energy will therefore proactively collaborate with other government departments and public authorities in order to improve the management of the environmental impacts of energy use by industry, mining and commerce.

Government will continue to track developments in international environmental standards, in order to formulate policies that prevent the loss of South African exports through unwitting transgressions of any environmentally sensitive policies supported by our trading partners. The economic implications of ratifying environmental agreements should, however, be properly assessed before South Africa consents to these.

Further detailed policies are provided in the section on the Environment, Health and Safety.

6.2.4 Quality and reliability of electricity supply

Poor quality and reliability of electricity supply can endanger workers, damage equipment, and cause production and revenue loss. Some industrial processes are particularly susceptible to supply quality and reliability, whereas others can tolerate a degree of disruption without significant impact. The issue of supply quality is particularly relevant in the light of the restructuring envisaged for the electricity distribution industry.

The government will ensure supply quality and reliability standards in the electricity supply industry.

The National Electricity Regulator will determine minimum standards for electricity supply to households, industrial, mining, and commercial consumers.

Electricity distributors will have to comply with these minimum standards. Where higher standards are required these can be negotiated between the distributor and the consumer at a cost premium.

6.2.5 Energy information

There is as yet insufficient accurate information on energy demand for policy planning and implementation purposes. Whilst the Department of Minerals and Energy has begun developing an energy statistics database, the database is not yet accurate or comprehensive, and does not include sub-sectoral production and economic data. A means of collecting accurate and consistent statistics from energy users and energy suppliers is necessary and co-operation with the Central Statistical Service is essential. Aggregated information should be made available to all interested parties for planning and research purposes.

The Department of Minerals and Energy will develop a comprehensive energy demand database, which will be available to all interested parties at a reasonable price, if necessary.

Publication of energy data will have to take into account sensitive commercial interests. Aggregation of data should, however, overcome this problem. Further policies on energy information are available in the section on Statistics and Information.

6.3 Transport

Transport of people and goods is an essential social and economic service, and accounts for about 24% of total energy consumption. More than 90% of transport energy is derived from liquid fuels. Since the supply of these fuels is largely dependent on crude oil imports, transport energy is unusual in that its pricing is heavily influenced by international supply and demand trends.

With the lifting of oil sanctions, and South Africa's re-admittance into the international community, the importance of liquid fuel supply security has declined dramatically. Instead, South Africa now faces the challenges of facilitating equitable access to affordable public transport, ensuring the efficient utilisation of transport fuels as a means of promoting international competitiveness and minimising harmful environmental effects stemming from the use of transport fuels. Opportunities also exist to increase fuel diversity within the transport sector. Innovative international transport technologies, enabling the use of natural gas, hydrogen and electricity as fuels, are reaching stages of maturity, which may make their usage economic for local applications.

Provision of public transport has been severely constrained by past land use development and allocation policies, resulting in low housing densities and the poor being located furthest from work opportunities and social facilities. This inequitable spatial development has a direct impact on transport patterns and, in addition to being a further burden on the poor, results in the inefficient use of transport energy.

Many transport energy problems are best addressed by transport and town planning-specific policies. Nonetheless, there are a number of energy-related challenges, which deserve attention.

6.3.1 Pricing of liquid fuels

Liquid fuel prices are presently composed of a cost-related component and a variety of duties, levies and taxes emanating from different government departments. These taxes are utilised to raise revenue for the general fiscus and for specific policy purposes. In many countries the price of diesel is much lower than petrol, in some cases by up to 33% percent. This price differential thus promotes the use of diesel, which is a more efficient fuel, and also lowers input costs for productive activities. Insufficient consideration has, however, been given to the impact of these taxes on fuel usage. In fact, liquid fuel pricing policies provide an opportunity to influence the fuel mix (particularly the ratio of petrol to diesel consumption), in order to support economic activities, constrain leisure activities and promote public transport. This can be achieved by adjusting taxation levels to provide appropriate price signals.

Tax differentials between petrol and diesel may be used to support government's policy of promoting more efficient and environmentally sound transport modes, such as diesel-driven motor vehicles where they form part of a holistic approach and are simultaneously underpinned by other supporting measures.

6.3.2 Efficiency of transport energy use

The key challenge for transport energy policy is to promote the optimum and efficient utilisation of transport energy, in a way that is sensitive to the needs and attitudes of transport energy users, and particularly for those most in need of affordable transport. The promotion of energy efficiency directly complements government's policy of promoting public passenger transport.

The Department of Minerals and Energy will advise other government departments, particularly the Departments of Transport and Finance, on the energy efficiency implications of alternative transport modes and public transport subsidy policies, and will provide assistance in the formulation of fiscal and transport policies to promote energy conservation and efficiency.

Issues, which need to be prioritised, include the energy efficiency implications of income tax deductions on company vehicles and travel allowances, as well as vehicle benefit schemes and the effect of transport subsidies.

Vehicle purchasers do not generally consider the vehicle's fuel consumption as a major criterion. This is due in part to a lack of accurate information on vehicle fuel efficiency.

The Department of Minerals and Energy will provide information on the fuel use characteristics of new vehicles.

Energy consumption information should be included in all advertising, vehicle test reports and vehicle specifications. The system will have to be developed in close liaison with the vehicle-manufacturing industry and should be implemented through appropriate marketing and information dissemination campaigns.

The implementation of this policy will assist government, as a major owner of vehicles, to include energy efficiency as a criteria for vehicle purchases. Further information on this is available in the Energy Efficiency and Fiscal and Pricing sections.

6.3.3 *Environmental impacts of transport energy use*

Whilst demand for transport energy needs to be satisfied in order for economic activity to take place, insufficient consideration has been given to the indirect costs of utilising transport energy. Further policies on this issue are covered in the Environment, Health and Safety section.

6.3.4 *Transport energy research, development and demonstration*

Operating vehicles on alternative fuels such as electricity, gas or diesel could derive major benefits. Research is required on government's role in the promotion of such vehicles, the technical and economic feasibility of such technologies, and the key requirements for their successful promotion. Research is also required to develop and stimulate energy-efficient and environmentally friendly transport energy technologies. Further policies on this issue are covered in the Research and Development section.

6.3.5 *Transport energy governance issues*

Clearly transport energy policy must be mutually supportive of related national policies. A further challenge facing government is therefore effectively to co-ordinate and integrate transport, energy, land use, economic development, environmental and other policies. The new constitutional dispensation may well exacerbate existing problems with policy co-ordination as transport functions are now devolved to provincial and local government levels.

6.3.5.1 *Intergovernmental co-ordination*

A lack of adequate co-ordination is demonstrated by the failure of past policies to consider their implications for transport energy efficiency. Policy instruments at government's disposal, including fiscal measures such as fuel taxes, vehicle licence fees and income tax deductions on transport benefits, have been used as a means of generating revenue, without sufficient consideration being given to their impacts on energy efficiency.

An inter-departmental Transport Energy Co-ordinating Committee will be established to co-ordinate and integrate policy formulation between the Department of Minerals and Energy and other relevant departments.

The functions of the Transport Energy Co-ordinating Committee will include:

- the identification of transport energy policy needs;
- the co-ordination of transport energy policy research;
- the formulation of appropriate policies;
- the co-ordination of policy administration;
- improving communication between government departments; and
- improving communications with other transport energy stakeholders.

The Transport Energy Co-ordinating Committee will also ensure the co-ordination and communication of transport energy policies between national, provincial and local government bodies.

6.3.5.2 *Transport energy and land-use policy*

Land use, transport and traffic management plans all impact on transport energy usage. Insufficient attention is currently paid to the energy impacts of these plans. The Transport Energy Co-ordinating Committee will give attention to the formulation of guidelines to assist metropolitan and other planning and implementing authorities to consider the transport energy use impacts of land use, transport and traffic management plans.

6.3.5.3 *Department of Minerals and Energy capacity*

In general the Department of Minerals and Energy will assume the lead responsibility for policy formulation where the primary motivation for such policy is energy supply, energy efficiency or energy conservation.

6.4 *Agriculture*

About three per cent of the total energy used in South Africa is consumed by agriculture, mainly by commercial farmers. Traction and transport tasks dominate this energy use, as evidenced by the fact that liquid fuels meet three-quarters of commercial agriculture's energy requirements. Stationary operations, such as lighting and refrigeration, are generally performed with electricity, although diesel is also used to power pumping and dehulling activities.

By contrast, traditional agriculture depends almost exclusively on the muscular energy of people and draught animals for the performance of traction and stationary tasks. The productivity of traditional agriculture power is severely constrained by the inherently low energy and power capacity limits of these energy inputs and the lack of access to cost effective energy supplies and energy-dependent agricultural technology. Women, in particular, bear a disproportionate burden in providing muscular energy for agricultural activities, in addition to their many household tasks.

Despite these problems, it is necessary to recognise that traditional agriculture provides employment and livelihoods for many of the black rural population, albeit at subsistence levels below the poverty line.

6.4.1 *Commercial farming and energy use*

Commercial farmers have, on the whole, adequate access to energy supplies and energy technologies. The key challenge for energy policy in respect of commercial farming and energy use is thus the issue of energy efficiency.

Although technological advances have enabled production per unit of land and per person to increase significantly, it is interesting to note that energy inputs have increased for the same agricultural output. Mechanisation, fertilisers and pesticides are energy-intensive technologies and, whilst they clearly have a role to play in increasing productivity, need to be balanced with environmental protection and improved nutrient cycling. New technologies make it possible to design farming systems, which are energy efficient, productive, profitable and environmentally responsible.

Policies related to this issue are covered in the sections on Energy Efficiency and Renewable Energy Sources.

6.4.2 *Energy use in traditional agriculture*

It is tempting to prescribe increased access to fuel energy and fuel-driven technologies as the remedy for low productivity in smallholder agriculture. This solution must, however, take two important factors into account. Firstly, fuel energy and fuel-driven technologies are costly and often unaffordable for smallholder farmers. Secondly, indiscriminate mechanisation of smallholder farming could lead to massive labour displacement and the loss of rural livelihoods. This would aggravate rural unemployment and migration to urban areas.

Such unwanted side-effects can be pre-empted by careful strategies which focus on providing access to energy services which relieve critical muscular-energy bottlenecks and help to raise the productivity of labour intensive agriculture. Examples of such selective applications of modest mechanisation are found in the high productivity smallholder farming systems prevalent in the far east, such as in Japan, Korea, Taiwan and China. This strategy is in accordance with Agenda 21, the international environmental convention, which

advocates the use of low external input and sustainable agricultural systems in support of rural development. Programmes to encourage these systems could focus on:

- supporting the use of perennial crops, to reduce ploughing bottlenecks in spring;
- research into efficient forms of animal traction; and
- supporting efficient nutrient cycling, through the development of ecologically sound, energy-efficient farming systems to reduce energy wastage and pollution.

Smallholder agriculture also requires many other enabling inputs in addition to improved energy services, such as rural schools, clinics, roads, communication infrastructure and well-trained people. In essence, the energy needs of smallholder agriculture cannot be divorced from broader issues around rural development and the supply of energy services to rural households. Rural energy programmes should not be established in isolation of these broad initiatives.

Nonetheless, specific policies, which can be addressed within the scope of the energy white paper, include the following.

6.4.2.1 Access to diesel supplies

Many smallholder farmers experience difficulties in accessing diesel supplies. This is caused by limitations on the number of supply points, due to distribution cost constraints, resulting in farmers having to travel long distances to buy fuel.

Government will facilitate the removal of market barriers so as to provide access to bulk diesel supplies for small-scale farmers.

Strategies will be established to increase access to diesel supplies, such as the creation or expansion of rural co-operatives, or the establishment of communal bulk storage facilities owned and managed by local communities.

6.4.2.2 Farm worker household electrification

While the majority of commercial farms are electrified, many thousands of farm workers do not have access to electricity within their homes. Policies addressing this problem can be found under electrification in the Electricity section.

6.4.3 Energy production through agriculture

Although the agricultural sector is a relatively small consumer of energy its contribution to the supply of fuelwood, the main source of energy for many millions of rural people, is crucial. This demonstrates the strong linkages between agriculture and the livelihood of rural people.

Many agricultural, forestry and agro-forestry products, by-products and residues can serve as raw materials for processing into modern bio-fuels, suitable for the operation of fuel-driven technologies at high efficiencies and for combined heat and electric power generation. Such biofuels include briquettes, charcoal, biogas, producer gas, ethanol and bio-diesel fuel. The residues from processing some of these bio-fuels include fertilisers and soil conditioners.

Policies relating to renewable energy supplies and social forestry programmes can be found in the section on Renewable Energy Sources.

• Part 3: Supply Sectors

7.1 Electricity

The electricity supply industry inherited from the apartheid government is in many ways typical of present-day South African economic infrastructure. It has highly sophisticated production and distribution capabilities, developed under circumstances of economic isolation to meet the needs of the industrial sector and a privileged white minority. The energy needs of the majority, the possibilities of regional integration, and the challenges of global competition, have only recently begun to be addressed.

South Africa produced 179 450 GWh of electrical energy in 1997. Ninety-six per cent of this amount is generated by Eskom and transported over its national transmission network to distributors country wide. More than 400 distributors, mainly municipal electricity departments, supply electricity to end customers. Eskom is also the largest single distributor in the country in terms of energy sales for final consumption and number of customers. Eskom is governed by a stakeholder-based Electricity Council, while municipal distributors are under the direct control of their elected local councils. All electricity utilities are subject to regulation by the National Electricity Regulator.

The full extent of the policy problems and challenges facing the electricity sub-sector has only begun to emerge recently. Government has identified the following list of primary challenges that will have to be addressed:

- approximately 40% of all homes in South Africa, and tens of thousands of schools and clinics, are without ready access to an electricity supply;
- the distribution sector of the industry is highly fragmented, with more than 400 distributors, resulting in low efficiencies, high costs, wide disparities in tariffs, and financial viability problems in many distributors;
- the electricity distribution industry continues to experience high levels of non-payment and electricity theft, resulting in increasing arrears and payment defaults;
- apart from a few notable exceptions the electrification programmes of most municipal distributors are limited by difficulties in accessing affordable finance;
- municipal electricity departments are expected to make a contribution towards the funding of other municipal services, particularly in the major urban areas, but are also faced with the burdens of non-payment and the need for significant expenditure on electrification;
- coal-based electricity generation results in significant polluting emissions, with potential long-term effects on the environment;
- in some cases electricity is used inefficiently, perhaps because of a consumer perception that electricity is cheap, thus wasting scarce energy and capital resources;
- although growth in electricity demand is only projected to exceed generation capacity by approximately the year 2007, long capacity-expansion lead times require strategies to be in place in the mid-term, in order to meet the needs of the growing economy; and
- whilst a number of the challenges presented above could place inflationary pressure on prices, South Africa has to maintain the competitive advantage of low, stable and cost-reflective electricity prices.

7.1.1 *Vision for the electricity supply industry*

Electricity supply throughout the world is undergoing a revolution. This is being caused mainly, but not solely, by electricity utilities having to meet new pressures resulting from global markets and governments opening up their countries to foreign investors to help fund power sector expansion and development. As a result, utilities are having to see themselves as businesses, and act accordingly. South Africa is not immune from these forces, and will have to move broadly in line with developments taking place in the rest of the world, while also ensuring that the industry evolution meets South Africa's special requirements. However in South Africa the main drivers for change are potential economic efficiency gains, and technological change (e.g. different economies of scale in power plant construction and new information and control technologies).

Therefore government believes that the operation of the industry will have to be constantly optimised to maximise the potential for adequate, reliable, and low cost electricity to serve the people and industries of South Africa. To ensure this result, as an initial goal the distribution sector of the electricity supply industry

will have to be rationalised, by reducing the number of distributors to a much smaller number. As investigations have demonstrated, it is the distribution sector that is most urgently in need of reform. But changes will also be needed in the generation and transmission sectors in due course.

As part of South Africa's energy policy objectives, the electricity supply industry objectives must:

- improve social equity by specifically addressing the energy requirements of the poor;
- enhance the efficiency and competitiveness of the South African economy by providing low-cost and high quality energy inputs to industrial, mining and other sectors; and
- achieve environmental sustainability in both the short and long-term usage of our natural resources.

To ensure the success of the electricity supply industry as a whole, various developments will have to be considered by government over time, namely:

- giving customers the right to choose their electricity supplier;
- introducing competition into the industry, especially the generation sector;
- permitting open, non-discriminatory access to the transmission system; and
- encouraging private sector participation in the industry.

Addressing the mid- to long-term issues will require substantial analysis and additional stakeholder consultation and input. Eventually, however, these measures must translate into an electricity supply industry that is financially viable, technically healthy and well managed. In other words, one that is capable of being the engine for growth, development and prosperity for South Africa.

Owing to the interdependence of the various electricity policies they are not presented in any order of priority, but rather in a sequence designed to assist the reader in understanding the logic of the policy.

7.1.2 ***Policy processes***

The challenges underlying government policy for the electricity sector have been debated in various forums over the past five years. Early initiatives culminated in the establishment of the National Electrification Forum in May 1993. After concluding its discussions the National Electrification Forum presented a set of recommendations to cabinet in the second half of 1994, leading to the establishment of the National Electricity Regulator in early 1995. The National Electrification Forum also developed financial models of various scenarios for the national electrification programme. This information was used by RDP drafters to establish a national electrification target of 2,5 million household connections by the end of 1999. The RDP further suggested that all schools and clinics should be electrified as soon as possible. As a contribution to the RDP Eskom has set itself the target of delivering 1,75 million household connections (300 000 per annum), assuming that municipal distributors would be responsible for the remainder. The National Electrification Forum subsequently dissolved, leaving the task of drafting a new electricity regulatory bill to an advisory committee on electricity legislation reporting to the Department of Minerals and Energy.

The National Electricity Regulator subsequently attempted to rationalise the electricity distribution industry through its first licensing round. This initiative failed to result in any effective rationalisation and, in the absence of a clear policy framework, the National Electricity Regulator turned to government for direction. An Electricity Working Group was subsequently appointed, reporting jointly to the Minister of Provincial Affairs and Constitutional Development and the Minister of Minerals and Energy, to investigate the possible restructuring of the financial relationship between local government and the electricity sector, and to develop proposals for the rationalisation of the electricity distribution industry. The Electricity Working Group developed proposals, after consulting with a wide range of stakeholders, and presented these to the cabinet for approval. Cabinet in turn referred the proposals to an inter-Ministerial committee which, in turn, created an internal government committee known as the Electricity Restructuring Interdepartmental Committee. Cabinet has subsequently adopted this committee's recommendations as government's position on the restructuring of the distribution industry for negotiation with stakeholders.

7.1.3 ***Restructuring the distribution sector***

There are a number of issues facing South Africa's electricity distribution industry which limit its ability to achieve its primary objectives of meeting the aggressive electrification targets, of ensuring world class supply quality, and of continuing to provide low cost and equitably priced electricity to all consumers. The challenges include the following:

- The industry is highly fragmented. Currently more than 120 municipalities have less than 1000 customers and more than 90 municipalities have revenue of less than R1 million per annum;
- There are substantial differences in the financial health of municipal distributors. Four municipalities earn 50 per cent of the total surpluses being earned by all municipal distributors and an additional 18 municipalities earn another 25 per cent of the total surpluses. At the other extreme 289 municipalities earn less than 1 per cent of the total surpluses, and the bottom 25 per cent of municipal distributors lose money on their electricity sales.
- There is a wide disparity in the prices paid by the various customer segments that cannot be fully explained by the costs associated with serving these segments. For example, mining customers pay anywhere from 9 to 17 cents per kWh in Gauteng, and anywhere from 23 to 32 cents per kWh in Mpumalanga. Price disparities for other customer segments are as wide.
- Economies of scale, skill and specialisation are not being captured by many of the small distributors. Average distribution costs (including purchased energy) range from 23.9 cents per kWh for distributors of less than 1 GWh in annual sales to only 13.4 cents per kWh for distributors of more than 1000 GWh in annual sales, a 46 per cent difference in costs.
- Electrification needs are not evenly distributed across regions with some of the poorer regions having the greatest need. Without explicit or transparent funding mechanisms there is a great risk that in times of tight resources many distributors will not be able to fund their targets. Moreover, as electrification is a national objective, cross-regional subsidisation should be considered as an equitable way to fund the electrification program.
- While there are many distributors that are not financially viable today, collectively the industry is able to fund both the supply of electricity and electrification over the long-term. However, if the industry is expected to both contribute to funding other municipal services (as it does currently) and to pay for the electrification programme over the long-term, the electricity distribution industry will experience financial bankruptcy without alternative funding and pricing mechanisms, a reduction in the generation and transmission prices (i.e. the wholesale price of electricity), or substantial increases in tariffs. Even if the price municipalities pay for energy is reduced to the price paid for energy by Eskom distribution, the collective position of the industry will not change. The current Eskom distribution surplus will just be transferred to municipalities, without changing the overall cashflow problems for the industry as a whole.

These challenges will have to be addressed in any restructuring of the electricity distribution industry. The current structure and funding mechanisms in the distribution industry put it at significant risk. It is already not meeting the objective of providing low-cost and equitably priced electricity to all customers, the financial health is deteriorating rapidly, and the aggressive goals of the electrification programme may not be met in the areas that need it most. This is evidenced by an increasing number of municipalities who are unable to pay their bulk accounts to Eskom, high prices, poor quality of supply in many areas and problems with the delivery of electrification.

7.1.3.1 Critical assumptions about restructuring

Government has found it necessary to make a number of assumptions about the restructuring process and the implications of restructuring. These assumptions may be regarded as constraints to restructuring, rather than formal policies, and include the following:

- Retrenchments that might occur in the distribution industry as a result of restructuring, will have to be negotiated.
- The electricity distribution industry will remain under public ownership for the short to medium-term, and any changes to ownership status will take place within the framework of government's policy on the restructuring of state assets.
- Municipalities will continue to play an important role in setting policy, including end-user tariffs and in supervising the distribution of electricity in their areas. This does not mean, however, that they must undertake the distribution of electricity directly.

- Municipalities will continue to fund other municipality services from funds generated from electricity, but these funds will be generated through new, transparent mechanisms.
- Distributors will have to meet their agreed-to electrification targets, although funding will be done nationally and in a transparent manner.
- Regardless of whatever distribution structure is put in place, national tariff systems and national service and technical standards will be enforced by the NER.
- Regardless of the distribution structure, there are certain issues which have to be addressed at a national level. For instance planning, standards and collective bargaining are best addressed at the national level, whilst local planning and customer service complaints are better addressed at a local level.

7.1.3.2 **Restructuring objectives**

Government believes that distribution industry restructuring should be undertaken in order to:

- ensure agreed-to electrification targets are met;
- provide low-cost electricity;
- facilitate better price equality;
- improve the financial health of the industry;
- improve quality of service and supply;
- foster proper co-ordination of operations and investment capital; and
- attract and retain competent employees.

To achieve these objectives government proposes the following policies.

7.1.3.3 **Regional electricity distributors**

Government will consolidate the electricity distribution industry into the maximum number of financially viable independent regional electricity distributors (REDs).

Based on initial financial modelling and operational considerations the maximum number of financially viable independent regional distributors is five. It is not possible to create nine regional distributors aligned by provincial boundaries because a number of these regional distributors would not be financially viable.

The REDs will be owned by Government. Control of all distribution network assets must pass to the companies and Government will determine appropriate mechanisms for achieving this.

Any further restructuring of REDs, if necessary, will be done in terms of the Government policy on rationalisation of State-owned assets. Government believes that transfer of assets by legislation is the preferred option but other options could be used depending on individual circumstances.

While these distributors will be independent, they should co-ordinate on issues such as electrification planning, tariff issues and centralised bargaining.

Government has decided that only two business forms are appropriate for the regional electricity distributors, namely companies established in terms of the Companies Act, 1973, or special statutory corporations established in terms of Special Acts of Parliament. Irrespective which governance form is decided upon, the governance structure of the REDs will have to comply with the protocol on corporate governance of State-owned entities.

The regional electricity distributors should be controlled by boards of directors appointed by Government. The memorandum and articles of association of the companies and the appropriate management structure still needs to be developed.

The relationship between the regional electricity distributors and municipalities will be formalised through legislation, contractual arrangements or other appropriate mechanisms.

7.1.3.4 Transitional Structure

Government has recognised that in order to implement the end-state model of independent regional electricity distributors from the present fragmented EDI, a transitional process is required. The transitional process must include the implementation of a legal transitional structure to manage the ongoing operations of the industry and implement the restructuring plan.

Government will implement legal transitional structure as an interim phase before the end-state model of independent REDS is implemented. The transitional structure will consist of Eskom distribution as well as that of municipal distributors, and will be a separate company from Eskom generation and transmission, including other municipal services.

As in the case with REDs, the Transitional Structure should be controlled by a board of directors appointed by Government. The Transitional Structure will consist of different regional electricity subsidiaries, along the same boundaries as the REDs, which will be determined before implementing the Transitional Structure. The Transitional Structure will fall away at a specific date, upon which the respective subsidiaries will have to be independent REDs. This date will be determined before the Transitional Structure is established.

During the Transitional structure a number of critical issues need to be addressed. These include the following: ownership and governance, constitutional issues, number of REDs, municipal levy, business form, tariff structure, key industrial customers, human resources, transfer of assets, legislation, as well as criteria and period for phasing out of transitional structure.

7.1.3.5 Privately owned distributors

A limited number of large industries who generate their own electricity are licensed as privately-owned distributors by the NER. Currently these privately-owned distributors operating alongside other licensed local authorities and/or Eskom distribution area. In the future no change with regards to this situation is foreseen.

Licensed privately owned distributors will be allowed to co-exist alongside other public and private distributors to distribute their own generated electricity, subject to approval by the NER.

7.1.3.6 Industry finances

Government expects the entire electricity supply industry to change the manner in which it funds its obligations. Restructuring alone will have limited impact on improving the overall financial health of the industry, particularly given the constraints placed on the restructuring process. In effect, unless alternative funding and pricing mechanisms are developed, the industry will be unable to both fund electrification and contribute to other municipal services without substantial increases in tariffs, major reductions in distribution costs, or the curtailing of the electrification programme.

The entire industry (generation, transmission and distribution) must move to cost-reflective tariffs with separate, transparent funding for electrification and other municipal services.

While additional work in this area needs to be completed the objective would be to design a tariff and tax system that minimises the impact on end-user tariffs while addressing the funding needs in the industry.

7.1.3.7 Local authority rights with respect to electricity distribution

The Constitution of the Republic of South Africa, 1996, empowers municipalities with executive authority in respect of, and the right to administer, gas and electricity reticulation. The purpose of this provision is to enable municipalities to fulfil these functions if they are required to do so.

Section 17 of the Electricity Act of 1987 provides that the supply of electricity in its area is subject to the consent of a local authority, but that where such consent is unreasonably withheld the National Electricity Regulator is allowed to rule on the matter.

Government will investigate the rights of local authorities with respect to electricity distribution and will propose parameters for the local government–utility relationship (service authority/service provider relationship). If necessary these parameters will be enacted through new legislation and policy implementation such as the proposed Local Government Municipal Systems Bill.

7.1.3.8 Electricity's role in funding local government

Since this is essentially a fiscal matter, rather than electricity policy, this issue is dealt with in detail in the section on Fiscal and Pricing Issues.

7.1.3.9 Choice of supply for some industrial customers

Some industrial sectors' international competitiveness is highly sensitive to the price and quality of electricity supply. Government wishes to see the competitiveness of South African industry and exports increased and wishes to maintain a predictable, secure and efficient electricity supply to these sectors.

However, not all of industry is equally sensitive to electricity prices and there are sectors where electricity costs constitute a relatively small proportion of input costs. In some cases, existing low electricity prices may even be a disincentive to invest in energy efficient technologies which could also enhance international competitiveness.

There is thus a need to disaggregate industrial sectors, to understand different sensitivities to electricity prices and to develop a differentiated set of policies which are relevant and appropriate to different sectors.

Within the context of electricity distribution restructuring, there is a fear by some large industrial users that the cost and tax structures of different suppliers might differ considerably, resulting in potential price uncertainties and penalties. On the other hand electricity distributors do not wish to lose potential income from large customers and the burden for sharing the costs of electrification should be equitable. The best way of balancing these different concerns is, in the first instance, to allow choice of supply only to those industries whose international competitiveness is particularly sensitive to the prices and quality of electricity supply. This arrangement has the added benefit of sending correct price signals to customers. Therefore:

Government will initiate a study which will determine the sensitivity of the competitiveness of different industrial sectors to the price and quality of supply of electricity and will develop a set of differentiated policies and criteria which could allow choice of supply to those industrial customers where this is a critical issue.

The study should include an assessment of the impact of this policy option on electrification financing and local government revenue.

General choice of supply for all customers is not seen as an option in the short term. Government first wishes to ensure that the electrification programme is substantially complete and the orderly restructuring of the ESI is achieved.

7.1.4 Electrification

Electrification is a central component of the RDP's infrastructure delivery programme. In line with the target proposed in the RDP document it has been government's intention to ensure the electrification of 2,5 million houses by the end of the decade. The programme will require capital investments of up to R2 billion per annum and it is expected that the programme will incur operating losses of up to R300 million per annum during the early years. Grid and off-grid connections will continue to be made at more modest levels after 1999.

From the government's perspective the most critical policy challenges surrounding the national electrification programme are obtaining financial resources, allocating these resources to appropriate projects, and ensuring that capable utilities are in place to implement the programme. This last point has already been

dealt with above under the heading of 'Restructuring the distribution sector'. Financing the programme and allocating these resources to selected projects are directly related and are discussed below.

The challenges which have resulted from the current funding and allocation mechanisms include the following.

- The annual allocation of more than R1 billion of public funds by Eskom to individual electrification projects takes place through internal utility processes, in a non-transparent manner, without any direct accountability to parliament or any sphere of government.
- As a combined result of the internal financing arrangements and the present structure of supply rights, costly investment in rural electrification occurs, while many urban areas remain unelectrified.
- The majority of municipalities are unable to finance or subsidise electrification projects.
- Because the subsidy funds Eskom raises are only available for its own grid-based programme, other electrification initiatives using off-grid technologies such as photovoltaic supplies are disadvantaged. This results in inefficient and expensive investment in grid electrification where other technologies would have provided cost-effective solutions.
- Government intends to address these problems by developing a detailed national electrification strategy. Government will ensure the allocation of funds for addressing backlog electrification projects, while it will assist in subsidising infrastructure developmental electrification projects. Government expects that utilities will fund infrastructure developmental electrification projects from a combination of commercial finance, concessionary loans and grant funding. Utilities will be encouraged to make the true costs of the electrification programme transparent and open to public debate.

For the purpose of funding, government will differentiate between electrification addressing backlog and electrification as part of new infrastructure development.

Government will co-ordinate the electrification programme, including the following activities: setting of realistic electrification targets, determination of allocation criteria and priority areas for electrification, ensuring allocation and management of funds, financing and subsidisation of electrification projects and determination of appropriate mix between grid and off-grid technologies.

Government also wishes to see electrification subsidies allocated in a more transparent and accountable manner than in the past, with elected political representatives playing a larger role in establishing the policy framework.

7.1.4.1 Universal access

Government recognises that household access to adequate energy services for cooking, heating, lighting and communication is a basic need. Whilst these needs can be met by various fuel-appliance combinations, government recognises that without access to electricity, a clean, convenient and desirable fuel, human development potential is ultimately constrained.

Government commits itself to implementing reasonable legislative and other measures, within its available resources, to progressively realise universal household access to electricity.

Access to electricity is taken to include grid supplies, Solar Home Systems, generators, hybrid systems, battery systems or any other supply solution which provides an appropriate and affordable electricity supply. The decision of which technology to utilise, will be based on life cycle cost analysis and the number of connections made in terms of the budget allocation.

7.1.4.2 Electrification targets

The Minister of Minerals and Energy, together with the Minister of Finance and the Minister of Provincial Affairs and Constitutional Development, will establish rolling five-year national electrification targets on an annual basis.

Annual connection targets will be allocated to electricity distributors who, as part of their licence conditions, will be expected to comply with these targets. Initial targets will be in accordance with those proposed by the medium scenario of the National Electrification Economic Study, as adopted in the Reconstruction and Development Plan.

7.1.4.3 The role of off-grid electrification

In many cases grid electrification is simply uneconomical. In such cases an off-grid supply can often provide an adequate electricity service. Government therefore recognises the need to level the playing field between grid and off-grid electrification.

Annual connection targets, and related subsidies, will be allocated for off-grid electrification in accordance with the national electrification strategy.

Government recognises the problems that off-grid industries might have to invest in the manufacturing of off-grid equipment on an annual basis, but will as far as it will be possible, commits itself to maintaining stable targets and subsidy levels.

7.1.4.4 National Electrification Fund

Government will establish a National Electrification Fund to provide electrification subsidies.

The National Electrification Fund will derive income from a combination of allocation from electricity industry; fiscal allocations; grants; and any other appropriate sources. Government will determine an appropriate balance between these sources from time to time. Initially this fund will be financed by subsidisation of the electricity industry, until the budgeting process and the issues regarding Eskom dividend and tax flow to fiscus have been finalised. It is important to note that with the establishment of this fund the current subsidisation from the electricity industry will be made transparent and is not a additional mechanism for obtaining finances for electrification.

It is foreseen that with time this Fund will decrease, as electrification projects are completed.

Further policy on the electrification funding can be found in the section on Fiscal and Pricing Issues.

7.1.4.5 Funding of electrification

The National Electrification Fund will subsidise a portion of the capital costs of connections made towards meeting electrification targets.

The subsidy will make a substantial contribution to the capital costs of connection, but should not remove supplier incentives to innovate for lower costs.

Backlog as well as new household electrification connections made under the national electrification programme will receive a standard subsidy and there will be differentiation in subsidy level on the basis of geographic region, supply technology or any other factor.

The Minister of Minerals and Energy will, together with the Minister of Finance, determine the appropriate subsidy level on an annual basis.

In so doing they will take into account:

- the rate of progress towards the goal of universal access;
- the resources available for electrification subsidies;

- industry cost trends; and
- any other relevant factors.

7.1.4.6 Subsidy allocation criteria

Allocation of electrification funds will be undertaken in terms of government's criteria for the allocation of electrification subsidies.

These criteria will be developed through ongoing research and consultation. The allocation criteria will aim to:

- maximise the economic benefits of electrification subsidies;
- achieve an equitable regional distribution of subsidies;
- provide appropriate division between grid and off-grid supplies; and
- stimulate innovation within suppliers.

7.1.4.7 Subsidy allocation mechanism and fund management

The Minister of Minerals and Energy may delegate responsibility to an appropriate organisation or organisations to allocate electrification subsidies and manage the National Electrification Fund in accordance with government's allocation criteria and policies.

Such allocating and fund management organisations will meet the following criteria. They will have:

- adequate accounting and managerial capacity to ensure responsible treatment of public funds;
- established capacity for project evaluation, project financing and project administration;
- a good understanding of the role of energy supply and electrification in social and economic development;
- the capacity to integrate electrification with other social and economic development processes; and
- a suitable level of independence from commercial activities relating to electrification so as to ensure that conflicts of interest do not arise.

7.1.4.8 Monitoring and evaluation

The progress of the national electrification programme may be monitored by a number of agencies, including at least:

- The National Electricity Regulator (NER);
- Department of Minerals and Energy;
- Department of Constitutional Development;
- Allocating and fund management organisations; or
- Other agencies concerned with development within South Africa generally.

7.1.4.9 Electrification database

The Department of Minerals and Energy (DME) will ensure that a national electrification database is established and maintained to assist with the monitoring of progress and the establishment of targets. The DME may request a suitable agency or agencies to undertake this task.

7.1.4.10 Evaluating the national electrification policy and allocation criteria

Government will evaluate the impact of the national electrification programme and will amend the electrification policy and strategy from time to time as necessary.

7.1.5 **Electricity pricing**

In its approach to electricity pricing policy government has to achieve an appropriate balance between meeting equity, economic growth and environmental goals. Pricing policy has to steer a course between affordable electricity prices for households, low-cost electricity for industrial consumers, prices which provide efficient market signals by accurately reflecting the cost of supply, and a general price level that ensures the financial sustainability of electricity utilities.

In addition to these general criteria for pricing policies, electricity distribution industry pricing presents the following additional challenges.

- As a result of the fragmentation of the electricity distribution industry there are currently more than 1100 domestic tariffs in place. Residential areas directly adjacent to each other often experience wide variations in tariff structures and levels. This situation creates unnecessary confusion for domestic consumers, is impossible to justify or regulate and may well contribute to an ongoing culture of non-payment.
- Non-payment and electricity theft continue to be widespread in South Africa and contribute to the financial losses of the electrification programme.
- The widespread practice of monopoly pricing within the commercial and industrial tariffs of many municipal distributors creates serious pricing distortions and imposes an uneven burden on these consumers, which, in turn, could inhibit industrial development.
- The structure and level of many electricity tariffs does not provide adequate incentives to consumers to use electricity more efficiently.

To address these challenges, electricity pricing policy, to be implemented by the National Electricity Regulator, will be informed by the following approach.

- Price signals should result in economically optimal investments in electricity infrastructure and consumption of electrical energy. Government is of the view that this will generally be achieved through the use of cost-based electricity tariffs which include capital replacement costs (long-run marginal costs).
- The level of electricity prices should essentially be determined by the utility's revenue requirements, while the tariff structure should be determined by the structure of costs.
- Recognising that many households are presently unable to afford cost based tariffs, government acknowledges that moderately subsidised tariffs for poor domestic consumers are necessary for equity reasons.
- To limit possible negative impacts and ensure effective political accountability subsidies should, as far as possible, be transparent to the public.
- Cross-subsidies should have a minimal impact on the price of electricity to consumers in the productive sector of the economy.

Government policy on electricity pricing is as follows:

7.1.5.1 **Electricity sales prices to distributors**

Cost-reflective tariffs will be applied at electricity distributor supply points in due course.

The cost of electricity inputs to regional distributors depends on the supply voltage level and the distance of the supplying sub-station from the Gauteng/Mpumalanga highveld where most generators are located. Basing transmission tariffs on the true cost of supply will have significant impacts on the financial viability of some distributors, as well as the prices paid by electricity consumers within their areas. Eskom presently normalises its prices nationally and levies a 'transmission surcharge' of a maximum of 3%, depending on the distance from Johannesburg, while in fact the geographic variation in transmission costs can be much higher.

7.1.5.2 **Regional distributor tariffs**

Regional distributors will establish cost-reflective tariffs for each major customer segment.

The new tariff system will be designed and implemented over an appropriate period of time. Tariffs must take into account adjustments to the electricity sales price to the distributors and cost savings achieved through industry consolidation. The level of end-user tariffs may be reduced if the generation and transmission tariffs are reduced and/or if significant cost savings occur as a result of restructuring. If it is determined that some subsidisation (such as transmission subsidies to certain regions) should continue, they should be made explicit and transparent.

7.1.5.3 Domestic tariffs and connection fees

The National Electricity Regulator will regulate domestic electricity tariffs in order to rationalise the large variety of tariffs available in South Africa and ensure that a suite of supply options with progressive capacity-differentiated tariffs and connection fees are available to domestic customers.

Domestic customers differ in terms of their levels of consumption, supply capacity requirements, ability to pay the capital costs of connection, and the ease with which they can alter their consumption patterns. Generally poor households demonstrate low levels of electricity consumption, therefore only requiring low capacity supplies, and can only afford low connection fees and subsidised tariffs. On the other hand wealthy households tend to be high consumption customers, require expensive high capacity connections, and can afford to pay full connection costs in addition to contributing towards the subsidisation of low consumption (poor) households.

A suite of capacity-differentiated tariffs with a range of connection fees and tariff structures will therefore be offered to domestic customers. Lower-end tariffs will be structured to subsidise low levels of consumption but, as consumption increases, will automatically cover full supply costs and even contribute towards cross-subsidies. As consumption increases, households will have an incentive to shift to more sophisticated cost-reflective higher-end tariffs.

These choices will provide a strong signal to domestic customers to choose affordable and appropriately rated supply options. The average level of domestic tariffs should, as far as possible, be set to recover operating losses incurred in supplying poorer domestic consumers from within the domestic sector. In remote rural areas, where the lowest capacity grid system cannot be supplied within the capital expenditure limit, this system will provide a natural opportunity for Remote Area Power Supply (RAPS) systems to be supplied. The implementation of this policy may require amendments to the Electricity Act to enable the National Electricity Regulator to regulate connection fees.

7.1.5.4 Non-payment and energy theft

Government will support electricity distributors in the establishment and implementation of sensitive but firm strategies to deal with non-payment and energy theft.

For the sake of the financial viability of the electricity supply industry, and the sustainability of the national electrification programme, it is essential that a culture of payment for services be revived within South Africa. Government, at all spheres, will take responsibility for this process and assist the electricity supply industry in dealing with this problem.

7.1.5.5 Meeting growth in electricity demand

Eskom is the world's fourth largest electricity utility, with an installed generating capacity of about 39 000 MW in 1997. The maximum demand in 1997 was about 28 330 MW. Eskom's latest Integrated Electricity Plan forecasts for an assumed demand growth of 4,2% that Eskom's present generation capacity surplus will be fully utilised by about 2007. Timely steps will have to be taken to ensure that demand does not exceed available supply capacity and that appropriate strategies, including those with long lead times, are implemented in time. The next decision on supply-side investments will probably have to be taken by the end of 1999 to ensure that the electricity needs of the next decade are met.

For many decades Eskom has carried the responsibility of supplier of last resort, effectively enjoying a de facto monopoly on the construction of new generation capacity. Power station construction was based on projections of historic demand growth and by 1980 it became apparent that Eskom had committed itself to

expensive over-capacity, a situation that has prevailed for the last fifteen years. Since customers ultimately have to bear the costs of poor investment decisions it is government's intention to ensure greater public participation in future decisions on public expenditures of this magnitude. Government also intends to steadily increase competitive pressures in the generation sector in order to improve efficiencies and reduce electricity prices.

In the light of the decisions that have to be taken with respect to future electricity demand, the debate about moth-balled power stations, existing power stations, Koeberg, non-utility generation and import of electricity will have to be formulised and completed.

7.1.5.6 Integrated resource planning and electricity supply

Government will require the use of integrated resource planning methodologies in evaluating further electricity supply investments and the decommissioning of older power stations.

IRP is a decision-making process concerned with the acquisition of least-cost energy resources, which takes into account the need to maintain adequate, reliable, safe, and environmentally sound energy services for all customers. The IRP approach includes:

- the evaluation of all candidate energy supply and demand resources in an unbiased manner;
- the systematic consideration of a full range of economic, environmental, social, and technological factors;
- the consideration of risks and uncertainties posed by different resource portfolios and external factors, such as fluctuations in fuel prices and economic conditions; and
- the facilitation of public consultation in the utility planning process.

The compulsory use of IRP methodologies will ensure that utilities avoid or delay electricity supply investments, or delay decommissioning decisions, when it is economical to do so, by optimising the utilisation of existing capacity and increasing the efficiency of energy supply and consumption. The use of IRP will also contribute to meeting the electricity supply industry's environmental performance.

Government will establish the guidelines for the IRP approach through new energy legislation and regulations and will require the National Electricity Regulator to oversee its implementation. If a competitive electricity supply market is established in future IRP policies will be adjusted to be consistent with the new market system.

7.1.5.7 Koeberg nuclear power station

Eskom owns and operates the 1840 MW Koeberg nuclear power station outside Cape Town for the generation of electricity. For further details on Koeberg see section on Nuclear Energy.

7.1.5.8 Non-utility generation

The entry of multiple players into the generation market will be encouraged.

Initially this policy will be implemented by obliging the national transmission system to publish National Electricity Regulator approved tariffs for the purchase of co-generated and independently generated electricity on the basis of full avoided costs.

The purpose of this policy is to:

- improve energy and capital efficiencies in the national interest;
- encourage the development of renewable and environmentally sound electricity generation technologies; and
- encourage more players to enter the generation industry in order to develop a competitive power market.

This policy will enable the economic exploitation of the significant available potential for non-utility generation in South Africa. Research has indicated that a technical potential of as much as 6 000 MW of non-utility generation could be exploited. By including environmental costs into the pricing structure the further development of renewable and environmentally benign generation technologies such as hydro, wind, solar thermal, and waste incineration will also be encouraged.

This policy forms part of the integrated resource planning approach to electricity supply and its implementation should thus be overseen by the National Electricity Regulator who will be responsible for finalising the details of the methodology for calculating the full avoided costs of non-utility generation.

It is expected that this policy, in addition to encouraging the exploitation of further energy-efficient generation options and increasing competitive pressures on Eskom, will provide the National Electricity Regulator and government with experience that would be invaluable in the event that a more fundamental change towards a market-based electricity supply industry is introduced at a later stage.

7.1.6 ***Electricity market structure***

The rapid changes in the political and economic context of the electricity supply industry world-wide in recent years raise questions about the continued ability of South Africa's monopolistic electricity industry to meet customers' electricity service needs in future. Various initiatives to establish competitive electricity markets have been undertaken internationally in recent years but much remains to be learnt about the net benefits of this course of action, the circumstances under which competition will be beneficial and the problems that are being encountered. Some of the benefits that have been observed with the introduction of competition include:

- increased opportunities to exploit cheaper and environmentally benign generation options;
- the potential to increase the level of supply security, at a lower cost, through a regionally integrated and diversified supply base;
- the potential for efficiency improvements; and
- the potential for downward pressure on electricity prices.

Concerns are, however, being raised in some countries about the impact of competition on equity and environmental goals and the ability of a competitive market to ensure *sustained* investment and security of supply at low prices in the long term.

Tentative steps towards enabling competitive pressures in South Africa have already been taken with the establishment of the Southern African Power Pool (SAPP), Eskom's own initiative to establish an internal national power pool, and the open access conditions included in the transmission licence issued to Eskom by the National Electricity Regulator.

Government realises that competitive models and private sector participation hold the promise of benefits for electricity consumers and will therefore be closely following developments in countries implementing these new arrangements.

Government will initiate a comprehensive study on future market structures for the South African electricity supply industry.

In the light of the above, it is clear that the introduction of Independent Power Producers (IPP) will be allowed in the South African electricity market. Any fundamental market restructuring is likely to be delayed for a number of years while the distribution sector restructuring and the bulk of the electrification programme is undertaken.

Mechanisms will be put in place to ensure that equity and environmental goals are achieved, and possibly even accelerated, throughout the market restructuring process and thereafter. In the meantime the initial exploratory steps will include the unbundling of Eskom's generation and transmission groups, the further development of the SAPP, increased non-utility generation, policy research into the desirability of

competition for the South African situation, and the strengthening of the National Electricity Regulator's ability to regulate private players and a competitive market.

7.1.6.1 Restructuring of Eskom

Present restructuring initiatives in the distribution sector, and future plans for restructuring generation, indicate that it has become necessary for Eskom to be restructured as a preparatory step for competition in the electricity supply industry.

In the long term Eskom will have to be restructured into separate generation and transmission companies.

For future restructuring, government intends to separate the power stations into a number of companies. Such a step will assist the introduction of competition into electricity generation. This will also create the opportunity for private sector and Black Economic Empowerment investment opportunities in the generation sector.

Eskom has over the years developed technological support and research capacity through its Technology Research and Investigations Division (TRI) and this capacity should continue to support the Electricity Supply Industry (ESI) in the future.

Government will consider organisationally separating TRI and other relevant technologies support capacities from Eskom and to position them as a national resource for the benefit of the entire ESI.

The restructuring of Eskom will be done in terms of Government policy on the rationalisation of State-owned assets.

7.1.6.2 Transmission

The open access conditions included in the transmission licence issued to Eskom by the National Electricity Regulator, as well as the establishment of the Southern African Power Pool (SAPP) brought a new dimension to the South African Electricity Supply Industry. In order to move to a competitive market, open access to the transmission lines will be a prerequisite.

Government will legislate for transmission lines to provide for non-discriminatory open access to uncommitted capacity, transparency of tariffs, and disclosure of cost and pricing information to the National Electricity Regulator.

7.1.6.3 Development of the Southern African Power Pool

Government has already signed an Inter-Governmental Memorandum of Understanding, while an inter-utility agreement was also signed by the respective utilities, with respect to SAPP.

Government will facilitate the development of the Southern African Power Pool (SAPP) to the mutual benefit of all its members.

It is envisaged that co-operation through the Southern African Power Pool will eventually bring great benefits to the region. At present the SAPP allows for the joint operation and trading of power between power utilities in member countries (most SADC countries and Democratic Republic of Congo) and for the wheeling of power through the transmission networks of third parties.

The developments around the SAPP are well advanced, with regional utilities taking the lead in negotiating rules for its operation and the establishment of the necessary infrastructure. South Africa will be an equal partner in negotiations to establish agreements that are mutually beneficial and equitable. Irrespective of South Africa's commitment to develop SAPP, it is of importance for South Africa to determine during the ESI restructuring debate, the percentage generation capacity that will be allowed as a minimum national target to ensure a security of supply for the country.

Government will appoint representatives to participate in the activities and meetings of the Electricity Sub-sector of SADC, of which SAPP is an important component. Since SAPP is an utility driven initiative, Eskom should represent South Africa in the SAPP to ensure that generation options outside South Africa are afforded a reasonable opportunity as South Africa plans for its future capacity needs.

7.1.7 Electricity sector governance

The shifts in government's energy policy objectives pose new challenges for the governance of the electricity industry. These include the need to:

- ensure the effective accountability of public utilities to implement national policy decisions, without affecting their ability to manage their commercial affairs independently;
- broaden the involvement of stakeholders in utility governance processes;
- expedite the introduction of IRP; and
- strengthen South Africa's electricity regulatory capabilities; and possibly the need to:
- introduce and maintain effective competition within the electricity supply industry.

Government recognises that sound governance will be critical to the successful development and operation of the electricity supply industry.

7.1.7.1 The National Electricity Regulator

Government will consolidate the electricity regulatory regime by establishing the powers and functions of the National Electricity Regulator through clear legislative mandate and by strengthening its capacity to achieve its mandate.

Although the National Electricity Regulator has been established through two amendments to the Electricity Act of 1987, the complete details of the regulatory regime have yet to be finalised. A new Electricity Supply Industry Regulation Bill will be submitted to parliament in 1999 to consolidate the legislative basis for the establishment and operation of the National Electricity Regulator.

One of the shortcomings in the current electricity regulatory system is the lack of a regulatory methodology.

Government will provide guidelines on the regulatory philosophy and approach which should be adopted by the National Electricity Regulator.

From the policies presented above it is clear that large demands will be placed on the National Electricity Regulator's resources in future years. It will have to deal with the many regulatory challenges that will emerge during the restructuring of the distribution sector; it will have to introduce IRP rapidly in order to guide investment planning in the years before effective competition is established; and it will have to prepare itself to oversee the introduction of competition into the sector.

To deal with these challenges the National Electricity Regulator will have to expand its capacity. Government will provide support for this process where it can and will facilitate international exchanges to assist the National Electricity Regulator with skills development.

Funding of the National Electricity Regulator appears under subsection Fiscal Revenue of Cross-cutting Issues (Part 4).

7.1.7.2 Department of Minerals and Energy capacity

Government will strengthen the Department of Minerals and Energy's capacity to deal with the many electricity policy challenges faced by the country.

The Department of Minerals and Energy carries primary responsibility for the development of government's policy for the electricity industry. The imminent changes to the structure and governance of the electricity sector will place large demands on government for policy leadership. Some of the tasks discussed above include the responsibility to head the restructuring of the electricity distribution industry, develop government electrification funding policy, establish the national electrification planning system, develop government's approach to the SAPP, investigate the possibility of electricity supply industry competition, and provide a clearer legislative mandate and policy framework for the National Electricity Regulator.

7.2 Nuclear energy

Nuclear energy is a minor component of the South African energy sector, contributing about 3% during 1997 of the national primary energy supply, and about 5% of the country's electricity, but despite its small contribution the nuclear industry has been the recipient of a major portion of the Department of Minerals and Energy's budget. The main actors in the nuclear sector are the Atomic Energy Corporation (AEC), Eskom, the Council for Nuclear Safety (CNS) and the private sector Nuclear Fuel Corporation (Nufcor). About 2600 people are employed, 1500 by the AEC, 944 by Eskom (mostly at Koeberg), and the balance by the CNS, Nufcor and several smaller companies.

Based on projections of power demand, and taking Eskom's current surplus capacity into account, it is not expected that more generation capacity will be required in South Africa before the year 2007 at the earliest. Whether new nuclear capacity will be an option at that point or beyond will depend largely on the environmental and economic merits of other energy sources relative to nuclear and its political and public acceptability, construction lead-times and load characteristics.

On the international front it appears that the majority of countries with nuclear generation capacity have either ceased building these plants or have slowed down plans to install additional nuclear power generation capacity, leaving France and Japan as the only Organisation for Economic Co-operation and Development (OECD) countries with a public commitment to expanded nuclear programmes. Non-OECD countries, such as a number of Pacific Rim countries (including China, Taiwan and Korea), are now seen as the main growth areas for nuclear power expansion. Scenarios developed by the International Atomic Energy Agency suggest that the share of nuclear power in electricity generation world-wide will either decrease from the present 17% to 12% or be maintained at its present level in the coming two decades. Expansion will depend on factors such as economic growth, public attitudes and approaches by decision-makers in assessing the macro-economic, health and environmental aspects of the different options available for electricity generation.

Certain nuclear materials and technologies used in the nuclear power industry can also be used for the construction of nuclear weapons, and their use is therefore subject to conditions set out under a number of applicable international treaties and conventions to which South Africa is a signatory. South Africa will have to continue fulfilling its obligations in this respect.

7.2.1 *The nuclear industry in South Africa*

The generation of electrical power from uranium requires:

- the *mining, milling and processing* of uranium ore in order to produce uranium oxide powder;
- *conversion* of the oxide to gaseous uranium hexafluoride (hex);
- *enrichment* of hex in order to increase the proportion of usable uranium;
- *fuel fabrication*, during which enriched hex is reconverted to the oxide which is then packed into metal-clad fuel elements;
- utilisation of the fuel elements in a nuclear power plant where they remain until spent;
- subsequent on-site *temporary storage* of the spent fuel for the medium term; and finally
- long-term *disposal*.

The sum of these activities is often referred to as the nuclear fuel cycle.

In South Africa, uranium is produced as a by-product of gold mining, the production of the oxide and its marketing being undertaken by Nufcor. Production during 1998 stood at just less than 1200 tons, generating an income of about R165 million. Most of the product is exported directly, with small amounts being beneficiated at the AEC's Pelindaba facility near the Hartebeespoort Dam, either for export or for subsequent purchase by Eskom. The AEC's uranium enrichment and fuel fabrication plants have been closed. The conversion plant is scheduled to close in the near future. Since 1996, AEC has identified core competencies in radiation technology, fluorination and molecular laser isotope separation (MLIS). However, the MILS programme has since been shut down.

Eskom owns and operates the 1840 MW Koeberg nuclear power station outside Cape Town. Its fuel is largely sourced on the international nuclear fuel market, in a combination of long-term contracts and spot market deals. At present spent fuel is stored on site at Koeberg, but these storage facilities are likely to be filled by the third quarter of 1999, by which time new temporary storage facilities with a higher racking density will be in place. Other radioactive wastes produced during operations at Koeberg are currently being disposed of at the Vaalputs national radioactive waste repository, near Springbok in the Northern Cape. Vaalputs is maintained and operated by the AEC, which recovers operating costs from Eskom.

At present a national radioactive waste management policy has not yet been established, nor has the suitability of Vaalputs for long-term disposal of spent fuel from Koeberg been investigated. These policy matters will have to be addressed in the near future.

7.2.2 Governance of the nuclear industry

The Nuclear Energy Act of 1993 governs the country's nuclear sector and is administered by the Department of Minerals and Energy. It also establishes the functions of the Atomic Energy Corporation and the Council for Nuclear Safety. The AEC is responsible for developing technological expertise in the field of nuclear fuels, promoting the development and application of nuclear technology for peaceful purposes, exercising control over the management of radioactive waste and administering the Nuclear Non-Proliferation Treaty and the International Safeguards Agreement on behalf of the State. (The latter are international treaties that are administered globally by the International Atomic Energy Agency.) The CNS regulates and controls the nuclear industry through the issuing of licenses, except for the medical uses of radioactive materials and industrial radioactive sources, which are controlled by the Department of Health. In addition, the Department of Foreign Affairs represents government in the negotiation of international nuclear agreements.

The Department of Minerals and Energy has drafted two bills, namely, the Nuclear Safety Bill and the Nuclear Energy Bill and Cabinet has approved them. The two bills seek, amongst others, to ensure a clear public differentiation between the nuclear regulatory functions (CNS) and nuclear industry activities (AEC). At present both bodies are governed by the same act, which leads to perceptions that they are not separate from each other.

In defining its policy on regulation, Government recognises the difference between nuclear installations, on the one hand, where the potential exists for acute exposures and catastrophic accidents, and therefore requiring a special liability regime with compulsory financial security, sophisticated safety assessment to ensure that the risk is engineered to acceptably low levels, and where the high level spent fuel waste requires specially engineered storage and disposal facilities. On the other hand there are other industries where relatively low levels of naturally occurring radioactivity are by-products of the process, where the hazard can be controlled within the overall occupational/industrial hygiene programme and the risk is covered by a regular civil liability regime, and where the mostly huge volumes of waste containing low levels of radioactivity is not amenable to engineered disposal facilities.

7.2.3 Challenges for the nuclear industry

Government proceeds from the understanding that the current situation in the nuclear sector is a product of an historical context, which differs substantially from that facing the country today. For this reason two types of problems require resolution: firstly, what long-term contribution can nuclear power make to the country's energy economy and, secondly, how can the existing nuclear industrial infrastructure be optimised? Intrinsic to the latter challenge is the recognition that the nuclear industry, and especially the AEC, is a repository of

scientific and technical expertise that could be of great benefit to the country. Government is therefore faced with both long-term policy questions and shorter-term managerial issues. In the long term, government needs to provide direction on the role of nuclear power within the country's overall energy mix, while in the short to medium term it needs to:

- be satisfied that the Koeberg power station and the AEC nuclear facilities are operated in a safe and optimal fashion;
- assess the activities, financing and possible restructuring of the Atomic Energy Corporation;
- ensure harmony between the AEC's scientific and technical research and development programmes, and national policy for these areas;
- develop a radioactive waste management policy and programme;
- ensure that environmental impacts arising from the use of nuclear materials are receiving proper evaluation;
- improve the governance of the nuclear sector and ensure its integration into broader energy planning; and
- separate nuclear energy matters from other matters relating to the nuclear sector.

Relevant to the above, it must be recognised that the nuclear sector is not static but is already undergoing change, for an example, as a result of the implementation of the 1990 'AEC 2000 Plus' strategic and business plan, and because of general restructuring of state-owned assets.

Government therefore intends to undertake any restructuring of the nuclear industry that may be necessary to ensure the environmental sustainability and cost-efficiency of South Africa's energy economy, while seeking maximum benefit from historical investment, and will do so in a participatory fashion.

7.2.4 *The future role of nuclear power in South Africa*

Whilst it is unlikely that additional nuclear capacity will be required for a number of years, it would not be prudent to exclude nuclear power as a supply option. Decisions on the role of nuclear power, as with any other supply option, need to be taken within the context of an integrated resource planning process. Government policy on this approach is presented in the sections on Electricity, and Environment, Health and Safety. Eskom is currently conducting feasibility studies on the possibility of constructing a pebble bed modular reactor (PBMR) nuclear power station.

Government will ensure that decisions to construct new nuclear power stations are taken within the context of an integrated energy policy planning process with due consideration given to all relevant legislation, and the process subject to structured participation and consultation with all stakeholders.

7.2.5 *Koeberg nuclear power station*

In light of the questions that have been raised about the true cost of operating Koeberg nuclear power station, and the concerns voiced amongst communities and environmental groups, government wishes to provide clarity about its expected future life-span.

As part of the IRP process government will investigate Koeberg's economic and technical performance, including long-term costs and the implications of radiological safety, emergency planning, decommissioning and waste disposal, to determine the optimal period for operating the plant. The parameters for the enquiry will be set by government.

The investigation into Koeberg will be conducted in the context of the long-term planning horizon for the South African power sector, and with consideration of the full life-cycle costs of running Koeberg as well as that of realistic alternatives. The results of the investigations will be made available for public scrutiny and comment before a final decision is made on the future of Koeberg.

The continued operation of the Koeberg power station cannot be assessed on its own merits, but has to be considered in the context of alternative energy supply options, and as part of an integrated resource planning process.

7.2.6 **Atomic Energy Corporation**

AEC's strategic role as a nuclear fuel supplier to Eskom has stopped. Because the AEC resulted in large part, from a policy content that no longer applies, its role in South Africa's further development needs to be carefully assessed. Toward this end and during 1997, an Inter-Ministerial Cabinet Committee for Science and Technology mandated the Department of Arts, Culture, Science and Technology (DACST) to initiate and manage an evaluation of 11 South African technology institutions, including the AEC. At the same time, an initiative by the AEC's Board to determine the future role and structure of the AEC was also started. Both these reviews have made recommendations which, amongst others, suggest that the commercial activities of the AEC be separated organisationally from its institutional responsibilities.

From the above two studies, Government has identified the following three broad organisational activities for the AEC that need addressing:-

First, an organisation that carries out institutional responsibilities on behalf of the State. These responsibilities may include:

- decommissioning and decontamination of past strategic nuclear fuel facilities;
- the management of nuclear waste disposal on a national basis;
- the application of radiation technology;
- operating the Pelindaba site and services;
- execution of the safeguards function with the International Atomic Energy Agency (IAEA), the Nuclear Non-Proliferation Treaty (NPT), the African Co-operative Agreement (AFRA) and the Treaty of Pelindaba; and
- technical co-operation activities with IAEA/AFRA.

Second, a separate organisation that houses all of the AEC'S commercial activities (even those that are still under development). An evaluation of all of the AEC's commercial activities must be undertaken to ascertain their future viability.

Third, the role of SAFARI, the AEC's isotope-producing reactor, must be thoroughly evaluated to determine the viability or necessity of the following three areas:

- its commercial viability in producing large-scale isotopes for the export market;
- its possible expanded use for academic research and training; and
- its strong geo-political role in terms of its usefulness to the IAEA/AFRA technical co-operation activities within Africa.

Government will consider the proposals that AEC must be restructured in such a way that it is divided into two separate and independent organisations: one dealing with commercial activities and the other dealing with institutional responsibilities on behalf of the State.

Restructuring will take place in terms of the Government policy on rationalisation of State-owned assets.

Government will investigate the role of the SAFARI Reactor in order to determine which activity areas are needed or viable.

The above policy proposals will further inform the decisions on the desirability of further fiscal support of AEC activities.

7.2.7 **Radioactive waste management**

In the absence of a national policy, one of the most pressing issues around nuclear energy concerns the management of the radioactive waste produced by the various stages of the nuclear fuel cycle. The AEC stores its radioactive wastes on site at Pelindaba, but recent events have highlighted a number of problems in this area. Although some wastes from Koeberg are disposed of at the Vaalputs repository, there are no final decisions on how to deal with its spent fuel in the long term. In fact, previous governments neither formulated a national policy on radioactive waste, nor did they institute a programme of management for such waste.

The Department of Minerals and Energy will investigate all aspects of the management of radioactive waste in South Africa and will make recommendations in regard to the safe management and disposal of such waste, following a process, which is subject to structured participation and consultation of all stakeholders. An IEP approach will be considered by the Department of Minerals and Energy in consultation with the Department of Environmental Affairs and Tourism.

The report will inform the development of government policy on the management of radioactive waste and must address issues around all radioactive waste, the role and most appropriate form of ownership and management of Vaalputs, and the role and management of other nuclear material repositories.

7.2.8 Safety, Health and Environmental Impact

It is essential that nuclear installations in South Africa are operated in a safe manner and that assurance is provided in this regard. A serious nuclear accident can have devastating consequences, not only for the workers and surrounding population, but also for the economy of the country. Assurance (through competent licensing and operation) must therefore be maintained at all times such that the probability of a serious accident at nuclear installations remains acceptably low.

Government will monitor on an ongoing basis relevant aspects of the nuclear industry to obtain assurance of safety in general.

The CNS is accountable to the Minister of Minerals and Energy and is responsible for regulatory oversight of the nuclear industry to ensure the safety of workers and the public, through a licensing process, especially related to those nuclear facilities where a potential exists for accidents which may result in catastrophic radiological consequences.

The Department of Minerals and Energy will monitor on an ongoing basis the effectiveness of policy and adequacy of regulatory oversight.

The operators of nuclear facilities (Eskom, AEC) are responsible for the safety of their facilities, especially related to operations, maintenance, radiation protection, effluent and waste management, environmental monitoring, emergency planning and decommissioning. It is essential that such operators have sufficient independent structures within their organisations to provide internal assurance of compliance with safety requirements. The Department of Minerals and Energy will address this aspect as part of the undertakings in this policy document to investigate aspects of the nuclear industry.

In the light of perceptions around health and safety issues associated with the nuclear industry, government believes that an impartial evaluation of these issues is required.

The Council for Nuclear Safety will produce, and submit to the minister, an annual public report on the health and safety circumstances associated with all major nuclear installations.

7.2.9 Nuclear Emergency Planning

Although the probability of a serious nuclear accident is very low the potential serious consequences requires the establishment of a nuclear emergency plan and that restrictions be placed on population development around nuclear facilities. A serious accident will require national co-ordination and it is essential

that governmental mechanisms are in place to deal with such a contingency. Restrictions on population development around nuclear facilities also have socio-economic implications.

Government will monitor the arrangements for national disaster planning and the restrictions on population development around nuclear facilities.

7.2.10 Clarifying nuclear industry governance

Governance systems within the nuclear sector evolved under strategic conditions, which required great secrecy, as a result of which integration with other energy sectors was minimal. Given the nature, and outcomes, of past nuclear policy formulation processes, transparency and participation in nuclear sector governance will be ensured to restore public confidence in government's nuclear energy policies.

Governance policy for this sector needs to ensure the adequate definition and separation of roles, distinguishing in particular between the functions of policy makers, regulators, administrators and nuclear energy operators.

The Department of Minerals and Energy will investigate and clarify functions of bodies associated with the nuclear industry, including the Atomic Energy Corporation and the Council for Nuclear Safety, as well as any other institution with governance functions over this industry, for example Department of Water Affairs and Forestry, and Department of Environmental Affairs and Tourism, who will be consulted.

7.2.10.1 Separation of nuclear energy and other nuclear issues

Governance of nuclear issues not associated with the energy sector, such as the administration of the Non-Proliferation Treaty and Safeguards Agreement, needs to be separated from nuclear energy governance in order to ensure effective policy making and the efficient utilisation of national resources.

The Department of Minerals and Energy will investigate the implications of separating the governance of nuclear energy issues from that of other issues associated with the use of nuclear materials.

7.3 Oil and gas: exploration and production

Despite its generous minerals endowment, South Africa has no significant proven crude oil reserves and has to rely on imports, which impact significantly on our balance of payments. It is, however, believed that potential exists for offshore discoveries of both natural oil and gas and onshore coal-bed methane in South Africa. The successful exploitation of these natural resources would therefore contribute to the growth of the economy and relieve pressure on the balance of payments.

Soekor, a wholly-owned state corporation was established in 1965 to explore and exploit natural oil and gas for itself, on behalf of the State or on behalf of any other person. A Prospecting Lease No OP26 was granted to Soekor whereby the government, through Soekor, undertook to prospect for natural oil and gas which resulted in the discovery of the F-A/E-M gas fields developed by Mossgas. The E-BT cluster of oil fields is presently being developed by a wholly-owned subsidiary of Soekor. Soekor currently holds prospecting rights on most of South Africa's offshore area.

7.3.1 Policy Framework

Government will ensure the optimal and environmentally sustainable exploration and development of the country's natural oil and gas resources to the benefit of all. Therefore Government undertakes to:

- maintain an appropriate capability to perform regulatory and promotional functions in respect of oil and gas exploration on behalf of the state.
- promote the development of South Africa's oil and gas resources by ensuring that the tax regime and contractual arrangements as well as the regulatory and operating environment will be consistent, stable and internationally competitive;
- ensure private sector investment and expertise in the exploitation and development of the country's oil and gas resources;
- promote research, technology development and technology transfer to stimulate the optimal development of the country's oil and gas resources;
- promote oil and gas development by applying the "use it and keep it" principle in contracts according to standard international practice.
- retain the rights to natural oil and gas offshore
- work towards government's long term objective of all on shore mineral rights vesting in the state.
- ensure a safe and healthy working environment in accordance with the Mine Health and Safety Act, 1996, and good international oil and gas field practice;
- ensure that an integrated and holistic environmental management on all onshore and offshore oil and gas exploration and production operations is achieved in accordance with international oil and gas field practice.
- ensure that the "polluter pays" principle is applied in the regulation and enforcement of environmental impact management measures and standards;
- promote international co-operation with an emphasis on Southern Africa.

Government will perform regulatory and promotional functions in respect of oil and gas exploration and production through entities which have clearly defined roles.

Government will determine the necessity or otherwise of introducing a dedicated oil and gas act to govern the exploration and exploitation of these mineral rights. Until then it will regulate the upstream oil and gas industry in terms of the Minerals Act of 1991 and in line with policy guided by the White Paper on a Minerals and Mining Policy for South Africa. Where appropriate, provision will be made to address specific requirements of this industry.

A stable fiscal regime will be maintained in conjunction with the Department of Finance and the South African Revenue Service, to promote and support oil and gas exploration and production.

7.4 Liquid fuels

7.4.1 Background

Prior to 1954, all fuel consumed in South Africa was imported in refined form and distributed by the four oil companies then operating as wholesale marketers in South Africa, namely BP, Shell, Mobil and Caltex.

During the first decade after World War II, the demand for fuel products in South Africa increased to such an extent that the establishment of a viable refining industry became possible. Genref was the first refinery, established by Mobil (now Engen) in 1954, followed by Sapref (Shell and BP) in 1964, both in Durban; Calref (Caltex) in 1966, in Cape Town; and Natref (Sasol and Total) in 1971/72 in Sasolburg.

For political and strategic reasons, the government of the day decided to embark on a synthetic fuel programme and Sasol I was established in 1954 to convert coal into synthetic fuel. The uncertainties of the international crude oil supply situation, and the oil embargo applied against South Africa, led to the establishment in 1964 of the Strategic Fuel Fund Association (SFF) for the acquisition of crude on behalf of the country and administration of the strategic crude oil stockpile. The synthetic fuel industry was expanded with the commissioning of Sasol II in 1982, and Sasol III in 1983; finally Mossgas, which converts natural gas to synthetic fuels, was established in 1987. Tariff protection is afforded to the producers of synthetic fuels.

Present crude oil refinery capacity is 455 000 barrels per day with the capacity of the Sasol synthetic fuels plant being 150 000 barrels per day and Mossgas 45 000 barrels per day of crude oil equivalent. About one-third of fuel demand is met by the synthetic fuels industry.

During 1997 South Africa imported approximately 23,6 million tons of crude oil and 21 300 Ml of refined product was consumed. Crude oil is South Africa's single largest import item. Approximately 15% of South Africa's primary energy consumption is currently met by imported crude oil. Taking synthetic fuel production into consideration, liquid fuels meet approximately 28% of South Africa's final energy needs.

The industry's wholesale turnover was some R40,7 billion in 1997 and it provides employment to more than 100 000 persons. There are approximately 4900 service stations in the retail sector of the industry, providing employment to an estimated 45 000 pump attendants.

As a result of the historical development of the liquid fuels industry and economic and political influences, the industry in South Africa is characterised by a unique regulatory framework and a significant degree of government involvement.

7.4.2 *The policy challenges*

Policy challenges for the South African liquid fuels industry include the need to achieve:

- an efficient and internationally competitive industry;
- the stable and continued availability of quality product throughout the country at internationally competitive and fair prices within appropriate health, safety and environmental standards;
- an equitable balance between the interests of industry participants and consumers;
- an environment conducive to synergistic investment in the liquid fuels industry and the related petrochemicals industry;
- an industry supportive of government's broader social and economic goals;
- a restructuring of the state's involvement in the industry to one more appropriate to South Africa's changed political and economic circumstances;
- The meaningful inclusion of those interests which have been historically disadvantaged; and
- The optimum and efficient utilisation of liquid fuels;
- An efficient network of pipeline and storage infrastructure whilst protecting against the abuse of market power and restrictive practices in these natural monopolies.

Government believes that the desired attributes for the liquid fuels industry can ultimately best be met in an environment of minimum governmental intervention and regulation. Government will therefore provide an environment within which the liquid fuels industry can conduct its business effectively and on a competitive basis.

The key policy challenge for government is thus to determine the appropriate level of involvement during the transition to a rapidly globalising and internationally competitive environment.

7.4.3 *A vision for the future*

Government's vision for the future is to create a stable and internationally competitive liquid fuels industry in our country. As South Africa is increasingly integrated into the global economy our industry will be well prepared to adapt to these changing circumstances. This implies an industry with limited government intervention and continued investment in new refining, wholesaling and retailing facilities. As a significant input cost to the economy, the cost of liquid fuels will be kept as low as possible and be made available as widely as possible. To this end natural monopolies in pipelines and storage facilities will be regulated with a view to optimising investment and lowering cost. Environmental, safety and product quality standards will gradually be improved as international standards advance. Opportunities for sustainable employment will be maintained and created. South African black interests will assume their rightful place in the affairs of the industry.

Achieving this vision will require a carefully and efficiently managed transition.

7.4.4 The Cornerstones of future Government policy

The government has since 1993 been engaged in a consultation process with a wide range of participants and stakeholders regarding the restructuring of the industry. From these processes Government has concluded that there is some consensus that current circumstances necessitate changes to the existing regulatory model within an appropriate timeframe to better reflect current realities.

The cornerstones of the future policy framework will thus be:-

- Deregulation;
- The stable and continued availability of quality product throughout the country at internationally competitive and fair prices;
- The preservation and promotion of formal sector employment;
- The desire for commercially based retail pricing in which the industry does not engage in inter-fuel or rural-urban cross subsidies;
- The preservation of retailing activities for small and medium businesses;
- Black economic empowerment reflected in the composition of the industry at all levels and significant domestic black ownership or control in all facets of the industry;
- The maintenance and enforcement of adequate health, safety and environmental standards;
- The promotion of a coastal refining and petrochemicals hub for future investments;
- Adequate provision for national strategic considerations relating to security of supply; and
- Tariff protection for vulnerable sectors where justified by cost-benefit analysis;
- A low cost pipeline and storage infrastructure suitably regulated to encourage optimum investment, to prevent the abuse of these natural monopolies and to prevent the exclusion of new entrants.

To achieve this outcome government will pursue the following policies.

7.4.5 A climate of certainty and fair returns for investors

Government is committed to promoting a climate that would be conducive to reasonable profits and sustained investment in the liquid fuels industry.

During the period of regulation, government is committed to the use of a fair and transparent method to set the margins in order to encourage investment in the industry.

7.4.6 Procurement of crude oil

The end of the oil sanctions era has allowed crude oil refineries to accept responsibility for their own oil acquisition. It is accepted that the oil refiners are in the best position to judge their oil requirements.

Crude oil refiners will continue to purchase their own crude oil requirements.

For as long as SFF, as state agency, is empowered to buy and sell crude oil, all transactions between the oil industry and SFF will be on a willing seller - willing buyer basis.

7.4.7 Crude oil refining

The refining industry was deregulated in 1991 and although the income of refineries is determined by the deemed import parity cost of fuels there is no control in respect of refining margins. There is also no regulatory barrier in respect of entry to the refining industry. However refiners need to find outlets for their products, either through placement in the local market or through exports.

Government will not extend regulatory control over the crude oil refining industry.

7.4.8 **A Southern African Refining and Petrochemicals Hub**

At present there is apparently no need for the construction of a new oil refinery, since the present total refining capacity of approximately 650 000 bbls/day has been sufficient to meet current demand. In future, however, this situation may change. Government is in principle supportive of a new refinery venture in future, provided that there would be a visible need driven by the economics of the day, as well as an opportunity to bring in new South African participants who were previously excluded from participation. Government believes that prospective refinery investors are increasingly viewing such investments in a SADC context. Government will encourage this approach.

There are important synergies possible between refining and petrochemical activities. South Africa's export orientated trade policy makes coastal locations more attractive for such investments. In addition the small size of liquid fuel markets in some SADC countries means that co-operative approaches to meeting these market needs can yield benefits to all concerned.

Government will promote a refining and petrochemicals hub at a coastal location.

7.4.9 **Price control**

Price control is based on import parity pricing (in-bond landed cost) at the refinery gate, with control over the profitability of the wholesale and retail sectors of the industry through the respective wholesale and retail margins. Price control, especially retail price maintenance in respect of petrol, and import control together form the cornerstone of the regulatory dispensation of the liquid fuels industry.

The government believes that competitive market forces should determine prices.

However, as long as price control is applied the import parity pricing approach will be retained, with suitable improvements if necessary.

Government intends to move away from price control with the achievement of suitable transitional milestones and arrangements. Control of industry margins, at wholesale and retail level will be removed and thereafter will be determined on a competitive and commercial basis.

7.4.10 **Marketing**

The Service Station Rationalisation Plan, a voluntary agreement between government and the wholesale and retail industries, guides the development of the retail sector. This agreement limits the number of service stations to promote throughput at service stations and thereby, through economies of scale, contains costs in a price-controlled environment. It also prohibits self-service at retail fuel outlets to protect the jobs of pump attendants, as well as vertical integration in the industry, in that wholesale marketers are not allowed to operate service stations, in order to promote small business in the retail industry.

The role and implementation of the Service Station Rationalisation Plan will be amended and phased out.

The restructuring and phasing out of the Rationalisation Plan will be accompanied by legislation prohibiting self-service and vertical integration in the industry to minimise job losses and to promote the maintenance and establishment of small businesses. These prohibitions will be reviewed from time to time with a view to their ultimate withdrawal. Such legislation will be discussed at NEDLAC in accordance with the NEDLAC Act. The labour implications of marketing-related restructuring will be addressed jointly with the Department of Labour. Due cognisance will be given to any relevant NEDLAC agreements.

There is no regulatory prohibition on participation in the wholesale industry. It is however incumbent on wholesalers to secure product and to find outlets for such product. This implies that historically disadvantaged South African interests that wish to enter the wholesale sector must be accommodated, on a

sustainable basis, through negotiation, as participants in the Service Station Rationalisation Plan. Once this is achieved the Service Station Rationalisation Plan can be phased out.

At the end of the transition phases the liquid fuels industry should be characterised by unrestricted market entry, allowed to develop in response to competitive forces, and subject to generally applicable legislation.

7.4.11 Control of import and export of crude oil and refined products

The control of the import and export of petroleum products is effected in terms of the Import and Export Act which is administered by the Department of Trade and Industry. The Department of Trade & Industry administers these provisions in conjunction with and according to energy policy determined by the Department of Minerals and Energy. Current policy allows free importation of crude oil to meet the needs of crude oil refiners, whereas importation of refined products is limited and is only recommended when demand cannot be satisfied through local production. Export and re-export of crude oil and refined product is allowed on condition that local demand is satisfied.

As free participation in the liquid fuels industry is realised, quantitative import and export control will be phased out. Duties on refined products may be introduced where justified by economic and socio-economic considerations.

7.4.12 Quality standards

To ensure that South African consumers are provided with quality product, from an environmental and technical point of view, it is necessary that appropriate fuel standards be upheld.

In an environment of free trade in liquid fuel products, fuel standards and specifications will be compulsory.

7.4.13 Transportation and storage of oil and liquid fuel products

Currently transport tariffs incorporated in the price structure of liquid fuels are those charged by the Transnet subsidiaries Petronet, Spoornet and Autonet.

When price control in the liquid fuels industry is removed it will no longer be necessary to continue with the current practice of making reference to a transport cost in the price build-up for certain products. Government will promote competition in the transport of liquid fuels.

The pipelines and storage facilities currently in use consist of a combination of state owned (Petronet and SFF) and private sector facilities which have in effect not been regulated. In the case of pipelines Petronet (a division of Transnet) has built, operated and regulated pipelines. Petronet's future is tied up with the restructuring of state assets and is not yet clear. However the department would like to see a separation of functions between, on the one hand, investment and operation and on the other hand the licensing and regulation of pipelines on the other.

The petroleum regulatory regime will inhibit monopolistic abuse of pipelines and storage facilities. Pipelines will be required to provide non-discriminatory open access to uncommitted capacity, transparency of tariffs, and disclosure of cost and pricing information to a suitable authority.

It is recognised that more detailed policy work is required in this area and this will be embarked upon as soon as possible. Included in this work will be an investigation to determine the adequacy of competition legislation, and its implementation, in respect of storage facilities and whether or not dedicated legislation is necessary. Stakeholders will be offered the opportunity to contribute their views during the investigation.

7.4.14 The synthetic fuels industry

Government recognises the important economic contribution made by the synthetic fuels industry in South Africa by providing a form of tariff protection to synthetic fuel manufacturers.

Tariff protection afforded to the synthetic fuels industry is being progressively lowered. The need for such protection will be reviewed before mid 2000.

For as long as the manufacturers of synthetic fuel do not have viable access to the retail sector, a dispensation will be promoted which ensures the upliftment of such fuels for placement in the market.

The interaction between the crude oil industry and the synthetic fuels industry should be on a negotiated basis. Government will urge these parties to consult all stakeholders on proposed new arrangements during the first phase (see below).

7.4.15 Governance and legislative action

The Petroleum Products Act of 1977 and the Central Energy Fund Act of 1977 will remain as enabling legislation, and are likely to have to be amended to accommodate policy reforms.

Governance of the liquid fuels sector will be commensurate with government's policy goals for, and level of involvement in, the industry. The industry will also be governed by generally applicable legislation such as competition legislation.

7.4.16 Phases and milestones in deregulating the petroleum industry

Despite the problems associated with deregulation, government is however satisfied that it is inevitable that it will become a reality at some stage in the future. It nevertheless recognises that the transition process may be difficult and that there will be some negative effects on employment and small business in the short and medium term. Government will embark upon a phased and managed transition and will seek the co-operation of key stakeholders in this process. Deregulation will proceed as far as practicable towards clearly identifiable milestones and on the basis of cost-benefit analyses. A special effort will be made to accommodate those who have been historically disadvantaged.

Government will introduce a deregulated oil industry as predetermined milestones are achieved.

The two cornerstones of the present regulatory regime are the control of petrol retail prices and import control on certain products. Buttressed between these two is the voluntary Service Station Rationalisation Plan.

At the appropriate time, after the milestones have been achieved, Government will simultaneously remove retail price control, import and export control and its commitment to the Service Station Rationalisation Plan.

The interwoven nature of the current regulatory dispensation requires a phased approach to the restructuring of the liquid fuels industry to ensure minimum disruption. A phased approach will allow for proper management and monitoring of the process. It will also allow time for preparation and adjustment by the respective industry participants and role-players. Government will introduce deregulation in three sequential phases. It would like to proceed as swiftly as possible but will be reliant to some extent on the continued co-operation of other stakeholders.

The first phase of the process will allow for interim adjustments to fuel price mechanisms and settling of over/under-recovery accounts with the oil industry. It will also create opportunities for the negotiation of intra-industry agreements, such as upliftment and market access agreements for synthetic fuels. During this phase mechanisms will be put into place to ameliorate any negative impact on employment opportunities as a result of the restructuring process. This phase will also allow the state to pursue the restructuring of its assets within the liquid fuels sector.

The key milestones to be achieved in the first phase will be:-

- *The sustainable presence, ownership or control by historically disadvantaged South Africans of approximately a quarter of all facets of the liquid fuels industry or plans to achieve this.*
- *Mutually acceptable arrangements between synfuels producers and the marketers of crude oil based fuels on the upliftment and marketing of synfuels.*
- *The introduction of necessary legislation to give effect to the cornerstones of government policy including the protection of "full service" and the equitable participation of small businesses in the industry.*
- *The introduction of suitable transitional arrangements within the Service Station Rationalisation Plan.*
- *The introduction of any necessary institutional and regulatory capacity required to enable Government to adequately monitor possible post deregulation distortions and to enable it to act against such distortions.*
- *Suitable arrangements to address any labour related consequences of deregulation.*
- *The introduction of suitable institutional capacity and measures to license and/or regulate oil and liquid fuel pipelines and possibly also storage facilities if this is found necessary.*

The second phase will be characterised by allowing market forces to set prices.

Retail price regulation, import control and Government support for the Service Station Rationalisation Plan will be simultaneously removed.

The third phase will be the post deregulation transition phase. This will be characterised by government vigilance and monitoring for possible problems arising from the introduction of deregulation and corrective action to address these. In the event uneven competition results in price distortions, for example rural- urban cross subsidies, then fiscal measures or price capping may be employed to counter balance such distortions.

Government will monitor and evaluate possible problems arising from the introduction of deregulation and will take corrective action.

The Department of Minerals and Energy will guide the transformation process.

7.4.17 State participation in the liquid fuels industry: CEF-group of companies

The CEF group of companies will be restructured to effect a separation of the three kinds of activities it is engaged in, namely; strategic, regulatory and commercial. Government will consider restructuring existing commercial state assets in the oil industry into a domestic commercial company in which the government would be a significant shareholder. This consideration will include retaining a wholly owned oil company for, at least, the purposes of taking up the state's participation rights in oil and gas field development. Restructuring (of the CEF group of companies) will take place in terms of the Government policy on rationalisation of State-owned assets and may be used to promote the participation of historically disadvantaged interests in the liquid fuels industry.

7.4.17.1 Soekor

Soekor was established in 1965 as a wholly-owned subsidiary of CEF (Proprietary) Limited. Restructuring of Soekor has already led to the establishment of two entities; a wholly-owned subsidiary Soekor (Exploration and Production) Proprietary Limited, responsible for exploring for and producing oil and gas and a business unit within the company which promotes, locally and internationally, the development of South Africa's offshore national oil and gas resources. This Petroleum Licensing Unit undertakes a regulatory and licensing function on behalf of the State which may be influenced by the further restructuring of Soekor.

The promotional, data management, regulatory and other functions performed by the Petroleum Licensing Unit in oil and gas exploration will be separated from those of Soekor (Exploration and Production) (Pty) Ltd which will be commercialised in preparation for the restructuring of CEF's commercial assets.

7.4.17.2 Mossgas

Government has a direct interest in the production of synthetic fuels from natural gas through its ownership of Mossgas. Private sector-interest in Mossgas has been assessed but none of the proposals submitted met the specified criteria and it was decided that Mossgas will continue in its present role as synthetic fuels producer and that satellite gas fields will be developed to enhance the life-expectancy of Mossgas.

Government will seek to optimise its investment in Mossgas. Government does not intend to embark upon any new synfuels projects.

7.4.17.3 Strategic Fuel Fund Association (SFF)

The maintenance of adequate petroleum reserves and stocks remains a strategic imperative for any crude oil importing country. The International Energy Agency considers a strategic crude oil stockpile level equivalent to ninety days import requirements as appropriate for its member countries.

Government will determine the country's strategic crude oil requirements and will ensure that supply security is maintained.

Taking cognisance of the capacity of its synthetic fuels industry South Africa will maintain a strategic crude oil stock level equivalent to at least three months total consumption.

7.5 Gas

7.5.1 The existing gas industry

Natural gas, produced from the F-A field in the Mossel Bay area, supplied 1,6% (or 72 PJ) of total South African primary energy supply during 1997, as a feedstock to the Mossgas synthetic liquid fuels plant. Piped coal gas, manufactured in Sasol's chemicals and liquid fuels plants and marketed by Sasol Gas, a division of the Sasol subsidiary Sasol Oil, supplies 1,1% (or about 30 PJ) of net energy consumption, largely to industrial consumers in the Gauteng and Mpumalanga provinces. The pipelines are owned by Gaskor. Sasol Gas markets both high energy content methane-rich gas (to Witbank, Middelburg and the Richard's Bay/Durban areas) and low energy hydrogen-rich gas in Gauteng. Both Mossgas and Sasol were state initiated and financed. Sasol has subsequently been privatised while Mossgas remains state owned. The Mossgas project was developed for purely strategic reasons and has been unable to re-coup its R11 billion capital cost. The Sasol gas business developed largely as a by-product of Sasol's synfuels business and remains inextricably linked to it. Sasol's gas production capacity is unknown.

7.5.2 Gas resources and industry development

South Africa has relatively small known gas resources of 30 billion cubic metres (bcm) off the south coast and some very small recent discoveries (3 bcm) off the west coast. However, the potential natural gas resources have not yet been fully investigated. To date South Africa has undertaken limited exploration for oil and natural gas leading to twenty gas and nine oil discoveries. Limited exploration for coal-bed methane is underway. This section on the downstream gas industry does not distinguish between natural gas and coal-bed methane.

Despite the relatively low level of known domestic gas resources it is probable that the South African gas industry is on the brink of significant expansion, due to natural gas field discoveries and development in

neighbouring Mozambique and Namibia, as well as the potential development of South African natural gas and coal-bed methane resources.

Based on the results from three wells drilled, the current recoverable reserve in the Kudu field in Namibia is 56 bcm. An upside potential of 230 bcm is likely. This amount of gas is sufficient to satisfy current levels of demand for gas in both the Western Cape and Gauteng markets.

The Pande field in Mozambique is the most mature of the gas fields, with current proven reserves of 65 bcm, and is likely to be developed first. The utilisation of this gas in South Africa will require the construction of an international gas transmission pipeline, up to 900 km in length, from Pande in Mozambique to Mpumalanga and Gauteng. The project has attracted significant international interest in recent years.

Potential gas development projects entail huge capital investments, locked into immovable assets with long term returns, and investors therefore require stable policy conditions. In the absence of stability, increased investment risks lead to lenders requiring higher returns, which pushes up the price of capital and hence the gas price. This has the dual effect of making some projects non-viable, and allocating an unnecessary portion of the rent to risk capital for those projects that are viable.

Given that both the Pande and Kudu fields are located in neighbouring countries the development of these projects has important implications for regional economic development. The harmonisation of gas policies within the region, particularly regarding bi-national gas trade, is required to facilitate this process. Considerable progress has already been made in this regard with Mozambique.

Strong potential thus exists for significant growth in South Africa's gas industry, based largely on regional gas trade. Recent developments in the local gas industry have seen Petronet, the state-owned fuel pipeline company, converting a liquid fuels pipeline to transport gas more than 500 km from Sasol's Secunda plants to the Richard's Bay and other Natal markets. Sasol has also recently built a 119 km pipeline from its Secunda plants to the Witbank area, thereby significantly expanding its market access.

7.5.3 ***Environment***

Environmental benefits arising from the use of natural gas as a source of energy include:

- reduced carbon dioxide emissions relative to equivalent energy other fossil fuels;
- low particulate emissions;
- high energy efficiency in combined-cycle applications;
- negligible sulphur content in regional deposits; and
- gas-fired generation plants require less space than conventional coal-fired plants of the same capacity.

7.5.4 ***Key policy challenges***

Gas has a number of attractive characteristics from an energy policy perspective. The development of the gas industry will stimulate inter-fuel competition, provide environmental benefits through lower emissions in contrast to oil and coal, provide greater options for industrial thermal applications, and increase the diversity of fuel supplies and hence improve South Africa's energy security. Other important uses of gas are as a reductant in the metallurgical industry or as a feedstock in the chemical industry. Government is therefore committed to the establishment of an appropriate climate to facilitate the development of the gas industry.

Key policy challenges facing government are the following:

- to ensure conditions conducive to a stable investment climate, so as to encourage economically viable development and thereby limit the risks to capital lenders and improve project viabilities;
- to ensure that gas transmission, storage and distribution operators do not adopt monopolistic behaviour and to limit the opportunities for dominant operators to abuse their market power;

- to deal effectively with the international aspects of gas transmission pipelines and international gas trade; and
- to develop appropriate gas governance systems and the necessary capacity for these to operate.

7.5.5 **Regional issues**

The Department of Minerals and Energy is currently in the process of developing a gas regulatory structure and addressing the harmonisation of regional gas policies through bi-national agreements. Studies by the World Bank, the International Energy Agency, and South African bodies are assisting this process.

The Government shall in consultation with relevant stakeholders endeavour to harmonise gas issues with neighbouring states.

This will facilitate cross-border gas trade and enhance regional socio-economic development.

7.5.6 **Regulatory regime**

South Africa's small gas industry is expected to expand and provide a significant component of national primary energy. Indications are that the existing participants in the industry, potential participants and potential investors would all welcome a regulatory environment in which government policies for the gas industry are stated explicitly. This will increase investor confidence and promote the rapid development of the industry.

A Gas Regulatory Authority will be established to implement a minimal regulatory regime consistent with orderly development of a competitive gas industry through granting licenses for the transmission, storage, distribution and trading of piped gas.

Government recognises that the existing gas industry is relatively small, but growing rapidly. The regulatory environment will be conducive to the development of the industry and will provide investors with confidence to invest in the required infrastructure by establishing clear, stable legislation to facilitate investment. Legal requirements will be phased in where appropriate.

Due regard will be given to the needs of all stakeholders.

The functions of gas transmission, storage, distribution and merchandising will be implemented as separate undertakings and will require separate licences. The regulatory system will facilitate pipeline routing, pipeline sizes and capacities, and the interconnection of pipelines. A facility will be made for phasing in of regulations, and where a monopoly exists a price control mechanism will be instituted.

7.5.7 **Industry structure**

Integration of companies operating in more than one of the gas chain elements, namely production, transmission, storage and distribution, can result in anti-competitive behaviour. On the other hand, the security of gas supply/demand to encourage development of the industry may require some form of vertical participation by the principle players.

Interests in more than one element may be permitted in order to facilitate project development from producer, through transmission to distribution. . In the event of common interests in the control of vertically-related companies, the licensing of such companies will be subject to proof of functional separation and arm's-length relationship between the companies.

The government will facilitate efficiencies which accompany economies of scale.

Large gas consumers will be permitted to purchase gas directly from the transmission system. [Small gas consumers in licensed distribution areas will purchase gas through a distribution system.]

7.5.8 **Transmission**

The natural monopoly characteristics of gas transmission pipelines presents the potential for the exercise of market power, including restricted access of gas industry competitors and maintenance of high prices.

The gas regulatory regime will inhibit monopolistic abuse of pipelines by requiring pipelines to provide non-discriminatory open access to uncommitted capacity, transparency of tariffs, and disclosure of cost and pricing information to the Gas Regulatory Authority.

Where a third party requests access to a transmission pipeline, decisions will be made on a reasonable basis, and at the expense of the applicant who requests the upgrading.

7.5.9 **Distribution**

A distributor's function is to supply lower volume consumers whose consumption is too small or too irregular to warrant purchasing from a producer/merchant. Distributors are vulnerable to predatory actions by producers, who can attract the steady-demand medium-sized consumers, thus destroying the distributor's ability to aggregate sales and enter into a take-or-pay contract with the producer. This chain of events would limit the expansion of the gas industry into the household market. The distribution system world-wide is reliant on a distributor's ability to aggregate customers and exclusive rights to an area to prevent duplication of the distribution grid.

Distributors will be awarded licenses for exclusive geographic areas in order to market a class of gas to small gas consumers. This will be subject to price approval by the Gas Regulatory Authority.

Licensed distributors will be required to satisfy specific customer service standards and to disclose operating information to the regulatory body responsible for the gas industry,

7.5.10 **Fiscal matters**

Depreciation on pipelines is currently not allowable for tax purposes. This is a fiscal policy which discourages investment. The Department of Minerals and Energy has made representation to the Department of Finance to allow tax deductibility on gas pipelines.

7.5.11 **Technical standards**

The Department of Minerals and Energy will assist the Department of Labour with the development of health and safety standards for the construction and operation of transmission and distribution pipelines, storage and metering.

Where existing standards are deemed acceptable, even if they do not conform to the new national standards, these will be permitted for indefinite use, but new or replacement work will have to conform to the national standards. Where existing standards are deemed unsatisfactory, a transition period will be allowed for institutions to bring equipment up to standard without undue financial hardship.

7.5.12 **Gas utilisation**

Some countries have chosen to restrict the usage of gas to certain applications, based on the understanding that gas reserves were limited and that this commodity should be conserved while alternative commodities were available. Such constraints on usage have tended to limit the growth of gas markets and hence the rate of exploration. International experience now shows that, in general, gas reserves are far larger than had been expected and that no limitations should be placed on gas utilisation.

No restrictions will be placed on the use of gas, or on the amount of national primary energy sourced from gas that may be imported from SADC countries.

Efficient-energy practices will, however, be encouraged.

7.6 Coal

South Africa has a coal resource of approximately 121 billion tonnes, of which about 55 billion tonnes are classified as economically recoverable reserves. Although coal's contribution to South Africa's total primary energy supply has declined slowly, at the current level of approximately 75% during 1997 it still dominates the energy sector. Approximately half the coal consumed in South Africa is used for the generation of electricity, and a quarter for the production of synthetic liquid fuels. A large number of urban households in the central industrialised area still continue to burn coal, even after electrification.

During 1997, total national coal consumption was approximately 157 million tonnes, and coal exports totalled 64 million tonnes. The production of discard coal during 1997 has reached about 62 million tonnes, mainly, as a waste product of coal beneficiation. It is estimated that 800 million tonnes of discard are stockpiled above ground, which can be regarded as a future reserve of low grade coal. Stockpiling must, however, be done in an environmentally acceptable manner.

The coal production and beneficiation industry is wholly in the hands of the private sector. Previous regulations, for example controlling prices and export quantities, have been repealed, and the industry was completely deregulated during 1992. The government currently maintains a monitoring watch on the industry to ensure that coal resources are optimally utilised to the national benefit and that a competitive market is maintained.

Government energy policy for the coal industry is to maintain a successful and competitive coal market, ensure the efficient utilisation of coal resources and to reduce the environmental impacts associated with coal usage. This last policy has already been partially addressed by the Mining Health and Safety Act of 1996, and is covered further in the Environment, Health and Safety section of this paper.

7.6.1 Coal market

Since the removal of all governmental controls in 1992, the coal industry has operated as a competitive market. Under these conditions the industry has prospered, exports have increased, thereby earning foreign exchange, and relatively low prices have been maintained.

The coal energy industry will remain deregulated and its level of performance will be monitored.

Government will continue to monitor the coal industry's performance, including wholesale and retail operations, to ensure that competitive conditions in the coal market are maintained, and coal resources are utilised efficiently.

7.6.2 Coal resources

Long-term national planning of coal utilisation and policy development requires information as to the quantity, quality and locations of resources and reserves, as well as the rates of consumption of different coal products. Government also requires data to monitor the level of sustainability of the South African coal export programme.

The national coal resource/reserve database will be developed, updated and maintained, subject to evaluation of the need from time to time.

7.6.3 Coal-bed methane

Coal-bed methane provides a hitherto wasted untapped source of gas. During coal mining operations, the coal-bed-methane is allowed to escape into the atmosphere, thereby contributing to the green-house gas burden. The

harnessing and exploitation of coal-bed-methane will minimise these green-house gas releases. Details of exploitable reserves are unknown, and further policy development requires knowledge of quality and quantity of this commodity.

The resource potential of coal bed methane will be investigated and established.

The investigation of the exploitation and utilisation of coal bed methane will be market driven. The exploitation and utilisation of coal bed methane will have the benefits of making underground coal mining safer as well as to prevent the release of a potent green house gas into the atmosphere.

7.6.4 Coal and the environment

It is likely that coal will remain the major source of energy for the foreseeable future. Since the use of this fuel carries with it the potential for significant negative environmental impacts it is necessary to develop policies to ameliorate these impacts.

7.6.4.1 Clean coal technologies

Significant scope exists to reduce the environmental impacts of coal use in urban households, utility boilers and approximately 4500 coal-fired industrial boilers through the utilisation of modern clean coal technologies at a low marginal cost.

Clean coal technologies will be monitored, and promising technologies evaluated and demonstrated, and their adoption, introduction and implementation will be facilitated where applicable.

Government will investigate the application of tax concessions and/or penalties for the promotion of the implementation of market-driven clean coal technologies.

Clean coal technologies represent a major area for co-operation with more developed countries. In some applications, especially where thermal energy is required, it may be cheaper, more efficient and more environmentally benign to make use of clean direct coal combustion, rather than secondary carriers such as electricity.

Government will therefore be involved in standard setting, monitoring, evaluation, and technology demonstration where necessary. Further information on these issues is available in the section on Research and Development.

Although South Africa is fortunate to have low sulphur content coals available for utility power generation, future coal-fired stations will be evaluated on Best Available Technologies Not Entailing Excessive Costs (BATNEEC) for both retrofit and new plant applications.

7.6.4.2 Low-smoke fuels

The Department of Minerals and Energy has initiated the Low-smoke Fuels Programme because of the high levels of air pollution caused by the combustion of coal in households. Improved efficiency in the combustion of low-smoke fuels will contribute, along with other measures, the health problems associated with environmental pollution. The aim of the Low-smoke Fuels Programme is to specifically replace the use of coal in households

Government will promote the use of low-smoke fuels and efficient combustion appliances for the improvement of air pollution from coal and wood use.

7.6.4.3 Efficiency of coal use

More efficient use of coal by industry, commerce and households, through improved processes and appliances, can reduce the environmental impact of coal combustion, including carbon dioxide emissions, and extend the life of this non-renewable resource.

Government will promote efficiency improvements in coal use.

Facilitating the international transfer of information and technology is one mechanism which could assist in improving efficiencies for the optimal utilisation of coal resources and the reduction in total global carbon dioxide emissions. Further information on this issue is provided in the sections on Energy Efficiency and International Energy Trade and Co-operation.

Cross reference to Green-house Gas Inputs in Environment Section.

7.6.4.4 Coal discards

Coal discards form a valuable reserve, even though they are of low quality. Since they are located above ground they can be reclaimed by beneficiation at a competitive cost as they do not incur a further mining cost.

There are at least two potential means of making use of discard coal, firstly the beneficiation of discards to yield conventional coal products and, secondly, the combustion of raw discards, for example in a fluidised bed combustor. Research has indicated that approximately 60% of the accumulated discards can be used for energy application purposes. Government is in support of current techno-economic investigations for power production from discard coal.

Government will continue to investigate and encourage options for the utilisation of coal discard streams and stockpiles and will promote appropriate options for the resultant energy and environmental benefits.

7.7 Renewable energy sources

Renewable energy is obtained, in one form or another, from the sun and its daily interaction with the environment. Altogether renewable energy resources provide approximately 10% of South Africa's primary energy. Biomass, in the form of firewood, wood waste, dung, charcoal and bagasse, accounts for close to 10% of net energy use at the national level (60% of household energy consumption). Hydro-electric power contributes less than 1% of electricity generation and most of that is pumped-storage. Other renewable energy sources make up a small but rapidly increasing amount of energy supply. These include the biogas and landfill gas which need to be promoted in order to address thermal energy needs.

Although more than 484 000 m² of solar water heater panels have been installed, this constitutes less than 1% of the potential market. The installed capacity of photovoltaic systems is approximately 5 MW peak, of which 50% is used for telecommunications. 280 000 water-pumping windmills are in operation and the installed capacity of small-scale hydropower exceeds 60 MW.

Rapid development of renewable energy technologies is taking place in many parts of the world. As costs decrease, more and more applications are becoming cost effective and competitive. In contrast to world trends, however, South Africa has neglected the development and implementation of renewable energy applications, despite the fact that our renewable energy resource base is extensive and many appropriate applications exist.

Renewable energy applications have specific characteristics, which should be taken into account. Advantages include minimal environmental impacts in operation in comparison with traditional supply technologies; generally lower running costs; and high labour intensities. Disadvantages include: higher capital costs in some cases; lower energy densities; and lower levels of availability, depending on specific conditions, especially with sun and wind based systems. Nonetheless, renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future. The development of government's renewable energy policy is guided by a rationale that South Africa disposes of very attractive renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

Government policy on renewable energy is thus concerned with meeting the following challenges:

- ensuring that economically feasible technologies and applications are implemented;
- ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
- addressing constraints on the development of the renewable industry.

Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential.

7.7.1 Monitoring of international renewable energy developments

Renewable energy developments in other countries need to be monitored, adapted, developed for local use and demonstrated to build awareness. This is particularly the case for near-cost-effective applications with extensive potential for replication. Perceptions exist in South Africa that renewable energy is only suitable for small-scale applications, where it would be too expensive to supply conventional forms of energy. In fact, renewable energy can be suitable for both small/local and large/centralised applications. Closed mind-sets are therefore a barrier to the adoption of renewable energy technologies.

Government will provide focused support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications.

Immediate priorities for this programme will be biomass applications (for the use of biomass, not for its production), passive building design, photovoltaic, micro-hydro and wind-based electricity systems and solar water heating. Activities will include information dissemination, education, extension and referral services, and the active promotion of implementation where applicable

It is anticipated that suitable demonstration projects, and the effective communication of their results, will contribute to the establishment of a greater acceptance of the role of renewable energy sources in South Africa. This will entail the promotion of a long-term perspective on the total energy system, taking into consideration externalities, the depletion of fossil energy sources and the reduction of supply risks through the diversification of the primary energy supply base.

7.7.2 Support to priority technologies

In many cases renewable energy technologies can be used in combination with and complementary to conventional energy sources. The role that renewable energy already plays in household electrification is an example of this integrated approach to the supply of energy services. In order for government to prioritise which specific renewable technologies and applications to support, research into local and international developments must be undertaken and barriers to their wider use must be addressed.

Government will support renewable energy technologies for application in specific markets on the basis of researched priorities.

Appropriate research into optimal system integration, control systems and pricing signals will be undertaken to identify opportunities for renewable applications. This research will inform government strategies for the support of prioritised technologies and applications.

7.7.3 Rural fuelwood

Fuelwood is the main source of energy for most rural households and access to sustainable and secure fuelwood supplies is important for the survival of many rural households. Demand exceeds sustainable supply in many areas of the country and this, coupled with agricultural and settlement pressures, is resulting in the denudation of natural woodland.

Government will facilitate the production and management of woodlands through a national social forestry programme for the benefit of rural households, where appropriate.

The implementation of this programme is currently the responsibility of the Department of Water Affairs and Forestry, in co-operation with the Department of Agriculture, the Department of Minerals and Energy, provinces, local communities and the private sector.

7.7.4 Standards and guidelines

As with all 'new' technologies, renewable energy applications have yet to establish standards and practices on a par with conventional supplies. The lack of standards contributes to user uncertainty about the cost effectiveness and reliability of these systems.

Government will promote the development and implementation of appropriate standards and guidelines and codes of practice for the correct use of renewable energy technologies.

Implementation of this policy will entail the development of

1. standards and codes of practice, based on international practice and adapted for South African conditions and cost efficiency requirements.
2. a Standards Laboratory and testing centre according to standards developers as a Government private sector initiative.

Such development can be facilitated by the Department of Minerals and Energy but must include standards authorities and the renewable energy industry.

Certification of system designers and installers, information dissemination and voluntary compliance with specifications and codes of practice will build confidence in the renewable industry. Government tender procedures are a further option to increase pressures for standardisation. It is preferable that activities of this nature be industry-led. Government will monitor progress in this regard.

To date insufficient attention has been paid to the establishment of national criteria for solar rights in South Africa, such as the rights of consumers to receive direct solar radiation during the day, on specific parts of their property, without interference by other buildings, structures or vegetation. Town planning ordinances, usually covers such rights, or access requirements. National government will facilitate the establishment of criteria for these rights.

7.7.5 Statistics, information dissemination and education

Informed decision making, at all levels, is only possible when suitable and credible statistics and information are available. There is currently a national lack of renewables energy data, and information on renewable energy system applications, system specifications, systems standards, installation and performance guides, technical and economic characteristics and many other related issues.

Government will establish suitable information systems of renewable energy statistics, where justifiable, and will assist with the dissemination thereof.

The Department of Minerals and Energy will facilitate the implementation of this policy, possibly with the assistance of an appropriate external body. The Department of Minerals and Energy will also establish programmes to disseminate information and educate energy users about the potential, characteristics, costs and implications of the various forms of renewable energy.

7.7.6 Renewable energy systems

Implementation of the renewable energy policies will require substantial funding. Opportunities to leverage investments in renewable energy systems, by means of innovative approaches to reducing the risks to financial institutions and hence the cost of finance to consumers, need to be exploited. The non-grid industry should make optimal use of private sector financing opportunities, in conjunction with the funding mechanisms being put in place for electrification.

The capacity of the Department of Minerals and Energy is presently being improved in order to cater for the need to implement the proposed renewable energy policies and programmes. To this end, some 1 400 rural schools and 300 rural health clinics have already been electrified with photovoltaic systems. A number of rural villages have been targeted for installation of solar home systems (SHS), solar cookers, solar water pumps and solar water heaters. The natural beneficiaries of these systems are households, schools and clinics in these rural areas. With the assistance of international funders and contractors, the programmes are developing at an ever-increasing rate.

Hydro schemes, such as Cahora Bassa, will be investigated by the Department. Already the Department is engaged in negotiations between the South African government and the governments of Mozambique and Portugal regarding agreements on tariffs. The establishment of the Southern African Power Pool will widen access to other hydro-electric resources in the Southern African region.

The attractive wind energy potential of South Africa will, likewise, receive attention.

Various international agencies have expressed an interest in assisting with the development of potential sources of renewable energy. Such support is dependent on the existence and proven activities of suitable local institutions, and a serious commitment from government to fully support cost-effective renewable energy applications.

8.

8. **Part 4: Cross-Cutting Issues**

8.1 Integrated energy planning

Integrated energy planning (IEP) is a process which entails the following technical functions:

- interpreting the requirements of national economic, social and environmental policies for the energy sector;
- analysing energy needs in terms of how their fulfilment will contribute towards attaining national economic and social goals;
- analysing the potential of energy supply systems and demand side management to meet current and potential future energy needs. This would include analyses of individual supply sub-sectors and the linkages between sub-sectors;
- analysing energy sector linkages to the macro-economy;
- analysing the potential effects on the energy sector of global and technological developments;
- evaluating the effects of legislative, institutional and industry structure arrangements on energy supply and demand; and
- specifying, sourcing and presenting data on energy supply and demand, energy sector institutions, and linkages with economic and social factors in order to provide a statistical description of the energy sector's historic evolution and current impact on economic and social development.

Clearly, the implementation of IEP requires sufficient capacity to carry out these technical functions and to engage with energy policy processes. Such capacity does not currently exist within South Africa and consequently there is an insufficient level of the information required to inform policy development on the South African energy sector. Key policy challenges are thus to:

- establish appropriate structures and systems to carry out IEP functions;
- establish and maintain the necessary resources to operate these structures and systems;
- link IEP technical functions into policy-making processes;
- facilitate the development of a least-cost energy system, including environmental costs;
- ensure an appropriate balance between demand and supply side actions and the use of primary energy resources.
- link electricity into the municipalities infrastructure investment plan. Therefore at local government level the Integrated Energy Plan (IEP) forms a component of the integrated development plan (IDP).

Government will facilitate the provision of the necessary resources to establish IEP structures and systems to develop energy policy.

8.1.1 Integrated resource planning decisions

By virtue of its size and economic importance, the energy sector periodically requires considerable investments in new supply capacity, which impacts on the economy. Historically, such decisions were primarily driven by concerns with maintaining supply security, without giving full consideration to the economic, environmental and social impacts of all alternatives. As a consequence, the tendency has been towards the construction of large-scale capital-intensive supply facilities, and the neglect of alternatives which might have been more cost effective in the long term, and had greater employment benefits and more favourable environmental impacts.

The Department of Minerals and Energy will ensure that an integrated resource planning approach is adopted for large investment decisions by energy suppliers and service providers, in terms of which comprehensive evaluations of the economic, social and environmental implications of all feasible supply and demand side investments will have to be undertaken. In the electricity sector's case, the National Electricity Regulator will only license new facilities upon the satisfactory completion of an integrated resource plan.

This policy is consistent with the requirement of the Integrated Environmental Management system, in which all project alternatives have to be considered.

The Department of Minerals and Energy will ensure that adequate capacity is available within the Department to implement and oversee the integrated resource planning approach, and will ensure that it is adequately included in the Integrated Environmental Management process, as advocated by the Department of Environmental Affairs and Tourism.

Decision making processes around large energy investments in international economies with sophisticated energy sectors, have, over the past decade or more, adopted the integrated resource planning approach. This is an effective means of ensuring that the natural preference of utilities for large supply-side investments is compared on an equal footing with all feasible alternatives, and that their environmental costs are integrated into an economic analysis. This 'levelling of the playing fields' between conventional supply options and those which are potentially more environmentally-benign (such as renewables and demand-side management) could well encourage structural shifts towards a more sustainable approach in the long term.

8.2 Statistics and information

In a report released in May 1996 commenting on South Africa energy policies, the Organisation for Economic Co-operation and Development's (OECD's) International Energy Agency stated that 'the lack of good data is a major weakness in the energy policy making process in South Africa. It also hinders transparency in the energy sector.'

Not only is good data required for the energy policy process but it is fundamental to the implementation of integrated energy planning. To facilitate integrated energy planning a database needs to be maintained covering at least the following areas:

- energy resources;
- energy production from indigenous resources (mining, renewables, oil and gas);
- international energy trade (imports and exports);
- energy transformation (production of liquid fuels and electricity from other sources);
- storage, transport and distribution of energy;
- national energy trade (wholesale and retail);
- investment in plant and infrastructure associated with the above areas;
- disaggregated energy usage, expressed in energy and cost terms;
- energy efficiency;
- energy related environmental emissions;
- average sectoral energy prices and taxes;
- institutions linked to all the above areas; and
- similar data from regional and international sources.

The data should be collected, stored and reported in accordance with international specifications and standards to facilitate easy comparison, integration and exchange. Data should be collected regularly and the database kept up to date. Modern information theory and technology make this practicable. Clear guidelines will have to be established and enforced regarding what kind of information is sensitive.

Government will ensure that the necessary resources are made available to establish structures and systems, and put in place legislation to facilitate the specification, collection, acquisition, storage, maintenance and supply of energy data, and energy-related data, according to the requirements of integrated energy planning and international standards. Government will facilitate the establishment of information databases.

Government will provide information to the public at a reasonable price. The provision of this information will not compromise the commercial position of parties supplying data to government.

8.3 **Energy efficiency**

Energy efficiency is a measure of the savings of energy, which is used to provide goods and services, while maintaining the desired benefits.

Since expenditure on energy constitutes a large portion of the country's GDP (15%), and a particularly large proportion of poor households' expenditure, it is necessary to give attention to the effective and efficient use of energy. Energy efficiency and energy conservation considerations must therefore form part of an overall energy policy. Energy efficiency should also be considered within the conceptual framework known as 'Integrated Resource Planning', which considers both supply-side and demand-side options for meeting energy service requirements.

In developing policies to achieve greater efficiency of energy use, government is mindful of the need to overcome shortcomings in energy markets, but without causing undue interference in the operation of market forces. In formulating energy efficiency policies government proceeds from an understanding that efficient use of energy is best achieved through the creation of an awareness of the benefits of energy-efficiency measures (both environment and economic) and the deployment of incentives to encourage such measures.

Significant scope for improved energy efficiencies exists within the industrial, commercial, domestic, and transport demand sectors.

8.3.1 **Energy efficiency in industry and commerce**

South African energy consumers in industry and commerce are in general unaware of the need for and potential of energy efficiency improvements and savings.

Government will promote an energy efficiency awareness amongst industrial and commercial energy consumers, and will encourage the use of energy-efficient practices by this sector.

Most countries have energy conservation regulations. In South Africa, no energy efficiency standards, norms or regulations exist. There has been a recognition for some years that substantial benefits would accrue to the commercial building sector and society at large from the introduction of energy efficiency standards. Studies indicated that 20% of the total municipal electricity consumption is utilised in commercial buildings. It is estimated that energy savings of around 30% may be realised through the use of improved design and management practices as well as retrofit projects of existing buildings in South Africa. One of the keys towards achieving this is the development and implementation of standards and norms.

Government will establish energy efficiency norms and standards for commercial buildings

Energy audit schemes and demonstrations have been implemented in various countries with great success. Various options for energy audit schemes and demonstrations exist. For instance sectoral energy studies can be conducted to achieve an overview of a sector and identify opportunities for energy efficiency improvements. Sectoral energy studies provide a basis for further specific actions in a sector.

Lack of expertise in industry has been identified as one of the key barriers to increased energy efficiency.

Government will promote the performance of audits, demonstrations, information dissemination, sectoral analyses and training programmes.

Electric equipment uses a large amount of electricity in industry. Cost-effective results are possible if more energy efficient electric motors were utilised.

Government will establish energy efficiency standards for industrial equipment.

Although government is itself a large consumer of energy, through its various facilities, it does not currently set a good example through the efficient use of energy. Government will implement an energy efficiency programme to reduce consumption in all its buildings.

Government will implement an energy efficiency programme to reduce consumption in its installations.

Not only will this programme establish good precedents, it will also reduce operating expenses.

8.3.2 Energy efficiency in households

As part of government's commitment to the socio-economic upliftment of South Africa's peoples a large number of low income dwellings will be constructed over coming years. There is, however, a serious concern that insufficient attention is being paid to the thermal performance of this low-cost housing. Building without attention to thermal performance may reduce initial costs slightly, but will expose residents to a lifetime of low thermal comfort, high energy costs and cause the high levels of energy related air-pollution encountered in low-cost residential areas to prevail well into the future.

Government will promote energy efficiency awareness in households and will facilitate the establishment of relevant standards and codes of practice for the thermal performance of dwellings, the inclusion thereof in the national building codes, and will promote their implementation through appropriate measures.

With specific reference to the low-cost housing sector the Department of Minerals and Energy has assisted in the establishment of appropriate guidelines in conjunction with the Department of Housing and all other public authorities responsible for housing standards and construction. These guidelines will facilitate minimal life-time costs and adequate thermal comfort levels.

A programme of education will be initiated for decision-makers, such as designers, financiers, builders and home-owners, dealing with the costs and benefits of building dwellings with good thermal performance.

8.3.2.1 *Appliance efficiency*

Public awareness of the operating cost of appliances is low, partly due to a lack of awareness around energy efficiency generally and partly because of a lack of information on appliance operating costs.

The Government will promote the introduction of a domestic appliance labelling programme.

Appliance labelling forms a major component of household consumer education and assists people in their choice of appliance. Not only are consumers informed about appliance energy consumption but manufacturers tend to compete to produce more efficient appliances.

Publicity campaigns will be undertaken to ensure that appliance purchasers are aware of the purpose of appliance labels.

8.3.3 *Energy efficiency in transport*

As a large proportion of transport fuel is imported any reduction in motor vehicle fuel consumption will assist in reducing pressure on scarce foreign exchange reserves. Furthermore, efficiency improvements can be instrumental in reducing air pollution and increasing economic output.

Detailed policies to increase transport energy efficiency are described in the section on Transport Energy Use.

8.3.4 *Energy efficiency and government capacity*

Government's capacity to undertake the energy efficiency programmes described herein is rather limited. Other countries in similar circumstances have found the establishment of an agency to be an effective means of providing the necessary capacity and flexibility to implement such programmes. The functions of such an agency could include:

- building consumer awareness of energy utilisation and cost-saving measures;
- demonstrating to consumers the benefits of energy efficiency measures through audits, demonstrations, sectoral analyses and other activities;
- building the capacity to implement targeted energy efficiency programmes;
- training people in energy efficiency methods; and
- identifying and facilitating the removal of barriers to energy efficiency.

Government will further investigate the establishment of appropriate institutional infrastructure and capacity for the implementation of energy efficiency strategies.

In order to monitor the achievement of these policies, targets may be set for energy efficiency improvements in various industries and commercial organisations. Government may monitor and evaluate the results and determine whether these targets have been met. Such targets may not be mandatory and industry and commerce may be asked to participate in the setting of voluntary targets.

8.4 Environment, health and safety

In common with most countries in the world, South Africa's energy sector causes significant positive and negative environmental and resource impacts. These have given rise to a number of environmental challenges, many of which result from the lack of infrastructure investment in poor residential areas, while others result from the methods adopted to exploit the country's natural resource endowments. These environmental impacts vary widely in scale and severity, ranging from the local level where peoples' health is affected on a daily basis, to regional and global impacts where the effects are more difficult to identify and control. Because energy-related environmental issues affect many sectors of society, different government departments exercise functions that involve the management of these environmental issues.

In this Section clear cognisance is taken of the Department of Environmental Affairs and Tourism's National Environmental Management Bill and specifically the environmental management principles related to energy and the environment, as the Department of Minerals and Energy has no regulatory responsibility regarding the impacts of energy on the environment. These overall principles are:

- placing peoples energy needs at the forefront and serving their interests equitably;
- ensuring that developments in energy are socially, environmentally and economically sustainable;
- ensuring that sustainable development requires the consideration of all the relevant factors; and
- promoting and facilitating public participation in decision-making affecting the environment.

There is an inevitable interaction between environmental and development goals, necessitating an integrated approach which encompasses these two issues. The key environmental challenge for the energy sector is thus to maintain an acceptable balance between these goals through the development and implementation of appropriate policies and strategies. Where environmental and development goals converge, it is essential that full advantage be taken of such opportunities.

Whilst the long-term ecological sustainability of the energy sector is desirable, government's current view is that the immediate priority is to address those environmental problems which affect the living conditions of millions of people on a daily basis. Amelioration of these conditions is seen as the first step on the path to achieving a more harmonious balance between society and the environment. The following set of policies on energy and the environment reflect this prioritisation. Policy implementation strategies will include both market-based and legislative approaches, depending upon the particular circumstances of each case.

8.4.1 *Indoor and outdoor air pollution from coal and wood use*

Even after electrification, many households continue to use coal and wood on a daily basis although this is expected to slowly decrease as prosperity rises, and living habits changed. The result of coal and wood burning is that indoor and outdoor air environments are severely degraded. Research has found that these households are exposed at times to levels of particulate pollution up to seven times above international health guidelines.

In rural areas in South Africa, around three million households burn fuelwood for their energy needs, often in enclosed spaces and without stoves or chimneys. Research indicates that pollution levels inside these dwellings are also unacceptably high.

In the case of both urban coal users and rural wood users, the health effects which result from extended pollution exposures are generally long-lasting and, in some cases, life-threatening. Not only is the ailment burden borne primarily by those who can least afford it, but the social costs of these effects are likely to be very significant. These costs include additional expenditure on health care, and lost productivity through illness.

Government will seek, as a matter of priority, to mitigate the negative environmental and health effects of air pollution from coal and wood use in household environments.

Measures to be used will include the promotion of:

- clean fuels (e.g. low-smoke fuels, LP Gas, etc.) as a substitute for bituminous coal;
- thermal improvements to existing and new houses to reduce the amount of coal required to heat dwellings in winter;
- continued electrification of households.
- the installation of chimneys in existing and new houses;
- improved ventilation in existing and new houses;
- the development and implementation of improved stoves with regard to performance and safety;
- the development and implementation of improved coal and wood burning practices; and
- education programmes on the implementation and application of the above measures.

Government will assess the viability of the different strategies in relation to each other with specific emphasis on the overall cost-effectiveness of each strategy.

The effectiveness of these interventions will be established by monitoring pollution levels. Government will make a distinction between urban and rural areas in terms of health externality costs and will address both areas as electrification gradually shifts the pollution burden from household to power station areas.

It is acknowledged in these policies that, despite early expectations, electrification alone does not eliminate air pollution in coal and wood-using areas in the short to medium term. This finding is particularly common in rural areas and poorer urban areas, where wood and coal are more cost effective than electricity for cooking and heating purposes. Given the scale of the social and environmental costs resulting from these forms of air pollution, there may be strong economic justification for fiscal interventions to reduce pollution levels. See also the Section on Low-smoke fuels under Coal.

8.4.2 Fires, burns and poisoning from household fuels

Almost all unelectrified households in South Africa use candles or paraffin for lighting, both of which have specific hazards. A large number of accidental fires occur every year in informal settlements, usually with devastating impacts on the residents' property, and frequently resulting in the deaths of less mobile people, such as infants and the elderly. The causes of these fires include not only accidents with candles and paraffin lamps, but also poor quality paraffin appliances which sometimes explode under conditions of heavy or improper use. The impacts of these fires and burns, in social and economic terms, are significant in total.

Paraffin poisoning is a common occurrence, especially among infants of less than three years of age in low-income households. These tragedies arise because paraffin is purchased and stored in drinking bottles, which are easily mistaken by young children as containing water or other drinking liquids.

Government will continue to encourage electrification of households, using either grid connections or off-grid means, and will monitor the impact of electrification on the number and severity of fires caused by candles and paraffin, in order to establish whether expected reductions materialise.

Government will develop, introduce and promote safety and performance standards for paraffin stoves.

This will be a means to prevent the sale of poor quality and dangerous stoves.

Government will require the suppliers of paraffin and related products, to the retail sector, to introduce safety measures as part of their activities.

Government will monitor and assess the impact of the safety measures undertaken by the petroleum industry and will provide guidance and support to these activities where necessary.

Such measures may include the use of child-resistant paraffin containers and lids. Should the petroleum industry fail to implement these voluntary measures, government will consider introducing legislation to make them compulsory. Government acknowledges the efforts of the Paraffin Safety Association of Southern Africa (PASASA) to contribute towards the implementation of this policy.

The incidence of fires and burns is expected to decrease as a direct result of electrification, because electricity is an effective substitute for candles and paraffin lamps. It will be necessary to monitor whether this result does occur. Electrification should, to a lesser extent, also reduce the number of paraffin poisoning cases and the number of accidents with paraffin stoves. Nonetheless, the continued presence of paraffin in newly-electrified homes, coupled with the cost-effectiveness of prevention measures, provides a clear rationale for the use of safer containers and stoves in the short to medium term.

8.4.3 Environmental impacts of bulk energy supply

The abundance of low-cost coal has led to that commodity providing approximately 75% of South Africa's primary energy during 1997, with higher environmental impacts than the other fossil fuels. Although the impact on the environment would be considerably less if the energy economy were based on natural gas, or perhaps hydro-electric resources, the presence of large and easily-exploited coal reserves suggests that coal will continue to be the mainstay of the energy sector for the foreseeable future.

It is therefore essential that adequate environmental performance is achieved by the electricity generation, iron and steel, chemical and synthetic fuels industries as well as other smaller industries which use coal as an energy source. In addition to pressures from local environmental interests, international environmental standards are likely to become an increasingly important influence on the energy industry, particularly for its export-oriented consumers who are more exposed to international environmental pressures.

Increases in the number of bulk electricity generators, which may follow the restructuring of the domestic electricity industry and increased regional energy trade, will require a systematic and balanced means of ensuring adequate environmental performance in this sector.

Regulatory responsibility for the environmental governance of Eskom, municipal generators and private sector companies such as Sasol, is widely distributed between the Department of Environmental Affairs and Tourism, the Department of Water Affairs and Forestry, the Department of Minerals and Energy (mining), the Council for Nuclear Safety, provincial and local governments and, potentially, the National Electricity Regulator. Poor or non-existent co-ordination between these entities leads to ineffectual and inconsistent environmental governance. Improved environmental governance requires some clarification of the roles of these various bodies.

The Department of Environmental Affairs and Tourism will continue to carry principal responsibility for the establishment of environmental performance standards and the implementation of management mechanisms.

The Department of Minerals and Energy will include explicit environmental considerations into studies regarding energy suppliers and users, and will integrate these results through Integrated Energy Planning.

Implementation of this policy will require:

- systematic and independent monitoring of the environmental impacts of energy suppliers;
- quantification of the costs and benefits of possible mitigation measures where the need for these arises; and
- the development of mitigation strategies where these are shown to be in the national interest.

Appropriate mechanisms for co-operation between the Department of Minerals and Energy and the Department of Environment and Tourism in undertaking these activities will be established.

Government will take primary responsibility for monitoring the pollution and resource impacts of bulk energy supply.

Implementation of this responsibility may be expedited by utilising existing infrastructure and expertise developed within the various suppliers, but the system must be directly accountable to government. Moreover, it is important that monitoring and control functions are systematically applied across all suppliers, rather than in the current ad hoc manner. Internalising the external costs, both positive and negative, require a balanced perspective and an equitable mechanism for quantification.

8.4.4 Vehicular emissions

Motor vehicle emissions represent a significant source of certain components of air pollution in the larger urban centres in South Africa, contributing to brown haze problems in some cities. Unleaded fuel was introduced in early 1996 without mandatory emission controls or standards. Although the introduction of unleaded fuels is expected to bring about a reduction in ambient lead concentrations, the effect of other

pollutants is unknown. To date South Africa has not pursued policies adopted by many industrialised countries in response to increased environmental emissions and congestion caused by extensive motor vehicle use. The Department of Minerals and Energy and the Department of Environmental Affairs and Tourism, in collaboration with the motor and oil industry, have embarked on a Vehicle Emissions Programme of vehicular emissions in the major urban centres of South Africa.

Based on the results of the Vehicle Emissions Programme, Government will promote the implementation of economically viable options and will investigate the feasibility of possible emissions control and management measures to reduce pollution from vehicles.

8.4.5 Education and awareness

An important problem identified by low-income households is a lack of awareness about the environmental and health risks resulting from their energy usage. Additionally they do not have access to real alternatives which they can not afford. This is particularly the case regarding more efficient energy use practices, the health effects of pollution, practices to reduce pollution exposures, and risks of fires and poisoning.

Government will, where resources are available, undertake information and education programmes on energy and the environment and provide assistance to others in developing and implementing such programmes and other economically viable alternatives.

The Department of Minerals and Energy will encourage a consolidated approach with other government institutions to achieve this policy objective as well as to encourage its inclusion in the Curriculum 2005 education programme.

Further information on this issue is provided in the section on Capacity Building, Education and Information Dissemination.

8.4.6 Greenhouse gas impacts

Scientific opinion suggests that the continued emission due to human activities of greenhouse gases, principally carbon dioxide and methane, may bring about significant and long-term changes to the functioning of the earth's atmosphere. Of great uncertainty still are the possible impacts and damage attributable to such climate change, although indications are that their scale could be significant.

South Africa is responsible for 1,6% of global greenhouse gas emissions and the country's energy sector is the single largest source of greenhouse gas emissions in Africa, being dependent on coal for more than 75% of the country's primary energy needs during 1997. This level of emissions is also mainly as a result of the high level of coal use by the electricity generation and synthetic fuels industries, and the high level of industrialisation producing high energy content products. In order to fulfil the national energy policy of making clean, affordable and appropriate energy available to all sectors of the population, a balanced least-cost mix of energy supply is promoted. Coal will therefore dominate other energy sources in South Africa for many years to come.

Although the country is unlikely to be faced with obligations to reduce its greenhouse gas emissions in the near future, international governance of this problem is an evolving area. Pressure on South Africa to take greater cognisance of its global environmental impacts will undoubtedly increase.

Policies addressing climate change will have environmental, political, economic and social impacts on all countries and will require action by all. The international community agreed to address the climate change in a global way through the United Nations Framework Convention on Climate Change (FCCC) which South Africa ratified in August 1997 to become a Party to the Convention. The FCCC is continuously being developed through the drafting of protocols of which the Kyoto Protocol, drafted in December 1997, is the latest. Being a global role player, South Africa in its responsibility as a Party is lead in this activity by the Department of Environmental Affairs and Tourism through its National Committee for Climate Change (NCCC). The Department of Minerals and Energy is actively participating in the activities of the NCCC.

The Kyoto Protocol strengthened the binding commitments for industrialised countries to reduce their emissions by sources and removal by sinks of man-made greenhouse gases. The Protocol also broadens the commitments of all

Parties to formulate, implement, publish and update national and regional programmes, which should include energy programmes. It has also established the Clean Development Mechanism (CDM) to assist developing countries to achieve the aims of sustainable development of the Convention as well as assisting developed countries in meeting their emission commitments. The NCCC has recommended that South Africa ratify the Protocol. Whilst it is unlikely that binding commitments will be applied to developing countries, it is possible that intermediate emission reduction or stabilisation goals will be negotiated in future for the wealthier and more carbon-intensive developing countries such as South Africa

Although there is no requirement to do so in terms of the FCCC, several countries (such as Denmark and the Netherlands) have voluntarily introduced a carbon tax as a means of encouraging a shift away from carbon-intensive fuels. However, the implementation of such a tax at present will decrease South Africa's international competitiveness. Although South Africa carries clear responsibilities towards the global environment and will increasingly have to factor these considerations into its resource investment and management decisions, there is at present no justification for the voluntary imposition of a carbon tax in South Africa.

The energy sector is one of the key stakeholders in the climate change arena. South Africa as a major coal exporter with growing foreign markets in both developed and developing countries, could be affected by existing and new international commitments. The Department of Minerals and Energy needs to increase its inputs into the development of South Africa's position, as a developing country, in international negotiations around climate change issues. The Department of Minerals and Energy will play a pro-active role to assist in positioning South Africa to maximise the advantages from arising opportunities such as international funding, technology transfer, and energy efficiency, adaptation and mitigation measures.

Government will monitor international developments and will participate in negotiations around response strategies to global climate change, in order to progressively balance its environmental responsibilities and development interests, along with health related local issues, in these processes.

The Department of Minerals and Energy will follow a 'no regrets' approach in the energy sector with regard to the potential global environmental impacts of energy activities.

A 'no-regrets' option is defined as that which decreases and minimises environmental impacts commensurate with cost effectiveness and positive cash flow.

The Department of Minerals and Energy will play an active role, together with the Departments of Foreign Affairs and Environmental Affairs and Tourism, in formulating South Africa's positions in these international climate change negotiations.

Funding sources such as the Global Environmental Facility, the Clean Development Mechanism (CDM) and the pilot phase of Joint Implementation (JI) namely Activities Implemented Jointly (AIJ), have been established for developing countries and economies in transition to assist them in reducing the environmental impacts of developmental projects and to achieve the objective of sustainable development of the FCCC.

The Department of Minerals and Energy will take advantage of opportunities for accessing international funding to assist in re-directing development projects along lines which have more favourable global environmental effects.

8.4.7 Energy, the environment and governance

The overall regulatory responsibility for energy-related environmental impacts lies with the Department of Environmental Affairs and Tourism as included in the National Environmental Management Bill and the White Paper on Integrated Pollution and Waste Management. The policies, principles and requirements of this Section should be read in conjunction with these documents.

The Department of Minerals and Energy needs to increase its interaction and close co-operation with other government authorities on the wide-ranging nature of the energy sector's environmental impacts. Examples include environmental inputs into the licensing of electricity generation facilities and the regulation of air pollution from low-income households, power stations, vehicles and other sources. Managerial responsibility

for the energy sector's environmental impacts is either severely fragmented or, in some areas, entirely unclear. This is related to the fact that various national departments exercise functions that involve the management of these impacts.

The Department of Minerals and Energy will adopt a pro-active approach in communicating with other government authorities on areas of common environmental interest, and will establish mechanisms to address problems from time to time and to disseminate appropriate information. Provincial governments, as the responsible agencies for many environmental governance issues, will receive particular attention in this regard.

The opportunity exists for South Africa to play an important leadership role amongst developing countries that seek to balance their environmental responsibilities with their national development needs.

8.5 Research and development

Energy research is currently supported by government, government agencies, parastatals and the private sector. The Department of Minerals and Energy manages a limited non-nuclear research programme, currently worth only R20 million per year, focused on policy development and related programmes, which is conducted by researchers at universities, research institutions and NGOs on a contract basis. Two other public sector organisations, the Atomic Energy Corporation (AEC) and Eskom, have significant research programmes. The activities of the AEC constitute the largest item on the Department of Minerals and Energy budget, although this is decreasing. These resources are used for institutional nuclear activities carried out for the government, nuclear enrichment research, high technology nuclear-based commercialisation activities and the decommissioning of uneconomic plants. The AEC spends approximately R30 million per annum of public sector funds on energy-related research. Research spending in Eskom, predominantly through the Technology Research and Investigations division (TRI) currently amounts to R115 million per annum and is increasing.

Government spending on energy research has decreased steadily since 1990, particularly on nuclear energy. This reduction stemmed from the cabinet decision to phase out the funding of national energy R&D through levies on energy sales, to terminate energy technology R&D, unless related to policy development, and generally to reduce state funding for research. On a pro rata basis South African public sector expenditure on non-nuclear energy research is much lower than that of countries at the same level of development, or in relation to the contribution or potential contribution of these technologies to the country's energy economy. Government presently supports only limited energy technology research, development and demonstration and has only recently started to actively co-operate with other countries.

In identifying the policy challenges faced by government it is useful to distinguish between three different types of energy-related research:

Policy analysis and development: which involves the identification of problems or opportunities requiring policy attention; the identification of policy alternatives; and the analysis of the implications of these alternatives as a basis for policy recommendations. This form of research is generally desk or committee-orientated and relies on the results of data collection and other fundamental research activities. Policy-oriented research is multi-disciplinary by nature, involves a systems approach to problems and requires sensitivity to social, economic, political, environmental and market related factors;

Technology-oriented research: which generally seeks to develop or adapt technologies for specific purposes. This form of research entails physical investigations using basic and applied research methodologies, in laboratories, in pilot projects and in field work; and

Demonstration projects: which attempt to demonstrate new technologies and systems in order to facilitate their adoption. This work is generally carried out in the field under actual operating conditions and is usually associated with cost verifications and the evaluation of social impacts.

In developing policy on research, development and demonstration, government needs to address the following policy challenges:

- correcting the skewed allocation of funds towards nuclear energy;
- improving energy research co-ordination and the reporting of activities and results;
- providing clarity on a national energy research strategy, including a focus on priority issues and the involvement of stakeholders;
- clarifying the roles of government, energy suppliers and the private sector in funding R&D; and
- facilitating local participation in international and bi-national research activities, particularly in technology oriented research.

8.5.1 *The role of government*

Government may therefore support those programmes and projects which:

- focus on the development of national energy policies; where still applicable
- are strategic and high risk and apply to the needs of more than a narrow sub-sector or specific company;
- address the needs of important emerging sectors with limited institutional capacity, such as renewable energy and energy efficiency applications; and
- are not generally undertaken by dedicated energy organisations, the private sector or other role players.

Energy has been identified as an element of the "Foresight" exercise currently undertaken by the Department of Arts, Culture Science and Technology to review and co-ordinate all government sponsored research.

8.5.2 *The role of energy suppliers*

Government assumes that established energy suppliers, acting in their own interest and collectively, may carry out the following types of research:

- establishment of client needs;
- development of products and systems to satisfy these needs;
- ensuring efficiency in the supply and consumption of the various energy carriers; and
- establishing future client needs and potential changes in operating environments.

8.5.3 *The role of the private sector*

Government expects this sector, particularly those industries concerned with the manufacture of energy appliances and those utilising energy-intensive processes, to focus on research which:

- develops products and systems for future income, including exports; and
- improves the performance of their own energy systems, so as to reduce costs and negative impacts on the physical environment.

It is known that a considerable amount of very good work is taking place in this area.

Based on these understandings government intends to apply the following policies.

8.5.4 *National energy research strategy and allocation of national research funding*

A research strategy will be developed that will:

- take into account planned and current research within the different energy sub-sectors;
- focus the scope of government's research priorities;
- provide a forecast of research themes for the future;
- take cognisance of local and international developments; and

- form part of the national science and technology framework which identifies opportunities and priorities in a holistic fashion and links into government's budget cycle.

A system is required to ensure that medium and long-term needs are identified and addressed, and that research funding is related to the availability of resources and the R&D activities of other role players.

Government will consider the development of a system to prioritise national research funding into the three main research categories in order to address the medium to long-term research needs in the energy sector. This will consist of an integrated, multi-year, national, needs-driven, energy research strategy, developed from time to time by an experienced team of experts appointed by the Minister. This strategy will identify medium and long-term priority programmes and themes.

Stakeholders will be consulted in the design and implementation of this system.

Extensive energy-related research is taking place in other countries, the results of which may be of value in South Africa. These developments are monitored by researchers, energy industries, energy consumers and others. Their inputs on opportunities for local applications will assist in developing the national energy research strategy. Adaptation for local applications and evaluation could then take place by means of demonstration projects.

A team of experts appointed by the Minister could review the national energy research strategy.

8.5.5 International and bi-national research activities

Cost sharing and interaction with experts from other countries, through direct participation in international research, development and demonstration programmes, can result in highly cost-effective results.

International and bi-national research activities may be handled as partnerships with local role players, particularly industry as this is where the main potential for improvement exists, and should be aligned with national strategic energy research priorities.

Such participation may take place through bilateral agreements with specific countries or through research programmes managed by international organisations.

8.6 Human resources

Employment in the energy sector demonstrates trends similar to other economic sectors. A recent study of government energy institutions as well as the electricity, petroleum and nuclear sub-sectors showed that while 46% of staff were black, only 7% occupied managerial positions. Women were under-represented in the sector, comprising 11% of the total workforce and accounting for 5% of total management. Black women were particularly under-represented, comprising 1% of the total workforce and accounting for 1% of total management. This figure excluded petrol attendants at service stations.

Although its precise contribution is difficult to measure, human capital created through investments in education and the development of skills emerges in studies of economic growth as one of the most significant growth determinants. High levels of education, the most important element in human resource development, leads to high productivity through improvements in the ability to apply sophisticated technologies and efficient organisational structures.

8.6.1 Redressing the inverse skills profile

Government recognises the integral nature of human resource development to its industrial strategy for the energy sector. To transform and develop appropriately trained and skilled human resources for the energy sector, the Department of Minerals and Energy will develop policies to redress the inverse skills profile and increase access to institutions, resources and opportunities in the sector.

The Department of Minerals and Energy will make recommendations for human resource development strategies and programmes in the sector.

The Department will commission a human resource and training audit to establish the current and future skill requirements of the energy sector and assess the nature and extent of current energy training provision. The audit will assess the extent to which appropriate skills exist to implement the policies contained in this white paper.

8.6.2 Increasing access to institutions, processes, resources and opportunities

The Employment Equity Act pulls together a number of initiatives on affirmative action already underway within government. These include Nedlac's endorsement of the ILO Convention III, sections of the constitution, and the establishment of workplace forums in terms of the Labour Relations Act.

The Department of Minerals and Energy will align itself with government's employment policies. In particular, it will develop an employment equity plan to assist in attracting new, appropriately skilled people into the department and correcting the effects of historical employment imbalances.

The Department's capacity will be built by attracting new skilled people, retraining existing staff and correcting the race and gender imbalances. The Department of Minerals and Energy will negotiate affirmative action targets with the workplace forum, allocate both human and financial resources to this programme and develop criteria to monitor its progress.

The Department of Minerals and Energy will strive to increase the number of black people and women on all policy development structures, forums, parastatal boards and similar structures. A target of at least 30% women, 50% black participants and 2% disabled persons by the year 2000, is envisaged, in line with the White Paper on Affirmative Action Policy.

Where necessary, strategies will be developed to ensure that people involved in these forums are equipped with appropriate skills to participate effectively.

The Department of Minerals and Energy and energy sector parastatals will promote procurement from and contracting with small and medium enterprises, especially those from the previously disadvantaged communities in order to support Black Economic Empowerment.

This programme will ensure increased support and access for black and women businesses providing services or contracting with the Department of Minerals and Energy and energy sector parastatals.

The Department of Minerals and Energy may issue guidelines to ensure the use of labour-based methods for energy service provision where appropriate.

The guidelines may cover such matters as skills training and the promotion of black and women contractors. Implementation of these guidelines will ensure the maximisation of opportunities to create short-term jobs and build local capacity which arise from electrification and other large scale energy-related programmes.

8.7 Capacity building, education and information dissemination

South African energy consumers, from low-income households to business and industry, are poorly informed about good energy-use practices and options. This lack of consumer knowledge about the effective use of energy undermines economic competitiveness, the sustainability of development initiatives, the environment and people's health. That education and information can play a central role in addressing these problems is borne out by international experience.

Government also recognises that a lack of capacity, education and information is as much a constraint on people's access to energy services as other factors such as market failure and limiting regulations. Policies are therefore required to improve energy practices amongst all consumer groups.

8.7.1 Capacity building, education and information dissemination strategies

Government will promote the development and implementation of capacity building, education and information dissemination programmes. These programmes will address issues around energy matters, environmental impact and the most appropriate means to meet energy service needs.

Comprehensive strategies will be developed to build knowledge, skills and confidence, and, where necessary, change attitudes and behaviour. In particular such strategies will aim to:

- enable consumers to make informed decisions regarding the safe, healthy, efficient and environmentally sustainable use of energy;
- enable representatives (particularly at community and local government levels) to proactively take up the energy issues of the communities they represent; and
- enable development and health practitioners to provide appropriate advice and practice and to integrate energy needs into project planning and implementation.

Strategies, which facilitate a flow of information between users, suppliers and government, will play an important role in developing government's understanding of consumers' energy needs and problems.

Although the Department of Minerals and Energy will take lead responsibility for the implementation of this policy, it is clear that opportunities exist to integrate energy information into existing communication and education programmes run by other organisations. The Departments of Health, Housing, Education, and Land and Agriculture, as well as NGOs, energy utilities, the private sector and the formal training sector, can all play a role in communication and education.

The Department of Minerals and Energy may monitor the development of energy awareness and regularly assess these communication strategies.

8.7.2 Government capacity

Government will allocate appropriate funding and staffing to undertake and support capacity building, education and information dissemination programmes.

8.8 International energy trade and co-operation

South Africa is actively involved in energy trade and co-operation with a number of countries in the region and further afield. Imports include crude oil and energy conversion plant and equipment and exports include coal for international markets and refined liquid fuels for regional markets. Active co-operation with a number of countries and organisations has developed over the years, particularly from 1993, and full official participation in Southern African Development Community (SADC) activities commenced in June 1994.

The major policy challenges in this area are:

- to remove constraints on the import and export of energy commodities and equipment;
- to reduce the uncertainties faced by potential foreign investors in the domestic energy sector;
- to enhance the expertise and infrastructure required for regional co-operation and energy trade;
- to ensure that co-operation with other governments and international agencies produces optimal results for both parties; and
- to develop the country's energy technology base.

Government proceeds from an understanding that energy markets are becoming increasingly globalised and that increased participation in energy trade has potential benefits in terms of export earnings and the improvement of energy supply security through increased diversity of supply sources. Mounting concern over long-term environmental damage arising from the large-scale use of fossil fuels has resulted in significant potential for South Africa to participate in international co-operative activities aimed at addressing this problem.

8.8.1 Removal of barriers to international energy and energy technology trade

There are a number of barriers to energy trade. These include duties on specific products, import and export control, export infrastructure capacity, lack of information and, at times, negative signals on energy investment potential. Some barriers need to be reduced or removed in the short term, particularly those restricting the import of renewable energy and energy efficiency equipment, in accordance with South Africa's trade policies and World Trade Organisation's (WTO) obligations.

Government will develop strategies to reduce energy trade barriers, improve the availability of information required to support energy trade, and facilitate investment in the energy sector.

8.8.2 Co-operation on regional energy activities

Current levels of regional energy co-operation are still very limited and significant scope exists for economic and political benefits for all countries within the region.

Government will facilitate active regional co-operation, including energy trade, information exchange, capacity building and the training of energy specialists.

The Southern African Development Community (SADC) member States have signed the SADC Energy Protocol and it has been ratified by the required two-thirds member States thus bringing it into effect. The Southern African Power Pool (SAPP) has been established and limited electricity trade is taking place between member utilities with South Africa being the net exporter. South Africa is negotiating gas trade agreements with Mozambique and Namibia. South African energy demand will inevitably drive regional energy trade over coming years. Such trade will broaden the supply base, increase supply diversity, reduce the need for domestic investment, increase competition and potentially reduce environmental impacts because of the nature of regional energy resources (gas and hydro). Economic rationality thus points to the inevitability of the development of regional energy markets.

8.8.3 Co-operation with other governments and international agencies

Considerable potential exists to access international support for dedicated activities, such as domestic capacity building, technological renewal and environmental protection. Memoranda of understanding have already been signed by a number of public sector energy bodies in this regard.

Government will actively pursue the establishment of energy sector co-operation with other countries and international bodies.

Implementation of this policy will require institutional capacity, a dedicated focus and specific skills for this purpose. Active liaison will be required with other government departments responsible for related functions, particularly the Departments of Foreign Affairs and Finance. Agreements will be entered into where sufficient capacity for meaningful co-operation exists, and where the short and medium-term objectives of both parties can be satisfied. Reviews will be carried out from time to time to determine whether programme objectives are being met and to ensure that positive returns on investment are being achieved.

8.8.4 Investor support

International firms and agencies are investigating the South African energy sector's potential. Options under consideration include energy supply, particularly electricity, energy efficiency, renewable energy in a variety of forms and environmental protection. Investment levels will depend on fiscal and energy policies, equitable investment regimes and the establishment of free market access. Investors also require improved provision of information on the energy sector, government policies, the identity of role players and indications of anticipated future developments.

Given the complexity of the energy sector and the diversity of conditions applying in the various sub-sectors, it is not possible to state a general policy on investor support. Particular policies, specific to the individual sub-sectors, are expressed in the Electricity, Liquid Fuels and Renewable Energy sections.

8.8.5 Government capacity

There is currently insufficient government capacity to fully implement these policies.

Government may allocate resources to establish appropriate capacities to implement policies on international trade and co-operation.

Capacity will be needed within the Department of Minerals and Energy to co-ordinate co-operation with regional energy activities, particularly those relating to the SADC. Indications are that in the future regional activities will be undertaken by means of task-sharing committees managed by appropriate part-time chairpersons. The Department of Minerals and Energy will act as a catalyst to these to assist energy trade and ensure that co-operation takes place on a least-cost basis to the mutual benefit of the concerned parties. The department will also ensure that public and private sector organisations are provided with information and opportunities to become involved where they have a contribution to make.

8.9 Fiscal and pricing issues

Fiscal policies have a fundamental effect on energy prices, thus affecting structural demand for energy products. The selective use of fiscal mechanisms can be very effective strategies for achieving energy policy objectives, such as encouraging fuel switching, raising dedicated sources of finance for particular needs and encouraging more efficient environmental and resource management. On the other hand, unconsidered usage of fiscal mechanisms within the energy sector can lead to unintended consequences, perhaps even directly contradicting government's other economic and social policies. It is therefore essential that fiscal policies are aligned with energy policies, particularly as competition increases between energy service providers.

Government's current fiscal policies have many linkages with the energy sector, with five main categories of fiscal transfer. Within each of these, the various energy sub-sectors are treated differently:

Value added tax: Productive activities in all sub-sectors are subject to value added tax (VAT), with the exception of certain petroleum products.

Income tax: Income tax is currently payable by private sector corporations in the coal, liquid fuels, gas and renewables sectors, but not by public utilities such as municipal electricity suppliers. The Eskom Amendment Act of 1998 has made Eskom a tax liable and dividend paying entity.

Special taxes and levies: Special taxes and levies apply to some sectors, notably the petroleum sector, where the fuel levy constitutes about more than forty percent of the pump price of petrol and diesel, contributing almost ten per cent of central government's revenues. A levy (set at a fraction of a cent per kWh) is also applied to electricity sales by generators over a certain size to raise funds for the operation of the National Electricity Regulator.

Tariffs: Historically, substantial tariff protection has been provided to the synthetic fuels industry, with a direct effect on the price of fuel to consumers. As at October 1998 this represented a 8c/l levy on petrol and diesel.

Implicit taxes: Public sector electricity suppliers (both Eskom and local authorities) extract sizeable surpluses from some of their electricity customers for purposes of cross-subsidising other customer classes and, in the case of local authorities, other municipal services. In effect, these transfers represent a hidden tax which, moreover, is not subject to the direct fiscal control of government.

The net effect of these practices is that levies and taxes make up a high proportion of the retail price of some fuels and a low proportion in other cases. For instance, close to half of the pump price of petrol comprises government taxes and levies, whereas the price of coal includes only 14% VAT, and in the case of the informal domestic coal market, not even that amount is collected.

This differential fiscal treatment of energy sub-sectors has evolved over a number of years in response to particular problems. In the context of increasing competition between suppliers of different energy carriers, all seeking to meet

the same energy demand, this tax treatment introduces structural distortions into the market, which may run counter to government's energy policy objectives.

Fiscal issues can be reviewed from various perspectives. For the purposes of this paper it is useful to distinguish between policies:

- which aim to raise revenue for government;
- which are concerned with allocative efficiency and structural change in the economy; and
- which are concerned with environmental and resource management.

8.9.1 Fiscal revenue

8.9.1.1 Funding of regulators

From the establishment of the National Electricity Regulator it was funded by means of a levy applied to electricity sales by generators, in accordance with amended Electricity Act (act 41 of 1986). The levy is small in relation to end-user prices. It is appropriate that the industry and its consumers should pay for regulatory services since, in principle, they ultimately receive the benefits of those services. The risk exists, however, that a multitude of special levies could be introduced in many sub-sectors, and that these will have inflationary effects outside the control of central government's fiscal authorities.

Government may consider the use of special-purpose levies earmarked on the budget to fund regulatory and other agencies, provided the additional costs are borne by those benefiting from the activities of the relevant agency, the agency so funded is accountable to government and these levies are managed in a responsible manner that promotes the principles of accountability, transparency and fiscal integrity. These levies will be dedicated to the special purposes for which they were designed while retaining parliamentary responsibility for appropriating the required expenditure.

The policy on the National Electricity Regulator can be found in Part 3: Supply Sectors, subsection "The National Electricity Regulator".

8.9.1.2 Electricity's role in funding local government

Surpluses earned on electricity trading accounts are currently a significant source of income for some local authorities. Unfortunately, not all local authorities own and operate electricity departments and electricity sales vary significantly between local authority areas. The bulk of these surpluses accrue to only a few local authorities. This implicit taxation on electricity varies widely between local authorities and has, to date, remained a non-transparent and unregulated form of taxation.

South Africa's new constitution provides for a range of revenue sources for local government including new fiscal powers (regulated by national legislation). Government wishes to move away from the present system of non-transparent electricity-based cross-subsidisation of municipalities, in favour of transparent, nationally regulated taxes. Government does, however, recognise that such transfers cannot be ended abruptly as they would significantly weaken local government's financial position.

Municipalities will be authorised to tax electricity, via an excise tax, within a limit set by government and monitored by the NER. Regional electricity distributors will collect this tax on behalf of local authorities and will show the tax separately from the electricity consumption portion of the consumer's bill.

Government will determine whether any specific customer segments will be excluded from this tax, and whether this tax would be phased out over an appropriate period of time.

Government will establish detailed guidelines for distributors to collect local government taxes.

Since the taxation of electricity is effectively a tax on inputs there are certain economic drawbacks to this policy. Government is sensitive to these and other related issues and will consider measures to ameliorate the impact of such taxes on those customers for whom such taxation might prove an unacceptable burden or where taxes will retard economic growth.

Although it is primarily the large municipalities that are funding other services out of electricity, all municipalities should be given the authority to tax electricity sales in their area. To ensure that consumers are not unfairly burdened however, a reasonable limit should be established. Municipalities currently receiving unduly large surpluses will, within a set period of time (such as three years) have to reduce their dependency on financing through electricity to the established limit. If government's decision in future is that municipalities should no longer have the right to tax electricity sales, then the tax would be phased out over an appropriate period of time. The total change in consumer's end-use tariffs as a result of moving to cost-reflective tariffs and transparent taxes will vary depending on the surpluses being generated today, and whether any customer segments are to be excluded from the taxes.

8.9.1.3 Income tax for the electricity industry

At present, no income tax is payable by Eskom and local authority electricity suppliers. This is primarily due to the historical fact that they are public sector utilities, and government has ostensibly had some control over the use of any surpluses they have generated. In practice, however, central government has had little influence over the use of electricity trading surpluses at the local government level and even less in Eskom, with the result that the allocation of retained surpluses has not necessarily been in line with the government's overall fiscal and macro-economic policies. At the same time, with increasing pressures for competition at the bulk energy supply level, there is a need to treat all energy suppliers to equal taxation. Regarding Eskom, this matter is under discussion in Parliament in the form of Eskom Amendment Bill.

Government will systematically investigate the implications of taxing electricity and the electricity industry.

Although there is no direct link between the source of taxation revenues and their allocation, the electrification subsidies to be allocated to the industry will be offset to a degree by the additional income tax collected from the industry. For further details see the Electricity section.

8.9.2 Allocative efficiency and structural change

Policies in this category are concerned with improving the efficiency of government's budget allocation decisions, and with bringing about structural changes in the economy through the strategic use of fiscal mechanisms.

8.9.2.1 Government budgeting processes

Implementation of the policies in this white paper will clearly require a re-allocation of fiscal resources between various areas of activity. It is not the intention here to identify problems with the actual amounts allocated to various sub-sectors, but rather to address problems with the process of budgeting and resource allocation.

Budgeting processes and the allocation of general government revenues to departments (including the Department of Minerals and Energy) have historically been undertaken on an incremental basis, with the main point of departure being the previous year's budget. This has the effect of building into allocation decisions a level of inertia and inefficiency, since resource allocations are not necessarily justified on their own merits. This practice is out of line with current trends in public and private sector management.

The Department of Finance has initiated improvement in the budget process of Government. This will facilitate a long-term improvement in the management of public resources. The introduction of the Medium Term Expenditure Framework (MTEF) as the basis for a more strategic approach to public expenditure planning is being implemented in Government.

The Department of Minerals and Energy will follow the MTEF budgeting approach in drawing up its departmental budget, from the project and programme level through to the departmental level.

8.9.2.2 Electrification subsidies

At present, considerable resources are allocated every year to the electrification programme, mainly through the mechanism of internal cross-subsidisation and surcharge included in the electricity price of Eskom and local authority distributors. Not only are these mechanisms non-transparent, but government has little influence over the collection and allocation of the surcharge.

In order to identify and quantify the non-transparent surcharge included in the electricity price, the current internal financing process for electrification will be replaced by a dedicated electrification levy, the level of which will be determined annually, as part of the budgetary process.

Government will fund a National Electrification Fund on budget, from a dedicated electrification levy, the level of which will be determined annually, as part of the budgetary process. The levy will initially comprise the implicit surcharge for electrification in the current electricity price structure.

Government will transfer the financing of the electrification programme from an implicit surcharge in the electricity price to the budget. The present surcharge will accordingly be assigned to the National Revenue Fund as an electrification levy with a corresponding allocation of these funds to a National Electrification Fund on the Department of Minerals and Energy vote.

This shift will not affect the overall level of funding of electrification nor the level of the electricity tariff.

It is recognised that the process will depend also on the National Electricity Regulator tariff setting and the implementation of the Eskom Amendment Act of 1998.

The Minister of Minerals and Energy, in consultation with the Minister of Finance, will annually determine the balance to be retained for commitments of the National Electrification Fund and any surplus to revert back to the fiscus.

8.9.2.3 Taxes and levies on transport fuels

As noted in the section on Transport Energy Use, fiscal policy has a major effect on the prices of, and thus demand for, various transport fuels. On the whole, these taxes and levies have traditionally been determined without any reference to environmental and other goals. One area in which tax differentials could have favourable impacts is in the diesel market, since demand for diesel is lower than production of the fuel by local refineries, resulting in excess diesel having to be exported.

Tax differentials may be used to support government's policy of promoting more efficient and environmentally sound transport modes, such as diesel-driven motor vehicles where they form part of a holistic approach and are simultaneously underpinned by other supporting measures.

Strategies for the implementation of tax differentials require further research as to their likely impacts in order to minimise undesirable consequences. In particular, the sensitivity of demand to price changes will be investigated, so as to establish what scale of tax differentials is required to achieve the desired shifts in demand. Differentials may have to be phased in over time to avoid price shocks.

8.9.3 Resource and environmental management

Policies in this category are concerned with influencing the decisions of energy consumers so as to achieve macro-level environmental goals.

8.9.3.1 Environmental costs

The production and consumption of energy has many undesirable impacts on the environment, often resulting in external costs, also known as negative externalities. This is particularly the case in South Africa

where the energy economy is heavily dependent on coal-based fossil fuels, which provide over 90% of the country's electricity needs and tend to be more polluting than many other supply options. Although the electricity generation industry has an active environmental management programme, evidence suggests that there are measurable external costs resulting from the use of coal.

In contrast with this situation, the incentives for investment in more environmentally-benign alternatives, such as energy efficiency and renewables, are insignificant. Historically, relatively few resources have been directed by the public or private sectors towards these options, even though they can offer significant economic and environmental advantages. This is attributable to many factors, including the low price of energy in South Africa and the absence of government funding or support for these options.

Government will investigate an environmental levy on energy sales, together with appropriate fiscal support for more environmentally benign and sustainable energy options including energy efficiency.

The mechanisms and implications of such a system require analysis and investigation, in conjunction with the Department of Environmental Affairs and Tourism and the Department of Finance.

8.9.3.2 Carbon taxes

This topic is covered in the Environment, Health and Safety section.

8.10 Governance and institutional capacities

Governance can be described as the complex set of processes and control relationships which occur between various players. In the energy sector, these players include parliament, cabinet, individual ministries, the minister responsible for energy in particular, parliamentary portfolio committees, government departments at national, provincial and local levels, regulators, statutory energy agencies, energy suppliers, energy consumers, other stakeholders (including organised labour, civic organisations, NGOs, researchers, consultants, financiers, contractors, equipment manufacturers and marketers), and supra-national bodies such as the SADC and foreign governments and organisations with whom agreements have been entered into. Not surprisingly, the range of players and the complexity of their inter-relationships makes energy sector governance difficult to understand, and even harder to manage.

At present parliament and its committees are responsible for energy legislation and the supervision of the executive arm of government. The executive consists of cabinet, the minister and the department, who are together responsible for formulating and implementing energy policy. Appointed boards or councils supervise a range of government-owned energy organisations, some created by means of a specific act, in order to provide them with strategic direction on their operational activities.

8.10.1 Clarification of governance roles

8.10.1.1 The Department of Minerals and Energy

The department is accountable to the minister and is responsible for general governance of the energy sector, the formulation of long-term integrated energy policies, communication with stakeholders, the management of investigation and demonstration programmes, the management of regional and international co-operation, and ensuring that appropriate institutions are established to achieve energy policy objectives.

8.10.1.2 The Minister of Minerals and Energy

The minister is responsible for the development and implementation of energy policy and is accountable to cabinet and parliament.

8.10.1.3 Cabinet

The cabinet assists with the co-ordination and implementation of energy policy and ensures its integration with other sectoral policies. Cabinet is accountable to parliament.

8.10.1.4 Parliament

Parliament is responsible for the approval or amendment of energy-related legislation. Parliament is accountable to the electorate.

8.10.1.5 Parliamentary committees

Parliamentary committees are responsible for considering proposals for new or amended legislation in detail and also supervise the actions of the minister and the department, particularly through the budget.

8.10.1.6 Provinces and local authorities

The other two spheres of government have a limited role in energy governance. They are, however, responsible for economic and physical planning and, as such, are concerned with the supply and use of energy.

8.10.1.7 Government-controlled energy institutions

These institutions all have specific mandates, usually defined in terms of founding acts.

8.10.2 Interdepartmental co-ordination

Due to the multi-sectoral impacts of the energy sector, extensive co-ordination is required with other government departments. It is, unfortunately, not feasible to achieve this through any one specific structure or system. Attention should, however, be given to increasing the capacity of all departments to engage on energy-related matters in order to make consultation more effective.

8.10.3 Co-ordination and communication with provincial and local government

There is clearly a need for improved communication and co-ordination between national, provincial and local government. For instance, the implementation of energy policies should be better integrated with provincial and local economic and physical planning activities.

The Department of Minerals and Energy will seek to create mechanisms to improve communication on energy policies and the co-ordination of their implementation with provincial and local government.

Implementation of this policy could entail the establishment of provincial energy committees in which the Department of Minerals and Energy might participate on an ad hoc basis. The department could also facilitate communications between the chairs of these committees.

The department may also investigate the feasibility of establishing energy advisory functions within its regional offices to assist with and participate in provincial and local planning activities.

9. Appendices

9.1 White paper consultations

	Workshop	Date	Participants
1.	Internal workshop at the Department of Minerals and Energy on the energy white paper planning process	19 June 1995	25
2.	Workshop with the Parliamentary Portfolio Committee on Minerals and Energy	28 August 1995	40
3.	National Energy Governance Workshop	24 October 1995	90
4.	Four regional workshops for community representatives	September, October 1995	approx. 250
5.	National Energy Policy Summit	19, 20 November 1995	470
6.	Informal stakeholder discussions	November and December 1995	
7.	Oil Industry, Business and Labour Stakeholder workshops/discussions	November 1997 - March 1998	
8.	Public hearings and deliberations at the Parliamentary Portfolio Committee	21 to 24 July 1998	
9.	Written Public Comments to Department	June 1998 to 31 July 1998	
10.	NEDLAC meetings	08 to 30 October 1998	

9.2 Documents produced and circulated

- South African Energy Policy Discussion Document, July 1995, 220 pages.
- South Africa Energy Policy Discussion Document: Summary, September 1995, 23 pages.
- Making Energy Policy for a New South Africa. September 1995, 12 pages (simplified version of the summary document).
- Workshop on the Energy White Paper Planning Process, 19 June 1995, 17 pages. (workshop proceedings).
- Workshop: Development of Energy White Paper, Parliamentary Portfolio Committee on Energy and Department of Minerals and Energy, 22 August 1995, 57 pages, (workshop proceedings).
- National energy governance workshop, October 1995, 4 pages, (workshop proceedings).
- Summary of community representative's workshops, (workshop proceedings).
- National Energy Policy Summit, summary report of main outputs, January 1996, 17 pages.
- Overview of the South African energy sector, December 1996, 140 pages.
- Draft White Paper, June 1998, 99 pages.

9.3 Submissions in response to the Energy Policy Discussion Document

Written comments were received from 82 organisations or individuals, which served as inputs to produce the Draft White Paper on the Energy Policy of the Republic of South Africa, 1998.

9.4 Release of Draft White Paper

The Draft White Paper was released for public comment in order to ensure that the final version submitted to Cabinet included inputs from the public and thus an inclusive energy policy document.

9.5 Submissions in response to the Draft White Paper

Public hearings of the Draft White Paper with the Parliamentary Portfolio Committee took place on 21 to 24 July, which resulted in written comments received from 24 organisations or individuals. In addition, the distribution of the Draft White Paper resulted in written comments received from 49 organisations or individuals. The Draft White Paper was submitted to NEDLAC and discussed with Business and Labour. Cognisance was taken of all these comments which influenced changes made to the Draft White Paper resulting in the White Paper on Energy Policy.

9.6 Approval of the WhitePaper on Energy Policy by Cabinet

This White Paper on the Energy Policy of the Republic of South Africa was approved by Cabinet on 2 December 1998.