DEPARTMENT OF MINERALS AND ENERGY

DRAFT

WHITE PAPER

ON THE PROMOTION OF RENEWABLE ENERGY AND CLEAN ENERGY DEVELOPMENT

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EXECUTIVE SUMMARY

The Constitution (Act No. 108 of 1996) requires that Government establish a national energy policy to ensure that national energy resources are adequately tapped and delivered to cater for the needs of the nation; further, the production and distribution of energy should be sustainable and lead to an improvement in the standard of living of citizens. The Government's overarching energy policy has been set out in its *White Paper on Energy Policy of the Republic of South Africa* (DME, 1998).

This Draft White Paper on Renewable Energy supplements the White Paper on Energy Policy, which recognises that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

Purpose of the Policy

South Africa relies heavily on coal to meet its energy needs because it is well-endowed with high-quality coal; in particular, South Africa has developed an efficient, large-scale, coal-based power generation system that provides low-cost electricity, through a grid system that is being extended to rural areas, to millions of rural residential, commercial and institutional consumers. As a result, coal is and is likely to remain, from a financial viewpoint, an attractive source of energy for South Africa.

At the same time, South Africa recognizes that the emissions of greenhouse gases, such as carbon dioxide, from the use of fossil fuels such as coal and petroleum products has led to increasing concerns, worldwide as well as in Africa, about global climate change. While South Africa is well-endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, so far these have remained largely untapped.

It is the intention of the Government to make South Africa's due contribution to the global effort to mitigate greenhouse gas emissions. For this purpose, the Government will develop the framework within which the renewable energy industry can operate, grow, and contribute positively to the South African economy and to the global environment.

Energy Security

The driving force for energy security through diversification of supply in South Africa has shifted from a self-sufficiency objective to increased opportunities for energy trade.

[DME, 1998] Given increased opportunities for energy trade, particularly within the Southern African region, Government will pursue energy security by encouraging diversity of both supply sources and primary energy carriers.

Some activities in this regard have already been initiated; for example, the Government has, as a part of its Integrated Electrification Plan, developed a scheme for providing solar photovoltaic systems to households in remote, rural areas, that are expected to replace candles, illuminating paraffin and diesel for lighting or battery charging. What is being proposed now is a strategic programme of action to develop South Africa's renewable energy resources, particularly for power generation or reducing the need for coal-based power generation.

One key element of this programme will be the entrepreneurship and innovativeness of South Africa's industrial and financial sectors, and another element will be the development by the Government of appropriate policies and frameworks that would encourage and guide the private sector. However, at present, these will not be enough, as renewable energy resource development in South Africa is in a nascent stage, while competing fossil fuels are well-established and have relatively low costs.

It is clear that renewable energy development will require financial incentives. While the Government intends to provide the necessary incentives, South Africa's fiscal resources are limited, and there are competing high priority social and economic programs, particularly in providing services to historically disadvantaged communities. Hence, the financial resources for these incentives will have to come from a combination of South African and international sources. South Africa has already ratified the United Nations Framework Convention on Climate Change (1997) and the Kyoto Protocol (2002), which creates the framework for tapping international funds *via* the Global Environment Facility and the Clean Development Mechanism to reduce greenhouse gas emissions.

Government's long-term goal is the establishment of a sustainable renewable energy industry producing modern energy carriers that will offer in future years a fully non-subsidised alternative to fossil fuels. The 9% of final energy consumption currently provided by renewable energy has come about largely as a result of poverty (e.g. wood and animal waste used for cooking and heating). To get started on a deliberate path towards this goal, the Government's medium-term (10-year) target is that renewable energy sources share of final energy consumption should increase from 9% (2 216 793 TJ or 53 Mtoe in 1999) to 14%, an increase of 5%, by the year 2012.

Achieving this ambitious target will require a phased, flexible strategy. The starting point will be small, with a limited number of "early win" investments based largely on relatively low cost technologies, such as biomass-bases cogeneration and commercial solar water heating, along with a focus on building and fine-tuning the required institutional framework. This

would keep the subsidy requirements manageable at a time when the short-term costs of the competing coal-based power generation are low because of the current surplus in installed power generation capacity, South African funds available for this purpose are constrained by the need to provide funds for high-priority national activities, and the magnitude of the funds available from international sources such as the Clean Development Mechanism has not yet been established.

Over time, as the need arises for new power generation capacity, the costs of coal-based generation will increase, which would improve the financial viability of renewable energy technologies, and thus reducing the subsidy needed by per unit of power generated. Similarly if the Rand continues to weaken against the US dollar, the opportunities for locally produced fuels to compete with US dollar denominated fuels such as petrol, diesel and natural gas, will increase. By this time, the magnitude of available international funds would be clearer, and the availability of South African funds would also be expected to increase, as it is expected that many pressing social activities would have been completed by then. These changes are expected to make it feasible to make rapid progress towards the target in the second phase.

Apart from the normal monitoring and evaluation associated with any policy, there would be a mid-term assessment after five years, which would consider any changes required in policies, targets or implementation strategies, taking account of changes in costs of coal-based as well as renewable energy power generation, availability of international funds as well as any international obligations agreed-to by South Africa, and the South African budgetary situation.

Essential Elements for Renewable Energy Implementation

Sustainable Development: Renewable energy that is produced from sustainable natural sources will contribute to sustainable development. As most of the sources are indigenous and naturally available, energy supply is afforded security and is not subject to disruption by international crises or limited supplies. Mitigating the use of fossil fuels through the

implementation of renewable energy will contribute to the global solution to adverse climate change while providing incremental financial resources to stimulate sustainable development.

Enabling Environment:

South Africa is well endowed with abundant renewable energy resources that can be converted to productive energy uses. At present, however, the utilisation of these resources are not cost competitive in many locations when compared to South Africa's fossil-based energy supply industry. There are many reasons for this discrepancy in cost including the fact that the lower costs associated with fossil fuel use does not fully account for its adverse impact on the environment. There is therefore a need for Government to create an enabling environment through the introduction of fiscal and financial support mechanisms within an appropriate legal and regulatory framework to allow renewable energy technologies to compete with fossil based technologies.

Market conditions for renewable energy generation can be optimised by reducing the barriers to the increased production of electricity from this source through the development and implementation of an appropriate financial and legislative framework. There is a need for Government support for renewable energy to help establish initial market share and demonstrate the viability of renewable sources, after which economies of scale and technological development take over. Mechanisms need to be developed to overcome the barrier of non-discriminatory third party access to the grid and procedures and wheeling charges defined and regulated to remove the barrier of cost effective transmission of power.

Institutional Arrangements: While one power producer, Eskom, currently dominates electricity generation and transmission in South Africa, the electricity distribution industry is currently undergoing restructuring, including the corporatisation of Eskom and the formation of six new regional electricity distributors. The Energy Policy White Paper encourages the entry of multiple players into the generation market. However, the appropriate regulatory and legal framework will be needed to support the entry of renewable energy generators. The

National Electricity Regulator has jurisdiction over the entire industry and regulates market access through licensing of all producers (greater than 5 giga watt hours/annum), transmitters, distributors and sellers of electricity, and could regulate the phased introduction of renewable energy generators. The Central Energy Fund could assist the implementation of renewable energy through the extension of its operational support. The establishment of technology support centres within existing research and development institutions would facilitate the promotion and ongoing development of technologies and would assist Government in the certification of systems.

Liquid Fuels and Gas Sector

The Central Energy Fund act (Act 38 of 1977) is enabling legislation in terms of which levies can be imposed on liquid fuels products for collection into the Central Energy Fund and or the Equalisation Fund. These funds can be employed for dedicated energy purposes in a manner prescribed by the Act. In terms of proposed amendment to the Petroleum Products Act (Act 120 of 1977), the Minister of Minerals and Energy will remain the liquid fuels industry regulator and may prescribe; the price at which any petroleum product may be sold or bought, the method of trading, the publishing of prices and quantities of crude oil or petroleum products to be maintained by any person as well as the technical characteristics of any fuel.

Government has accepted a process of managed liberalisation of the regulatory dispensation of the liquid fuels industry. A ten-year timeframe is envisaged for the liberalisation of the industry, allowing time for the black empowerment companies to consolidate their positions within the industry.

The Gas Act (Act 48 of 2001) and amended Petroleum Products Act provide a basis for the integration of renewable energy derived liquid fuels such as bio diesel and ethanol and landfill gas into the gas and petroleum industry regulatory framework. The Minister of Finance has announced a 30% tax reduction for biodiesel.

Renewable Energy Technologies: It is necessary to consider which technologies could be promoted by measures to stimulate the market. In the short-term it is important that technologies that are currently available in South Africa are implemented. The local content of equipment needs to be maximised in order to minimise the costs associated with implementation and operation, as well as the promotion of employment opportunities.

Strategic Goals and Objectives

Strategic goals and supporting objectives have been developed for Government to meet its commitment to promoting renewable energy. Four key strategic areas have been addressed, i.e. financial instruments, legal instruments, technology development, and awareness raising, capacity building and education.

Financial Instruments: The goal is to promote the implementation of sustainable renewable energy through the establishment of appropriate financial instruments with the following objectives:

- To set targets for the directing of public resources for the implementation of renewable energy technologies in combination with international sources of funding for this purpose.
- To introduce appropriate fiscal incentives for renewable energy.
- To extend existing state financial supports systems and institutions and introduce innovative approaches to the establishment of sustainable structures and financing mechanisms for delivering renewable energy systems.

Legal Instruments: The goal is to develop, implement, maintain and continuously improve an effective legislative system to promote the implementation of renewable energy with the following objectives:

- To develop an appropriate legal and regulatory framework for pricing and tariff structures to support the integration of renewable energy into the energy economy and to attract investment.
- To develop an enabling legislative and regulatory framework to integrate Independent Power Producers into the existing electricity system.
- To develop an enabling legislative framework to integrate local producers of liquid fuels and gas from renewable resources into their respective systems.

Technology Development: The goal is to promote, enhance and develop technologies for the implementation of sustainable renewable energy with the following objectives:

- To promote the development and implementation of appropriate standards and guidelines and codes of practice for the appropriate use of renewable energy technologies
- To promote appropriate research and development to strengthen renewable energy technologies and optimise its implementation.

Awareness Raising, Capacity Building and Education: The goal is to develop mechanisms to raise awareness of the benefits and opportunities of renewable energy with the following objectives:

- To promote knowledge of renewable energy and energy efficiency and thereby to increase their use.
- To promote and stimulate the renewable energy market through the dissemination of information regarding renewable energy technologies and their applications.
- To persuade the appropriate Government and Government funded institutions to implement training and education programmes with regard to renewable energy.
- To actively involve women in decision-making and planning and promote empowerment in renewable energy programmes or activities.

- To improve communication and interaction between national, provincial and local Government institutions on renewable energy policies.

Governance

The Constitution requires that the legislative and executive authority of different spheres of Government operate within a framework of cooperative governance. The Department of Minerals and Energy will take overall responsibility for renewable energy policy in South Africa. The Department will establish the appropriate enabling environment to ensure that activities undertaken by other stakeholders are co-ordinated, uniform and effective.

The future National Energy Regulator (NER) will regulate market access through licensing of all producers (greater than 5 giga watt hours/annum), transmitters, distributors and sellers of electricity. The NER will also regulate the prices at which power is purchased from generators, both Eskom and the Independent Power Producers and approve electricity tariffs.

In applying the Petroleum Products Act the Minister of Minerals and Energy may introduce measures to facilitate the entry of liquid fuels produced from renewable resources.

The key focus area of the Central Energy Fund (CEF) is aimed at contributing to the development of South Africa's energy sector by contributing to the universal access to energy, including the increased use of renewable energy. The CEF renders operational support to the energy sector in the form of treasury services, including the raising of funds both locally and internationally. Mechanisms will be investigated to extend the operational support available from the Central Energy Fund to renewable energy programmes.

The Department of Minerals and Energy will develop a partnership approach to ensure an integrated focus for national renewable energy initiatives.

The Way Forward

This Draft White Paper on Renewable Energy will be issued for public comment. Based on comments received, the Draft White Paper will be revised and finalised and submitted to Cabinet for approval and public launching by the Minister of Minerals and Energy.

Following on the development of this policy on renewable energy, a strategy on renewable energy will be developed, which will translate the goals and objectives of the policy into a practical implementation programme.

Government will use a phased, managed and partnership approach to select renewable energy projects that are already well developed and have low start up costs. This will lessen the strain on fiscal resources and hold greater potential for successful implementation. Furthermore, Government will monitor international technological developments in renewable energy with a view to identifying technologies appropriate to the South African situation. These technologies will be considered for local implementation once they become commercially viable and are proven beneficial in meeting the national objectives.

1. INTRODUCTION

This Draft White Paper on Renewable Energy supplements the Government's overarching policy on energy as set out in its *White Paper on the Energy Policy of the Republic of South Africa* (DME, 1998), which pledges 'Government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications'.

This Draft White Paper on Renewable Energy sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. More specifically, it has the following two goals, i.e.:

- to inform the public and the international community of the Government's goals, and how the Government intends to achieve them, and;
- to inform Government agencies and Organs of State of these goals, and their roles in achieving them.

1.1 Vision

Government's overall vision for the role of renewable energy in its energy economy is:

An energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation.

1.2 Definition of Renewable Energy

Renewable energy harnesses naturally occurring non-depletable sources of energy, such as solar energy, wind, and biomass, to produce electricity, fuel, liquid fuels, heat or a combination of these energy types.

Solar energy can be used to generate electricity; heat water; and to heat, cool and light buildings. For example, photovoltaic systems capture the energy in sunlight and convert it directly into electricity. Alternatively, sunlight is collected and focused with mirrors to create a high intensity heat source that can be used to generate electricity by means of a steam turbine or heat engine.

Wind energy uses the naturally occurring energy of the wind either directly as in windmills or to generate electricity, and can be used, for example, to charge batteries or pump water. Large modern wind turbines operate together in 'wind farms' to produce electricity for utilities. Small turbines are used to meet localised energy needs.

Biomass (organic matter) ***energy*** can be used to provide heat, make liquid fuels, gas and to generate electricity. Wood is the largest source of biomass energy. Other types of biomass include plants, residues from agriculture or forestry, and organic components in municipal and industrial wastes. Landfill gas (biogas) is considered to be a biomass source.

Biomass can be converted directly into liquid fuels called ***bio fuels*** used, for example, for transportation. The two most common bio fuels are ethanol and bio diesel. Ethanol is made by fermenting any biomass that is rich in carbohydrate, such as maize. Bio diesel is made using vegetable oils, animal fats and algae.

Hydropower uses the movement of water to drive turbines to generate electricity.

The hot core of the earth constitutes another source of "renewable energy" via ***geothermal*** *activity* in the earth's crust. Examples are the natural geysers and hot water sources employed for power generation and space heating or using deep hot dry rock as heat-exchangers by pumping water through the natural rock fissures to produce steam for power generation.

2. PURPOSE OF THE POLICY

The purpose of this Draft White Paper on Renewable Energy is to set out Government's principles, goals and objectives for renewable energy. It furthermore commits Government to a number of actions to ensure that renewable energy becomes a significant part of its energy portfolio over the next ten years.

South Africa currently relies almost completely on fossil fuels as a primary energy source (approximately 90%), with coal providing 75% of the fossil fuel based energy supply (DME, 1999). Furthermore, of the total amount of electricity generated, 91% is derived from coal (NER, 2000). Coal combustion in South Africa is the main contributor to carbon dioxide emissions, which is one of the greenhouse gases that have been linked to climate change. This reliance on fossil fuels to meet energy requirements is recognised, but as concerns about global climate change grow, South Africa also needs to be a responsible global neighbour. In addition, the current surplus of electricity generation capacity is temporary and will require major new capacity to be built in the future to meet the growing demand. Hence, it is the intention of the Government to strategically develop its renewable energy resources through the implementation of a properly managed programme of action that will provide sufficient incentive for the sustainable development of the renewable energy-based industries.

South Africa is well endowed with abundant renewable energy resources that can be converted to productive energy uses. At present, however, the utilisation of these resources is generally not cost competitive compared with South Africa's fossil-based energy supply industry. There are many reasons for this discrepancy in cost, including, the fact that the lower costs associated with fossil fuel use does not fully account for its adverse impact on the environment. There is therefore a need for Government to create an enabling environment through the introduction of fiscal and financial support mechanisms within an appropriate legal and regulatory framework, to allow renewable energy technologies to compete with fossil based technologies. Government intends to strategically develop the renewable energy

resources in the future in a systematic way. The challenge for the Government will be to provide sufficient incentive for the renewable energy-based industries to develop, grow and to be sustainable in the long-term. South Africa's fiscal resources are however limited. The limited financial resources available for the renewable energy programme will be optimally used with a specific emphasis on ensuring that the global climate change resources are accessed to facilitate its implementation.

South Africa will continue to benefit from the innovativeness of its people in industry and academia to meet the challenge of providing renewable energy alternatives that can initiate the renewable energy programme without the requirement of exorbitant subsidy demands. It is the aim of the Government to set proper boundaries within which the renewable energy industry can operate and grow thus contributing positively to the South African economy and to the global environment. This will include changing the basic framework of how energy is produced, sold, traded, transferred and bought. The long-term goal is the establishment of a sustainable renewable energy industry that will offer in future years a fully non-subsidised alternative to fossil fuel dependence.

In order to meet afore-mentioned goal Government has set the following 10-year target for renewable energy:

To increase renewable energy sources share of final energy consumption from 9% (2 216 793 or 53 Mtoe in 1999) to 14%, an increase of 5%, by the year 2012. The renewable energy is to be produced mainly from biomass, wind solar and mini and micro-scale.

3. POLICY DEVELOPMENT

3.1 Development Process

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimising the environmental impacts. Consequently, the Department of Minerals and Energy has been engaged for a number of years in a process for the development of a renewable energy policy. Various studies have been undertaken and discussions, meetings and workshops have been held with a wide range of stakeholders to discuss the development of a renewable energy policy.

3.2 Policy Principles

Policy principles are the fundamental premises that Government will use to apply, develop and test policy and subsequent actions, including decision-making, legislation, regulation and enforcement. The overarching principles of this Draft White Paper on Renewable Energy are those of the Constitution and Bill of Rights, as well as those in the White Paper on the Energy Policy (DME, 1998).

The key policy principles for renewable energy are the following:

Full cost accounting: Pricing policies will be based on an assessment of the full economic, social and environmental costs and benefits of policies, plans, programmes, projects and activities of electricity generation.

Equity**:** There should be equitable access to basic services to meet needs and ensure human well being. Each generation has a duty to avoid impairing the ability of future generations to ensure their well-being.

Global and international cooperation and responsibilities: Government will recognise its shared responsibility for global and regional issues and act with due regard for the principles contained in relevant policies and applicable regional and international agreements.

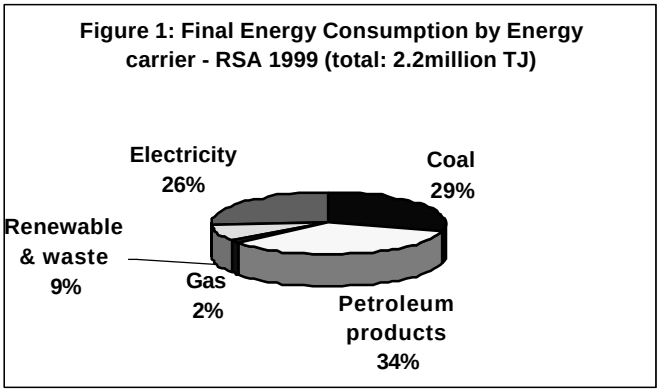
Allocation of functions: Government will allocate functions within the framework of the Constitution to the institutions and spheres of Government that can most effectively achieve the objective of a function within the context of energy policy.

Participation: Government will encourage the inclusion of all stakeholders in energy governance with the aim of achieving equitable and effective participation.

3.3 Renewable Energy Potential

Globally, the renewable energy industry is projected to grow rapidly over the next decade. The International Energy Agency estimates a 15-20% of total energy supply contribution from renewable energy by 2010 (UK, DTI, 1999), up from 10% in 1999 (EIA, 1999). This is due to renewable sources of energy having considerable potential for increasing security of supply by diversifying the energy supply portfolio and increasingly contributing towards a long-term sustainable energy future. In terms of environmental impact, renewable energy generation results in the emission of less greenhouse gases than fossil fuels, as well as fewer airborne particulates and other pollutants.

Renewable energy accounts for approximately 9% (1999) of total energy consumption (see Figure 1). The majority of this energy is generated from fuel wood and dung and not modern renewable energy technologies. Less than 1% of the total electrical energy used in South Africa originates from renewable energy sources. One of the objectives of this White Paper is to reduce the dependence on the use of fuel wood and dung through the establishment of an enabling environment to promote the implementation of modern renewable energy technologies.



Conditions in South Africa are favourable for the increased use of renewable energy resources, specifically wind, solar and biomass. Preliminary estimates of the theoretical potential of some renewable energy resources are as follows:

Table 1[1] (World Bank, 2002)

Resource	Theoretical Potential (GWh/year x 1000)	Theoretical Potential (toe/year x 1000)
Solar water heating[1]	0.5	42
Solar Photovoltaic[2]	40 000	3 000 000
Solar Thermal Electric[3]	20 000	1 000 000
Wind[4]	5.7	486
Bagasse[5]	5	429
Wood Waste[6]	2.62	225
Landfill Gas[7]	0.93	80
Hydro[8]	10	857

[1] The figures is just indicative of the theoretical potential (economic viability and practical availability not considered), and cannot be considered as exact, but to represent only an approximate market potential

Total Energy Consumption 1999	600	53 000

Note: Toe = 0.012 GWh

In comparison with the total energy consumption in 1999 (600 000 GWh or 53 Mtoe), it is clear from table 1 that South Africa has ample renewable energy resources to exploit.

(1) Based on estimate of Solar Water Heating market potential.

(2) Based on average of 7501 MJ/m^2/year solar radiation (DME, Eskom, CSIR, 2001), 8% solar to electric efficiency, 22% capacity factor, 84% land area.

(3) Based on 6480 MJ/m2/year solar radiation (DME, Eskom, CSIR, 2001), 16% solar to electric efficiency, 40% capacity factor, 16% land area. (Based on Eskom's 100 MW Solar Thermal Power Plant feasibility study, 1% (19400km^2) of suitable area in the Northern Cape which is harnessed for solar thermal power generation could generate a potential of 1.3 x 10^6 TJ or 30 Mtoe/year electricity which is 1.7 times the total energy consumption of 1999 (2.2 million TJ) (16% solar to electric efficiency, 40% capacity factor)).

(4) Assumed annual capacity factor of 33%

(5) Assumed annual capacity factor of 68.5%

(6) Assumed annual capacity factor of 80%

(7) Assumed annual capacity factor of 85%

(8) Assumed annual capacity factor of 55%

(run-off river schemes)

Renewable energy can be generated centrally and distributed for use near its point of production. Providing energy at (or near) the point of use reduces the infrastructure required for energy distribution and energy delivery losses, as well as increasing energy efficiency. Accelerated implementation of technologies in the private, commercial and industrial sector, such as passive solar design technologies, could also impact positively on energy demand side management and thus defer the need for additional power plant capacity.

The amount of renewable energy that is actually consumed within the next 10 years will be a function of:

- The regulatory framework with regard to electricity, liquid fuels and housing and building markets.
- The evolving electricity pricing structure.
- The amount of subsidy funds available to enable implementation.
- The fiscal treatment of renewable energy
- The final operational structure of the power sector and the ease of accessing the grid and wheeling power to end-users.
- Detailed feasibility evaluation results for individual projects.

The growth of the renewable energy industry will deliver social, economic and environmental benefits to South Africa. Implementation of a renewable energy programme that meets international requirements will attract investment that would otherwise be lost to the country. In addition, novel approaches to energy provision, such as renewable energy, have the potential for increased industrial growth and employment opportunities by establishing industrial development that is more cost effective and competitive internationally. In addition, renewable energy technologies provide significant potential export market opportunities to the southern African region.

Fuel wood is the main source of energy for most rural households. Demand exceeds supply in many areas of the country resulting in environmental degradation caused by unsustainable harvesting practices. In addition, the use of fuel wood impacts negatively on air quality and human health. In the rural areas, the distribution of energy based on renewable sources is often more economical than extending the electricity grid. The provision of affordable basic energy services to the rural community will activate the rural economy and grow the income generating potential of the communities. The burden of collecting fuel wood is mainly placed on women. The time spent in this activity represents a high social and economic cost to the family and society, which could be avoided by providing access to alternative fuels. To address these problems women need to be more closely involved in decision-making in issues related to energy, and more specifically the use of renewable energy.

4. SETTING THE CONTEXT

The Draft White Paper on Renewable Energy was developed in the context of both international and national driving forces. International developments around the United Nations Framework Convention on Climate Change, the world markets for renewables, and South Africa's reintegration into the global economy, necessitated the development of a definitive policy on renewable energy. Government's overarching energy policy (DME, 1998) touched on renewable energy, which needed to be fully developed and articulated.

4.1 The National Context

4.1.1 The Constitution

The Constitution (Act No. 108 of 1996) provides the legal basis for allocating powers to different spheres of Government and contains a number of rights specifically relevant to the national energy policy. The Constitution states that Government must establish a national energy policy to ensure that national energy resources are adequately tapped and delivered to cater for the needs of the nation. Energy should be made available and affordable to all

citizens, irrespective of geographic location. The production and distribution of energy should be sustainable and lead to an improvement in the standard of living of citizens.

The Bill of Rights provides that:

"*Everyone has the right*

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that -

(i) prevent pollution and ecological degradation;

(ii) promote conservation; and

(iii) secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development."

Chapter 2, Bill of Rights of the Constitution further states: *"The State must respect, protect, promote and fulfil the rights in the Bill of Rights"*

In order to meet the Government's obligations in this regard, the White Paper on the Energy Policy states that Government will work towards the establishment and acceptance of broad targets for the reduction of energy related emissions that are harmful to the environment and to human health.

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

The White Paper on the Energy Policy of the Republic of South Africa (DME, 1998) sets out Government's policy with regard to 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. The policy addresses all elements of the energy sector.

The White Paper states that the electricity sector reform will be based on introducing competition into the industry by restructuring Eskom generation into separate generation and transmission companies.

The policy recognises that South Africa has neglected the development and implementation of renewable energy applications. However, the significant medium and long-term potential of renewable energy is recognised. Government policy on renewable energy is concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented through the development and implementation of an appropriate programme of action.
- 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.
- Addressing constraints on the development of the renewable energy industry.

4.1.3 Reconstruction and Development Programme

Since 1994, social and economic policies have largely been informed by two strategies: the White Paper on Reconstruction and Development (1994), and its programme "for integrated and coherent socio-economic progress" (White Paper on Reconstruction and Development p71), and the macro-economic strategy - *Growth, Employment and Redistribution* (GEAR). The main energy emphasis in the White Paper on Reconstruction and Development was the electrification of 2.5 million households by 2000.

The five programmes of the Reconstruction and Development Programme (RDP) - meeting basic needs, developing human resources, building the economy, democratising the state and society, and implementing the RDP, are to a large extent echoed in the five overarching policy goals set out in the White Paper on the Energy Policy.

Other policy documents, such as the Rural Development Strategy of the Government of National Unity (1995) detailed the challenges facing rural people with regard to access to energy supply and the need for co-ordination of rural development.

4.1.4 Growth, Employment and Redistribution Macroeconomic Strategy

The Growth, Employment and Redistribution Strategy of 1996 placed its 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 contributes towards economic growth, trade, investment and employment creation, as well as providing infrastructure for households.

In addition, there has been an increased emphasis in recent years towards a liberalisation of energy markets. This includes a programme of restructuring and rationalisation of state-owned enterprises. This has implications in a number of energy markets, in particular for the electricity sector.

4.1.5 The Integrated Sustainable Rural Development Strategy (ISRDS)

The Integrated Sustainable Rural Development Strategy (ISRDS 2000) was "designed to realise a vision that will attain socially cohesive and stable rural communities with viable institutions, sustainable economies and universal access to amenities, able to attract and retain skilled and knowledgeable people, who are equipped to contribute to growth and development".

A strategic objective of the ISRDS is "to ensure that by the year 2010 the rural areas would attain the internal capacity to integrated and sustainable development". Key aspects facilitating this objective are decentralised Government, capacity building at the local level

and significant transfers from central Government to provide incentives for efficient local Government.

While the contribution of the energy sector is to provide basic energy services to rural areas, in particular extending access to electricity via non-grid electrification and mini-grids, as well as improving access to other fuels and appliances, the effort should also be viewed as an opportunity to create an economic base via agricultural and home-based industries and SMMEs in order to grow the income-generating potential of communities.

4.2 The International Context

4.2.1 Climate Change

The Intergovernmental Negotiating Committee for a Framework Convention on Climate Change was established in 1990. This Committee drafted the United Nations Framework Convention on Climate Change (UNFCCC), which was opened for signature in June 1992 at the Rio de Janeiro Earth Summit. The fundamental objective of the UNFCCC is to achieve stabilisation of the concentrations of GHG in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. South Africa ratified the UNFCCC in 1997, which enables South Africa to apply for financial assistance for climate change related activities from the Global Environmental Facility (GEF).

The Kyoto Protocol was introduced in 1997 at the third Conference of Parties. The conference resulted in a consensus decision to adopt a Protocol under which industrialised countries (Annex 1 countries) will reduce their combined greenhouse gas emissions by at least 5% compared to 1990 levels by the period 2008 to 2012.

The Protocol will come into force after it has been ratified by least 55 parties to the UNFCCC, including Annex 1 parties accounting for at least 55% of the total 1990 carbon dioxide emissions in this industrialised group.

South Africa ratified the Kyoto Protocol in March 2002. The Kyoto Protocol does not commit the non-Annex 1 (developing) countries, like South Africa, to any quantified emission targets in the first commitment period (2008 to 2012). However, there is potential for low cost emission reduction options in these countries. The Clean Development Mechanism provides for the certified emission reductions between non-Annex 1 countries and Annex 1 countries. The mechanism is specifically defined to support sustainable development with respect to greenhouse gas emissions in developing countries while helping Annex 1 countries to comply with their commitments under the Kyoto Protocol. The Annex 1 countries may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their emission reduction commitments.

4.2.2 World Markets for Renewables

Renewable sources of energy are estimated to meet between 15 and 20% of current final world energy consumption, predominantly from hydro-electricity, wood, biomass and geothermal (UK DTI, 1999). Scenario analyses by Shell, which assume pressure towards sustainability, show renewables meeting around 40% of world energy needs by the middle of the century (Shell, 2001). This prognosis is based on the reducing role for fossil fuels as they become scarcer, the need to contain fossil fuels use because of their emissions and the need to reduce their impact on climate change.

4.2.3 South Africa in the International Arena

South Africa faces the challenge of ensuring the availability of abundant easily sourced and competitively priced energy supplies. Energy security is now being achieved through the greater diversification and flexibility of supply and competition between energy carriers. The challenge facing Government is to create a policy framework with appropriate legal, fiscal and regulatory instruments that attract domestic and international investment, while ensuring that national policy objectives are achieved and at the same time resulting in an appropriate energy mix.

There is an international trend towards the generation of "clean" energy in response to the threat of climate change and to meet the commitments of the Kyoto Protocol. South African industry depends on modern energy carriers produced from coal, oil and gas. Although South Africa is not committed to a specific timeframe to reduce greenhouse gas emissions, it has a window of opportunity to utilise international funding for the penetration of renewable energy into South Africa's energy mix.

5. BARRIERS TO RENEWABLE ENERGY IMPLEMENTATION

There are significant barriers to the further implementation of renewable energy, which need to be addressed. The key issues include the following:

- Many renewable energy technologies remain expensive compared to conventional energy supplies for bulk energy supply to urban areas or major industries.
- Implementation of renewable energy technologies needs significant initial investment and may need support for relatively long periods before reaching profitability.
- There is a lack of consumer awareness on benefits and opportunities of renewable energy.
- The economic and social system of energy services is based on centralised development around conventional sources of energy, specifically electricity generation.
- Financial, legal, regulatory and organisational barriers need to be overcome in order to implement renewable energy technologies and develop markets.
- There is a lack of non-discriminatory open access to key energy infrastructure such as the national electricity grid, certain liquid fuels and gas infrastructure.

6. ESSENTIAL ELEMENTS OF RENEWABLE ENERGY IMPLEMENTATION

In order to develop a policy to address the key issues related to renewable energy several approaches to renewable energy implementation were explored. Essential elements of such approaches are - sustainable development, an enabling environment, institutional arrangements, information and technology.

6.1 Sustainable Development

Sustainable development is defined as "the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations" (National Environmental Management Act, 1998). The provision of reliable and affordable energy for business and the domestic market, underpins everyone's quality of life.

Renewable energy that is produced from sustainable natural sources will contribute to sustainable development. As most of the sources are indigenous and naturally available, security of energy supply is improved and not disrupted by short-term international crises.

The challenge of climate change is recognised as one of the major environmental threats facing the world today. Reducing the use of fossil fuels through the implementation of renewable energy will reduce harmful emissions and thereby reduce South Africa's impact on climate change.

6.2 Enabling Environment

Renewable energy technologies will not be commercially competitive in the short to medium term. The establishment of an appropriate enabling environment through the development of fiscal, financial and legislative instruments, will therefore be required to simulate increased utilisation of these technologies. This includes Government support for renewable energy to help establish an initial market share and non-discriminatory open access to the national electricity grid (with an appropriate wheeling arrangement) and other energy infrastructure. Procedures and wheeling charges need to be defined and regulated to remove barriers to the cost effective transmission of power. Government has already stated that it will reduce the fuel levy on diesel produced from biomass by 30% (Budget Speech Minister of Finance, February 2002).

Many of the renewable energy technologies are currently under developed compared with conventional options and hence costs tend to be high. There is a reluctance to invest in what are sometimes considered to be risky investments.

Fossil fuels represent a concentrated form of energy, while renewable energy normally uses dispersed sources with low energy concentrations. Renewable energy typically has a different cost structure to traditional energy sources. For some technologies the initial capital cost is high but the operation and maintenance costs are low and the fuel is free or of low cost.

The current price structure for energy derived from coal, crude oil and nuclear does not include environmental externalities and does not reflect the true costs of production. However, even if externalities were to be included, there would still be need to support individual renewable technologies in the market until they have achieved the necessary economies of scale, technological development and investor confidence. Supporting financial instruments should however provide incentives for continued minimisation of costs.

The transport infrastructure for conventional energy, such as electricity transmission lines and petroleum pipelines, link the traditional sources of production to the areas of consumption. Much of the existing transport infrastructure was either provided by the State or its establishment heavily subsidised.

Renewable energies however may not necessarily be produced or consumed in areas where the transport infrastructure is currently located. New infrastructure may therefore be required to link renewable energy supplies into the existing transport infrastructure, which will need appropriate mechanisms to facilitate this. This could include the introduction of low transport (wheeling) tariffs for renewable energies where existing infrastructure is used. The Government is developing the regulations and rules that will apply to access to the electricity grid and wheeling of power.

The barrier of non-discriminatory open access to the electricity grid could be overcome through the implementation of power purchase agreements to independent power producers (IPPs). This system could also be legally defined and regulated by the Government. Such agreements could include a contract and agreed price over a specified period of time, which would reduce risk and offer a guaranteed outlet for the power generated. This would help to overcome the problem of high initial investment cost. As renewable IPPs become commercialised over time they will become able to compete with other technologies. A system will however need to be developed to compensate for the cost of electricity generated from different technologies and from different geographical locations. In addition, the procedure and charges for wheeling the power from the generator to a customer through the national grid needs to be defined and regulated in order to remove transportation costs for electric power.

6.3 Institutional Arrangements

6.3.1 Electricity Sector

One power producer, Eskom, currently dominates electricity generation and transmission in South Africa. However, the electricity distribution industry is currently undergoing restructuring, including the corporatisation of Eskom and the formation of six new regional electricity distributors.

The White Paper on the Energy Policy of the Republic of South Africa provides for the integration of grid and non-grid technologies into a single National Electrification Programme, which is an integral element of the restructuring of the electricity distribution industry being undertaken. The Energy Policy also encourages the entry of multiple players into the generation market. However, the appropriate regulatory and legal framework will be needed to support the entry of renewable energy generators.

The National Electricity Regulator (NER) has jurisdiction over the entire industry and regulates market access through licensing of all producers (greater than 5 giga watt hours per annum), transmitters, distributors and sellers of electricity. All electricity tariffs have to be approved by the NER that also regulates quality of supply and mediates disputes and customer complaints. A regulatory framework will be required to guide the approach to renewable energy implementation to guide the NER in its function as the regulator over the electricity supply industry.

The establishment of technology support centres within existing research and development institutions would facilitate the promotion and ongoing development of technologies and would assist Government in the certification of systems. One essential element to sustainable renewable energy generation will be technological development aimed at reducing costs and increasing efficiency.

6.3.2 Liquid Fuels and Gas

The Department of Minerals and Energy is responsible for the governance of the liquid fuels industry in South Africa and governance of the liquid fuels sector is commensurate with Government's policy goals for, and level of involvement in, the industry. The industry is also governed by generally applicable legislation such as competition legislation.

The Central Energy Fund act (Act 38 of 1977) is enabling legislation in terms of which levies can be imposed on liquid fuels products for collection into of the Central Energy Fund and or the Equalisation Fund. These funds can be employed for dedicated energy purposes in a manner prescribed by the Act.

Price control is affected in terms of the Petroleum Products Act (Act 120 of 1977). In terms of the amended Petroleum Products Act, the Minister of Minerals and Energy will remain the liquid fuels industry regulator and will prescribe the price at which any petroleum product may be sold or bought, method of trading, publishing of prices and quantities of crude oil or petroleum products to be maintained by any person. The Minister shall furthermore appoint a person in the public service as Controller of Petroleum Products who shall issue licenses in terms of the Act and in issuing such licenses.

Government has accepted a process of managed liberalisation of the regulatory dispensation of the liquid fuels industry. The time-horizon for this process will be determined by the achievement of specific milestones as set in the White Paper on Energy Policy (December 1998). A ten-year timeframe is envisaged for the liberalisation of the industry, allowing time for the black empowerment companies to consolidate their positions within the industry.

In order to develop the piped gas industry and regulatory framework for the development of a competitive gas industry through granting of licenses for the transmission, storage, distribution and trading of piped gas and matters connected therewith the Gas Act (Act 48 of 2001) was promulgated.

The high initial costs for renewable energy necessitates the establishment of funding mechanisms to promote their implementation. The Central Energy Fund has historically been focussed on the management of crude oil and locally produced hydrocarbons. However, increasing the use of renewable energy, biomass derived liquid fuels and energy sources such as bio diesel, ethanol and landfill gas have been identified as one of its key focus areas in future. Mechanisms, such as the Central Energy Fund and Equalisation Fund, could be harnessed to extend the operational support available to renewable energy programmes. The Gas Act and the proposed amendment to the Petroleum Products Act will provide a basis for the integration of renewable energy derived liquid fuels and landfill gas into the petroleum and gas industry regulatory framework. Government could take the lead by setting supply and demand targets e.g. a percentage of Government (national and provincial) and Government related financial institutions, agencies projects budget invested in renewable energy programmes and a target set for a percentage of renewable energy demand by Government (national and provincial) and related institutions and agencies.

6.4 Information

There is already a significant use of renewable energy in South Africa. An urgent task is a quantitative "baseline" study to determine more precisely the quantum and nature of renewable energy currently in use. One obstacle to the development of renewables is the lack of information available to the consumer about renewable energy options. There is a need to provide comprehensive, independent and comparative information on renewable energy products and services to customers to support informed decision-making.

6.5 Renewable Energy Technologies and Applications

Certain renewable energy technologies are well developed and are generally readily available. The challenge for South Africa is to start implementing those technologies that are most suitable for wide spread application in South Africa. Local manufacture will be promoted in

order to limit the cost of imported equipment and to benefit from economies of scale, as well as creating employment opportunities.

Technologies that could be further developed and implemented in South Africa in the short-term to meet the proposed target of renewable energy generation include the following: solar, wind, biomass technologies and micro-hydro power.

6.5.1 Biomass Energy

The main sources of biomass are fuel wood in the rural domestic sector and bagasse and pulp and paper waste in the industry sector for in-house heat and electricity generation.

Due to the over exploitation of natural woodlands and unsustainable harvesting practices, growing local scarcities of fuel wood and the concomitant negative environmental and social impacts constitute serious problems in many rural areas. Targeted intervention in these areas to manage woodlands for the benefit of rural households is recognised in the White Paper on the Energy Policy. The Department of Water Affairs and Forestry has accepted responsibility for the launching of a National Action Plan on Social Forestry that includes a community forestry programme. As fuel wood still forms the major source for rural energy supply and is often used in open fires with concomitant health implications, there is a strong potential for energy efficient woodstoves to be used more widely, as is the case in other African countries.

Biomass is used to some extent in industry, in the form of bagasse in the sugar industry and wood wastes in the timber industry for in-house heating and electricity generation. By making improvements in boiler and turbine efficiencies considerable scope exists for co-generation (production of process heat plus electricity for the purpose of export) in both of these industries. Co-generation of electricity in the industrial sector from biomass is currently ongoing but this is used on-site and not exported to the national grid because of the low price

of electricity generated from coal and the lack of clarity of the rules applicable to Independent Power Producers.

In many of South Africa's neighbouring states charcoal is used extensively as a domestic fuel. In South Africa however charcoal is currently used mainly in the recreation, catering and metallurgical industry, leaving scope for its further exploitation.

6.5.2 Solar Energy

The African continent has very favourable exposure to sunshine all year round. The daily average global solar radiation levels in South Africa range between 4.5 and 6.4 kWh/m^2 compared to about 3.6 kWh/m^2 for parts of the United States and about 2.5 kWh/m^2 for Europe and the United Kingdom.

Solar energy is the most readily accessible renewable energy resource available in South Africa. The potential uses and applications include:

- Solar passive building design practice for residential, commercial and industrial buildings to minimise thermal energy consumed. This includes the energy that is consumed by the occupants, as well as that which is embedded in the construction of the building.
- Solar water heating for domestic, recreational, institutional and industrial use.
- Solar space heating - closely related to solar passive and active building design practice and can also include solar water heating technologies.
- Solar cookers as an alternative to cooking with fuel wood in the rural areas.
- Agricultural use (e.g. crop drying and green houses), especially for the small-scale farming.
- For electricity (photovoltaic and solar thermal) generation, ranging from small to medium-scale stand-alone applications to large-scale grid-connected applications.
- Heat pumps for water heating and space heating and cooling.

The photovoltaic (PV) effect is widely applied for powering the conventional and cellular telecommunications networks. It is also applied in small-scale remote stand-alone power supplies for domestic use, game farms, household and community water pumping schemes. The installed PV capacity is estimated at just over 8 MW_p (2000). However, storage constraints are limiting the wider utilisation of solar electricity generation (solar thermal and photovoltaic).

Domestic solar water heating is currently about 1.3% of the solar energy market. Water heating accounts for an average of 30-50% of household electricity bills. Appropriate solar water heating systems have the potential to save up to 70% on water heating electricity costs and up to 40% on total household electricity costs. There is thus considerable scope to increase the application of solar water heating, which would contribute favourably to electricity demand management. An increasing market for solar water heating would result in a growth in the relevant manufacturing industry and increased employment opportunities.

6.5.3 Wind Energy

South Africa has a sizable wind energy resource. Suitable geographic areas of high wind potential compare favourably with that of Europe. Eskom conservatively estimates a potential 500 to 1 000 MW wind energy that can be exploited for electricity generation in South Africa. Suitable sites are mainly situated along the coastline and the Drakensberg escarpment. Large-scale exploitation will therefore be via electricity generation in wind farms and transmission through the national grid. Variability of output due to localised fluctuation of the wind could be overcome by appropriate site selection, thus ensuring delivery at a high annual capacity factor.

Grid connected wind farms could supplement the electricity grid through distributed generation, rather than transporting the electricity over large distances with the associated costs and electricity losses. Large wind turbine systems would supplement the grid by

providing generation capacity at coastal areas and working with water pumping schemes to "store" the energy which could provide supply at peak times. Careful placement of large wind farms minimises potential noise and visual pollution.

Moderate wind regimes, for example the large sparsely populated areas of the Karoo and Northern Cape, can be economically exploited in hybrid electricity generation configurations with PV and/or diesel generator sets. A small local supply industry focusing on small stand-alone battery charging systems already exists in the country.

6.5.4 Hydropower

South Africa has limited potential for large-scale hydroelectric power generation. Current (2000) installed capacity amounts to 600 MW spread over 2 power stations, with a further 1 400 MW by way of pumped storage schemes.

There are an estimated 6 000 to 8 000 potential sites for small-scale hydropower applications in the power range up to 100 MW, situated mainly on the eastern escarpment in KwaZulu-Natal and the Eastern Cape. The present installed capacity in this range is estimated at 68 MW (2000), spread over a relatively small number of installations. There is therefore significant scope for the further utilisation of this resource.

The Southern African Power Pool (SAPP) will allow the free trading of electricity between the countries of the Region, providing South Africa with access to the vast hydropower potential in the countries to the north, notably the significant potential in the Congo River (Inga Falls). At the same time the countries to the north could benefit through access to the coal fired power resources in the south. Such an arrangement should stabilise the energy requirements of the region as a whole well into the next century.

Exploitation of the vast hydropower resources will constitute a significant infusion of renewable energy resources in the energy economy of the Region over the medium to long term. The Lesotho Highland Water Scheme has the capacity to contribute some 600 MW of hydroelectric power to the system already in the short term. Global pressures regarding the environmental impact and displacement of settlements by huge storage dams will likely limit the exploitation of hydropower at a large scale**.**

7. STRATEGIC GOALS, OBJECTIVES AND DELIVERABLES

Strategic goals and supporting objectives chart the direction that the Government will follow in meeting its commitment to promoting renewable energy are set out below. Five key strategic areas are addressed, i.e. financial instruments, legal instruments, technology development, and awareness raising, capacity building and education. In addition to the goals and objectives, associated deliverables have been identified.

7.1 Financial Instruments

Goal

To promote the implementation of sustainable renewable energy through the establishment of appropriate financial and fiscal instruments.

Objectives

- To set targets for the directing of public resources for the implementation of renewable energy technologies in combination with international sources of funding for this purpose.
- To introduce appropriate fiscal incentives for renewable energy.

- To extend existing state financial supports systems and institutions and introduce innovative approaches to the establishment of sustainable structures and financing mechanisms for delivering renewable energy systems.

Deliverables

- An analysis of the current financial framework and identification of barriers for the implementation of renewable energy sources.
- An investigation into appropriate financial (e.g., subsidies, environmental levy and green certificates) and fiscal instruments/incentives (e.g. low interest loans and tax rebates) to stimulate the implementation of renewable energy technologies and practices.
- Mechanisms to increase the access of renewable energy to the national grid.
- Regulations and incentives for the promotion of thermally efficient housing in collaboration with the Department of Housing.
- Establishment of a Renewable Energy Fund under the auspices of the Central Energy Fund to finance the implementation of renewable energy initiatives. The Fund could be used for example to facilitate access to green financing, as well acting as a loan guarantor to reduce the risks for financing institutions.
- Monitor and evaluate the effectiveness of financial incentive schemes.
- An equitable electricity tariff structure that will be managed by the National Electricity Regulator that addresses the issue of cost of supply for the different renewable energy technologies, including capital replacement costs for non-domestic users.

7.2 Legal Instruments

Goal

To develop, implement, maintain and continuously improve an effective legislative system to promote the implementation of renewable energy.

Objectives

- To develop an appropriate legal and regulatory framework for pricing and tariff structures to support the integration of renewable energy into the energy economy and to attract investment.
- To develop an enabling legislative and regulatory framework to integrate Independent Power Producers into the existing electricity system.
- To develop an enabling legislative framework to integrate local producers of liquid fuels and gas from renewable resources into their respective systems.

Deliverables

- Appropriate regulations for grid-connection and wheeling of electricity.
- Regulations requiring power generator's tariffs to be based on full cost accounting and environmental externalities.
- New legislation for the electricity industry to incorporate renewable energy and energy efficiency and to provide equitable opportunities for their development.
- Regulations for the petroleum industry to accommodate locally produced bio diesel and ethanol.
- Clear rights for property owners to capture solar radiation on their property without interference by other structures or vegetation on neighbouring properties.

7.3 Technology Development

Goal

To promote, enhance and develop technologies for the implementation of sustainable renewable energy.

Objectives

- To promote the development and implementation of appropriate standards and guidelines and codes of practice for the appropriate use of renewable energy technologies
- To promote appropriate research and development to strengthen renewable energy technologies and optimise its implementation.

Deliverables

- A mechanism for the certification of the design and installation of renewable energy systems such as solar water heating and photovoltaic solar home systems.
- Implement appropriate standards governing the design, installation and performance of renewable energy systems, together with a certification process to verify that the systems actually meet these standards. Revise Government tender procedures to include specific standards for renewable energy technologies.
- Monitor ongoing research and development programmes and identify additional investigations and demonstration projects that would assist in the development and optimisation of renewable energy systems.
- Identify appropriate public/private partnerships for the promotion of renewable energy technology development and implementation.
- Identify and expand areas for international co-operations in the field of Renewable Energy.
- Identification and enhancement of appropriate mechanisms to gain from technology and skills transfer and to benefit from international experience.

7.4 Awareness Raising, Capacity Building and Education

Goal

To raise awareness of the benefits and opportunities of renewable energy

Objectives

- To promote knowledge of renewable energy and energy efficiency and thereby to increase their use.
- To promote and stimulate the renewable energy market through the dissemination of information regarding renewable energy technologies and their applications.
- To persuade the appropriate Government and Government funded institutions to implement training and education programmes with regard to renewable energy.
- To actively involve women in decision-making and planning and promote empowerment in renewable energy programmes or activities.
- To improve communication and interaction between national, provincial and local Government institutions on renewable energy policies.

Deliverables

- Establish Integrated Energy Centres in collaboration with key stakeholders.
- Standards for accrediting renewable energy training programmes that are registered by the South African Qualifications Authority.
- Training programmes on renewable energy for stakeholders funded by the Energy Sector Education and Training Authority.
- Awareness raising campaigns aimed at all stakeholders.

8. CROSS CUTTING ISSUES

8.1 Energisation

The DME is spearheading the implementation of the concept of "Energisation" in the rural areas in conjunction with the rural electrification programme in order to address the energy needs of communities in a sustainable and consistent manner. An electrification programme, particularly if it has a strong non-grid component, has to form part of a holistic approach to energy provision, if it is to succeed. Electricity supply through photovoltaics (solar home systems) is (economically) insufficient to cater for thermal energy requirements of households, while experience shows that even if grid-electricity is supplied the energy intensive thermal requirements are often satisfied through wood fuel and conventional fuels (e.g. paraffin, LPG). In order to provide affordable access and to attract the market and banking sector to service communities with a package of energy services (photovoltaic systems, paraffin, LPG, gelfuel) sustainable, effective and efficient micro-credit schemes and other financial support mechanisms have to be developed and implemented. This will lessen the dependency on fuel wood and contribute to environmental conservation.

8.2 Integrated Energy Centres

Government is setting up Integrated Energy Centres in cooperation with stakeholders. Like the energisation concept, the Government will be seeking to bring energy services to the disadvantaged communities as well as to address health, environmental, economic and other needs.

The integrated energy centres encourage the development of cooperatives, and thereby enhance economic development activities. The energy centres link energy needs with other needs, health, job creation, environment and tourism.

The objectives of the Integrated Energy Centres are to disseminate renewable energy technologies, information regarding renewables, and to educate households to use energy efficiently.

8.3 Gender and Energy

Energy plays an important role in the lives of all people who use different kinds of energy for various purposes. However the disparities in modern energy service provision brought about by lack of access to infrastructure impacts largely on the poor and rural people. Consequently fuel wood is the main energy source used in the rural areas. Women are the main users of fuel wood for meeting household energy needs but also have to bear the burden of collecting wood and water. In some areas the woodlands have been depleted and in others they are under heavy pressure. This means that women have to walk even longer distances.

Conventional energy approaches virtually exclude women's concerns from the current capital-intensive, expert-dominated energy sector. Consequently economic growth has unfortunately been accompanied by severe gender disparities. Globally 70% of people living in poverty are women and in South Africa some 80% of rural households are female-headed. These households typically cook daily with wood, crop residues and untreated coal. While entrepreneurial home-based industries depend on biomass supplies, women spend long hours working in survival activities – cooking, firewood collection, water carrying and food processing. The time spent in these activities represent a high social and economic cost to the family and society and is directly related to the low level of energy services that are available to people living in poverty, where access to affordable, safe and sustainable fuels is limited. Such chores could be avoided by providing access to alternative fuels or to efficient stoves. These would also mitigate the indoor air pollution associated with the use of firewood and dung, which is the cause of acute respiratory illness responsible for infant mortality and lifelong debilitation. The nutritional status of women is also often worsened because of the little food that they eat and the food poisoning which is so endemic in rural areas with lack of access to clean drinking water. Women's role in environmental issues and sustainable

development is an accepted fact. What is less well-known is that these roles are closely linked to the use, supply and management of energy resources. Strengthening the role of energy in sustainable development will require paying attention to the special role of women and specific attention to women's participation in energy activities. This can only be done by recognising the relationship between women's needs, roles and concerns and the energy system.

Sustainable energy development and, in particular renewable energy, has a significant, positive impact for women in terms of labor, health, income generation and quality of life. But these can only be realized when women's concerns and needs are properly reflected in energy policy-making and there is more emphasis on demand and end-users. This will lead to:

- Recognition of women's non-market labor time as human energy and to the relief of this burden as an objective of energy policy;
- Involvement of women in policy formulation and planning of biomass and modern household fuels, renewable energy, efficiency improvements on stoves and appliances; and;
- Opportunities for women entrepreneurs in renewable energy and energy efficient enterprises.

The gender division of labor traditionally leaves women out of the decision making arena. It is in this light that this policy places emphasis on the following:

- Meaningful participation of women in issues that effect them;
- Involvement in decision making regarding energy matters;
- Assisting women to develop entrepreneurial skills through productive uses of renewable energy technologies.

Among the energy sector stakeholders women are poorly represented and this calls for training and skill development among women. Career guidance should be offered at schools to encourage more young women and men to acquire appropriate skills.

8.4 Trade and International Co-operation

The SADC Trade Protocol is one of the cornerstones of the SADC regional integration process. It envisages the creation of a Free Trade Area within eight years of entry into force. (DFA, 2001). This has implications for those renewable energy technologies that South African industry specialises in. At present such technologies include photovoltaic systems, solar water heaters, small wind turbines and so on. The photovoltaic systems also include 'balance of systems' - inverters, regulators and batteries. Biomass conversion technologies, from fuel-efficient woodstoves, biogas digesters up to bagasse and wood pulp power plants are all produced locally and have export potential. In the short term solar cookers also may be mass-produced locally and have an export market in Africa.

In the medium term full scale wind turbines could be produced (as in India, which has the fourth largest power generation from wind, where 14 manufacturers export their products to Asia and Africa). For remote areas an industry in hybrid systems and micro-hydro for either stand-alone applications or mini-grids merely waits to be developed.

In the long term solar thermal power plants and turbines could be produced locally if the results from the first demonstration plant runs successfully in 2003.

It is envisaged with the New Partnership for African Development (NEPAD) which was recently launched, that the African Continent will harness its natural resources and share information and technologies regarding renewable energy.

9. GOVERNANCE AND PARTNERSHIPS

The Constitution requires that the legislative and executive authority of different spheres of Government operate within a framework of cooperative governance.

The Department of Minerals and Energy will take overall responsibility for renewable energy policy coordination in South Africa.

The Department will work with the relevant Government Departments to establish the appropriate enabling environment to ensure that activities undertaken by other stakeholders are coordinated, uniform and effective. Furthermore, the Department intends to facilitate the implementation of this policy in cooperation with other key national departments including the Departments of Environmental Affairs and Tourism, Finance, Trade and Industry, Housing, Provincial and Local Government, and Water Affairs and Forestry.

An underlying principle in allocating governance functions is the devolution of responsibility to the most appropriate sphere of Government. Where the allocated sphere of Government does not have the resources or capability, the next higher sphere of Government will execute the function, where possible.

Department of Minerals and Energy: The Department will carry out the following functions within its jurisdiction and budgetary constraints related to renewable energy:

- Development of policy, strategy, action plans, legislation and enforcement
- Coordination
- Dissemination of information
- Monitoring, auditing and review
- Capacity building.

National Electricity Regulator: All electricity utilities are subject to regulation by the National Electricity Regulator (NER). Furthermore, the NER advises the Minister of Minerals and Energy on any matter relating to the electricity supply industry. The NER will undertake the following functions related to renewable energy:

- Regulate electricity market access through licensing of all producers (greater than 5 giga watt hours/annum), transmitters, distributors and sellers of electricity.
- Regulate the prices at which power is purchased from generators, both Eskom and the Independent Power Producers.
- Approve electricity tariffs
- Regulate quality of supply and mediate disputes and customer complaints.

Central Energy Fund: In terms of the Central Energy (CEF) Fund Act (1977), (CEF) is mandated to engage in the acquisition, exploitation, generation, manufacture, marketing and distribution of energy and to engage in research relating to the energy sector. The key focus area of the CEF is aimed at contributing to the development of South Africa's energy sector by contributing to the universal access to energy, including the increased use of renewable energy. The CEF also renders operational support to the energy sector in the form of treasury services, including the raising of funds both locally and internationally. Mechanisms will be investigated to extend the operational support available from the Central Energy Fund to renewable energy programmes.

Partnerships: The Department of Minerals and Energy will promote a partnership approach and an integrated focus for national renewable energy initiatives. Key stakeholders in these partnerships will include: the renewable energy industry, industry in general, electricity utilities, independent power producers, provincial Governments and local Governments, state owned enterprises and institutions, communities, non-Governmental organisations and consumer forums.

10. THE WAY FORWARD

This Draft White Paper on Renewable Energy is issued for public comment. After consideration of comments received, it will be revised and submitted to Cabinet for final approval and public launching by the Minister of Minerals and Energy.

Following its approval, a Strategy on Renewable Energy will be developed, which will translate the goals, objectives and deliverables set out herein into a practical implementation plan.

Government will use a phased, managed and partnership approach to renewable energy projects that are well developed and have a satisfactory return on investment. This will lessen the strain on fiscal resources and hold greater potential for successful implementation. Furthermore, Government will monitor international technological developments in renewable energy with a view to identifying technologies appropriate to the South African situation. These technologies will be considered for local implementation once they become commercially viable and are proven beneficial in meeting Government's objectives.

11. REFERENCES

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12. APPENDIX 1

Glossary

Anthropogenic - generated by human activity.

Applications/Configurations – the renewable energy electricity supply options employed can be;

- Connected to the main grid,
- Connected to a mini-grid, or
- Used for stand alone systems (non-grid). Some stand alone configurations provide services on the same level as grid services,
- Configurations substituting electricity are especially relevant for heat purposes in industry and households.

CDM - Clean Development Mechanism.

Civil Society - all members and sectors of society outside Government.

Environmental sustainability - the ability of an activity to continue indefinitely at current and projected levels, without depleting the social, cultural and natural resources required to meet present and future needs.

Externalities - impacts on the environment, carrying costs that are not included in the market price for the service or goods produced. In reality it is difficult to measure economic prices/costs and often not all impacts are included.

Financial costs/prices - costs and prices showing at the market.

GHG - Greenhouse gases. These are the gases in the earth's lower atmosphere that trap heat, thus causing an increase in the earth's temperature and leading towards the phenomenon of global warming.

Independent power producers *(IPPs)* – producers of power (electricity), who sell the power to electricity distributors for supplying the national grid. The sale is normally fixed at terms set by the owner of the transmission network in compliance with the legal and financial regime

Renewable energy sources - sun, wind, biomass, water (hydro), waves, tides, geothermal, and any other natural phenomena which are cyclical and non-depletable.

Renewable technology - the technology that converts a primary source or resource to the desired form of energy service.

toe (ton of oil equivalent). An energy unit against which other energy units, e.g. GWh etc are compared

GWh (Giga Watt hours) An energy unit in which electricity consumption is measured

GWh = 3600 GJ (J = Joule, unit of energy)

toe = 42 GJ = 0.042 TJ = 0.012 GWh