DEPARTMENT OF MINERALS AND ENERGY

JULY 2007

NUCLEAR ENERGY POLICY AND STRATEGY FOR THE REPUBLIC OF SOUTH AFRICA

DRAFT FOR PUBLIC COMMENT

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PURPOSE OF THE DOCUMENT

This document presents a policy framework within which prospecting, mining of the radioactive ores as well as the development and utilisation of nuclear energy for peaceful purposes in South Africa shall take place.

VISION

Industrial and technological leadership to secure alternative energy resources for the future through the development of a globally competitive infrastructure for the peaceful utilisation of Nuclear Energy and Technology.

SCOPE

The document covers the prospecting and mining of uranium ore as well as the nuclear fuel cycle in its entirety focusing on all applications of nuclear technology for energy generation.

This policy does not cover non-energy related applications of nuclear technology.

MINISTERIAL FOREWORD

This policy document represents South Africa's vision for the development of an extensive nuclear energy programme by ensuring that Government's objective on the prospecting and mining of uranium ore and the use of uranium ore as a primary resource of energy must be regulated and managed in a manner that will be for peaceful purposes. In the long term the goal is to be self-sufficient in aspects of the nuclear fuel cycle. As a point of departure, South Africa has more than 20 years experience of safe nuclear power plant operation and experience in research, development and use of nuclear related technology.

South Africa's Koeberg Nuclear Power station which delivers electricity for the Western Cape has accorded our country the opportunity of acquiring a wide spectrum of skills in plant operation, radiological and environmental protection and radioactive waste management amongst others. These skills will be very important in ensuring safe and sustainable use of an extended nuclear energy programme for the benefit of the country. In this extended programme NECSA will play a vital role as the state's body responsible for research and development in the field of nuclear energy. It will also be important to retain and develop specialist scientists to ensure success of the programmes.

This document clarifies the main objectives and lays down the principles that will guide Government's vision for an extended nuclear energy programme. Above all, the principles of safety and peaceful uses must be highlighted. From a strategic perspective it will be necessary to implement new structures and mechanisms in order to ensure successful implementation of this Policy and strategy. The envisaged Strategic Actions are major challenges but these are not insurmountable. This is a very ambitious undertaking but I am confident that with the contribution of the South African collective the vision is surely within reach.

Ms B. Sonjica

A. NUCLEAR ENERGY POLICY FRAMEWORK

1. Introduction

This Policy and Strategy serves as an embodiment of the South African Government's commitment to the development of the nuclear energy sector in a coordinated manner. It presents the Government's vision for nuclear energy and proposes a framework within which this vision can be attained. The current involvement and activities in the nuclear energy sector both upstream and downstream are outlined. The long term vision of becoming globally competitive in the use of innovative technology for the design, manufacture and deployment of state of the art nuclear energy systems and power reactors and the nuclear fuel cycle is presented.

This vision is premised on article IV of the Treaty on the Non-proliferation of nuclear weapons (NPT) which affirms South Africa's inalienable right to research, develop, produce and use nuclear energy for peaceful purposes.

South Africa has a track record of safe nuclear power plant operation and maintenance, as well as world class research capabilities and development experience and use of nuclear power technology.

2. Background

South Africa has an energy intensive economy mainly as a consequence of the exploitation of the country's mineral resources. Coal accounts for over 90% of the total electricity generating capacity. This is mainly due to the abundant coal deposits in the country which are unfortunately far from, for example Cape Town, a major electricity load centre. Economic considerations resulted in South Africa's building its only nuclear power station in the Western Cape during the 1980's in order to ameliorate situation. Although at present nuclear power accounts for only ~6% of electricity generated in the country, it is very important in an area where there are no coal reserves. Concerns over increases in the price of coal and global warming, partly as a

result of greenhouse gas emissions and other atmospheric pollutants, necessitate a need to diversify from the over-reliance on electricity generated from coal.

The prospecting, exploration and mining of minerals are regulated by the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) (MPRDA). The MPRDA sets out the regulatory requirements essential for the granting or refusal of prospecting or mining rights. However, due to the sensitive nature of uranium, Government identified a need to formulate a policy that will specifically cater for the prospecting, mining and beneficiation of uranium ore. As far the prospecting or mining of uranium is concerned the Department of Minerals and Energy will issue the right on condition that the applicants acquire a certificate of registration from the National Nuclear Regulator (NNR) before they could start with the mining activities. The reason behind this requirement is to guarantee compliance with the set radiation safety standards which are being regulated by the NNR.

The White Paper on Energy Policy calls for the achievement of energy security through the diversification of primary energy sources. Further, South Africa's electricity generation capacity has to be increased significantly in the next few decades to facilitate economic growth and social progress, while remaining sensitive to climate change. This presents an opportunity to promote diversity in primary energy sources, considering that the use of nuclear energy is increasingly being recognised worldwide as one of the strategies to mitigate greenhouse gas emissions and global warming, since it is an important carbon-free source of power.

South Africa also possesses sizeable uranium reserves and has an extensive uranium mining industry, making the country one of the important producers of uranium in the world. The presence of this primary energy source in South Africa is a key element of security of energy supply nationally.

The only economically viable alternative to coal as base load generation on a large scale is therefore nuclear energy. Nuclear Energy is attractive for a number of reasons amongst which are the following

- South Africa has sizeable uranium reserves and a vibrant mining industry.
- The extraction of uranium ore does not present any major challenges .
- Value addition in the form of beneficiation of uranium ore and the implementation of a strong nuclear energy programme would lead to job creation and the development of skilled workforce.
- A solid regulatory framework, which would facilitate a structured development of the nuclear sector, already exists in South Africa.
- South Africa has good non-proliferation policy credentials and as such pursuit of a peaceful nuclear energy programme can be done within national and international nuclear non proliferation obligations.

3. International Situation

It is universally accepted that energy and access to it is essential for human development. Equally the continued health of the planet's environment is of concern to many Governments including the South African Government. There is consensus on the need to diversify energy sources and improving energy efficiency, while reducing greenhouse gas emissions. As a result there is a resurgence of electricity generation through the use of nuclear energy. Climate change and pressures on greenhouse gas emissions have resulted in many countries seriously considering the nuclear energy option for electricity generation. This is because nuclear energy's contribution to greenhouse gases is negligible compared to fossil fuels. Direction in terms of suppliers, operation and maintenance will become increasingly biased towards this technology. South Africa has to be prepared to respond appropriately.

4. Nuclear Energy Policy Objectives

Through this Policy Government aims to achieve the following objectives:

- Promotion of nuclear energy as a important electricity supply option;
- Creation of a framework for safe and secure utilisation of nuclear energy;
- Contribution to the country's national program of social and economic transformation, growth and development;
- Encourage the participation of Public entities such as the South African Nuclear Energy Corporation (Necsa) in the uranium value chain. Such public entities shall be used to store the secured uranium supplies, as well as participate in the local beneficiation thereof;
- To guide in the actions to develop, promote, support, enhance, sustain, and monitor the nuclear energy sector in South Africa;
- Attainment of global leadership and self-sufficiency in the nuclear energy sector in the long term;
- Exercise control over un-processed uranium ore for export purposes for the benefits of the South African economy.
- Improvement of the quality of human life and to support the advancement of science and technology;

5. Existing Nuclear Governance Framework

The Minister of Minerals and Energy is the responsible line Minister for the governance of the nuclear industry and related matters. Apart from the

Minister's authority over radioactive waste and irradiated nuclear fuel, the Minister also regulates matters regarding nuclear non-proliferation.

5.1 White Paper on Energy Policy (1998)

Nuclear energy policy is guided by the White Paper on Energy Policy as approved by Government at the end of 1998, where it was retained as one of the policy options for power generation. As part of national policy government also encouraged a diversity of both supply sources and primary energy carriers. In terms of the White Paper Government will investigate the long-term contribution nuclear power can make to the country's energy economy and, secondly, how the existing nuclear industrial infrastructure can be optimised. This nuclear energy Policy and strategy outlines the vision envisaged in the White paper. Some of the main policy objectives relate to decisions regarding possible new nuclear power stations, the management of radioactive waste, safety monitoring of the nuclear industry, effectiveness and adequacy of regulatory oversight, and a review of bodies associated with the nuclear industry.

5.2 Nuclear Energy Act, 1999 (Act No.46 of 1999)

The Nuclear Energy Act provides for the following:

- Establishment of the South African Nuclear Energy Corporation wholly owned by the State with its main function being to undertake and promote research and development in the field of nuclear energy and radiation science and technology
- Ministerial responsibility for the implementation and application of the Safeguards Agreement and any additional protocols entered into by the Republic and the International Atomic Energy Agency (IAEA) in support of the Nuclear Non-Proliferation Treaty
- Ministerial authority to regulate the acquisition and possession of nuclear material and related equipment in order to comply with the international obligations of the Republic.

- Ministerial authority to prescribe measures regarding the discarding of radioactive waste and the storage of irradiated nuclear fuel.

5.3 National Nuclear Regulator Act, 1999 (Act No. 47 of 1999)

This Act establishes the National Nuclear Regulator. The main object of the Regulator is to provide for the protection of persons, property and environment against nuclear damage through the establishment of safety standards and regulatory practices.

5.4 Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005)

This document establishes a national radioactive waste policy framework setting out the principles for management. It further provides for the necessary management structures for radioactive waste management.

5.5 Secondary Governance Instruments

Other secondary relevant governance instruments are the Hazardous Substances Act, 1973 (Act No. 15 of 1973), the Mine Health & Safety Act (Act No. 29 of 1996), the Mineral and Petroleum Resources Development Act, (Act No. 28 of 2002), the National Environmental Management Act (Act No. 107 of 1998) and the National Water Act (Act No. 36 of 1998), as well as the Electricity Regulation Act, 2006 (Act No. 4 of 2006)

6. Current Profile of the South African Nuclear Energy Programme

6.1 Uranium exploration and mining

South African private sector companies currently mine and export uranium ore without appreciable levels of beneficiation. Due to a high price increase there has been increased interest in the exploration and mining of uranium ore, however without any appreciable increase in the beneficiation of uranium ore concentrates.

6.2 South African Nuclear Energy Corporation

The South African Nuclear Energy Corporation, Limited (NECSA) was established as a public company in terms of the Nuclear Energy Act, 1999 (Act No. 46 of 1999) and is wholly owned by the State. Apart from several ancillary functions, the main functions of NECSA are to undertake and promote research and development in the field of nuclear energy and radiation sciences and technology; to process source material, special nuclear material and restricted material and to co-operate with persons in matters falling within these functions. Apart from its main operations at Pelindaba, including the SAFARI research reactor, NECSA also operates the Vaalputs low & intermediate radioactive waste disposal facility. South Africa's main technical expertise on nuclear technology is at Necsa, including expertise on uranium conversion and enrichment remaining from South Africa's previous strategic nuclear programme.

6.3 Eskom Holdings Limited (Owner and Operator of Koeberg Nuclear Power Station)

Eskom is the owner of the Koeberg Nuclear Power Station. Construction of Koeberg's two reactors commenced in 1976 under a turn-key contract and they have operated safely in the more than 20

years since their commissioning in 1984 and 1985 respectively. Koeberg supplies 1800MWe to the national grid when both reactors are operating at full power contributing ~6% of South Africa's electricity. With most of South Africa's electricity generating stations situated on the highveld coal fields, Koeberg provides a necessary anchor for the electricity transmission network. South Africa's expertise with respect to the management, operation and maintenance of nuclear power plants resides in Eskom.

6.4 Pebble Bed Modular Reactor

The PBMR Company is developing a demonstration high temperature gas cooled reactor. The latest PBMR design is currently the only one that meets most of the Generation IV requirements.

6.5 National Nuclear Regulator

The National Nuclear Regulator (NNR) was established in terms of the National Nuclear Regulator Act, 1999 (Act No. 47 of 1999). Apart from its several objectives, the main objectives of the NNR are to provide for safety standards and regulatory practices for protection of persons, property and the environment from nuclear damage; to exercise regulatory control related to safety over the siting, design, construction, operation, manufacture of component parts, decontamination, decommissioning and closure of nuclear installations; and to exercise regulatory control over vessels propelled by nuclear power or having radioactive material on board which is capable of causing nuclear damage. The NNR is also the national competent authority in connection with the International Atomic Energy Agency's Regulations for the Safe Transport of Radioactive Material.

7. Policy principles for Nuclear Energy use in South Africa

The Government's vision for nuclear energy shall be guided by the following principles:

P1. Nuclear Energy shall be used as part of South Africa's ***diversification*** *of primary energy sources to ensure security of energy supply.*

P2. *Nuclear Energy programme shall contribute to* ***economic growth*** *and* ***technology development*** *in South Africa through investment in infrastructure, creation of jobs and development of skilled workers.*

P3. Nuclear Energy shall form part of South Africa's strategy to ***mitigate climate change*** *and global warming.*

P4. All activities undertaken in pursuit of nuclear energy shall be in a manner that ***mitigates their impact on the environment****.*

P5. All Nuclear energy sector activities shall take place within a ***legal regulatory framework consistent with international best practice.***

P6. Nuclear energy shall be used only for ***peaceful purposes*** *and in conformity with national and international legal obligations.*

P7. In pursuing a national nuclear energy programme there shall be ***full commitment to ensure that nuclear and radiation safety*** *receives the highest priority.*

P8. South Africa shall endeavour to ***use uranium resources in a sustainable manner****. To the extent possible technologies chosen for Nuclear Power plant shall be those that allow for maximum utilisation of uranium resources including the use of recycled uranium.*

P9. Government shall encourage the ***development of appropriate institutional arrangements*** *to ensure the development of human resources competent to discharge the responsibility of managing a nuclear infrastructure.*

P10. South Africa shall strive to acquire technology know-how and skills to enable design, development, construction and marketing of its own nuclear reactor and fuel cycle systems. To this end an ***industrial support base*** *for the nuclear sector shall be developed as appropriate, taking into account the scale of the national programmes.* ***Technology transfer*** *shall be optimised in any procurement of nuclear and related equipment.*

P11. All facets of the nuclear energy sector shall always be subjected to ***appropriate safeguards and security measures****.*

P12. Government shall ***support research, development and innovation*** *in the use of nuclear technology. Government shall also support participation in global nuclear energy technology innovation programmes..*

P13. Government shall put in place effective ***mechanisms to protect and safeguard the South African nuclear energy industry Intellectual Property rights and innovative technology designs****.*

P14.Government shall create programs to stimulate public awareness and inform the public about the nuclear energy program.

P15. Government will ensure that adequate funding will be made available to support the technology development initiatives that are essential to the implementation of this policy. In addition, where appropriate, price support mechanisms can be implemented to enable the ongoing operations of key technologies.

8. Responsibilities:

8.1 Government shall be responsible for:

Overall Policy Making
Establishing and implementing a legal framework

Establishing the required Operational and Regulatory Bodies
Ensuring Cooperative Governance
Ensuring National Coordination of Nuclear Activities
Fulfilling Obligations in terms of international agreements
Ensuring adequate national competence and capacity
Ensuring Implementation of this Policy
Approval of Investment plans of State Owned Enterprises in terms of achieving the goals of this policy
Facilitate foreign engagements on nuclear issues

Where necessary amendments to existing legislation will be made to ensure alignment with the Policy Objectives.

8.2 Regulatory Bodies

Regulatory bodies shall be responsible for the efficient, modern and cost-effective enforcement of compliance with legal requirements and internationally benchmarked regulatory requirements as well as provide advice to Government as appropriate.

8.3 Operators/Investors

Operators shall be responsible for fulfilling all regulatory requirements and for ensuring that decisions are taken within the confines of this Policy and any applicable legislation.

9. International Cooperation

Nuclear activities take place within an internationally accepted framework in the Treaty on the Non-proliferation of Nuclear Weapons (NPT). National Obligations in this regard include a Comprehensive Safeguards Agreement with the International Atomic Energy Agency (IAEA). South Africa shall continue to fulfil all its multilateral obligations as embodied in the NPT and all its legally binding instruments.

When planning and promoting research, development and utilisation of nuclear energy, Government will effectively use International cooperation and collaborative work as much as possible within the constraint of protecting intellectual property in national programme with commercial objectives.

10. Bilateral Cooperation

South Africa shall pursue bilateral cooperation with those states that have similar nuclear programmes or which have nuclear programmes from which South Africa requires technology transfer with due regard to the framework of the NPT and national legislation.

11. Multilateral cooperation

South Africa shall pursue multilateral cooperation on nuclear energy in terms of the national policy on multilateral institutions taking into account international obligations arising from treaties and other legally binding instruments. The Government recognises the International Atomic Energy Agency (IAEA) as the leading multilateral institution for ensuring peaceful uses of nuclear energy.

B. NUCLEAR ENERGY STRATEGIC FRAMEWORK

12. Institutional Arrangements

The following institutional arrangements are considered necessary for the implementation of this policy:

- Executive national coordination.
- An organisation for R&D and Innovation coordination.
- An organisation for power generation
- A single national nuclear safety regulator.
- A national nuclear security agency.
- A national nuclear architectural capability.
- A national radioactive waste management agency.

However, with the implementation of this policy, and as the industry develops, it may be appropriate to adjust these institutional arrangements accordingly.

12.1 National Nuclear Energy Executive Coordination Committee

The strategic and multi-faceted nature of nuclear fuel cycle activities necessitate the formation of a coordination committee at Executive (Cabinet) level, which will ensure coordination of actions and alignment of all actions with national policies and legislation.

A National Nuclear Energy Executive Coordination Committee, which shall ensure implementation and exercise oversight over all aspects of this nuclear energy policy implementation shall be formed, appropriately structured and funded.

12.2 National Nuclear Research, Development and Innovation

Government shall maintain one national organisation for the coordination of nuclear energy research, development and innovation in South Africa and perform these functions within the provisions of the Nuclear Energy

Act (Act 46 of 1999) as amended. One of the functions of the national organisation will be to stimulate nuclear related research in universities and at private laboratories.

Government shall enhance the role of Necsa as the anchor for the coordination of all nuclear energy research, development and innovation in South Africa.

12.3 National Nuclear Power Generation Organisation

It is necessary to create certainty in the nuclear energy sector so that there is no doubt as to who is mandated to fulfil certain roles in particular operation of nuclear power plants.

Eskom shall be the main operator of nuclear power plants in South Africa. Ownership of nuclear power plants may also take the form of Public Private Partnerships with Eskom retaining the controlling shareholding as the Public sector player.

12.4 Integrated National Nuclear Safety Regulator

International best practice in nuclear regulation consolidates environmental, design, construction, operations, decommissioning and decontamination processes.

Given the scale of the intended nuclear program, and the need for regulatory efficiency, government shall centralise all these regulatory functions in a single nuclear and radiation safety statutory agency.

12.5 National Nuclear Security Agency

There shall be an amalgamation of existing national nuclear security responsibilities into a single agency responsible for establishing and enforcing regulations and best practice for all nuclear security issues to achieve consistency of national nuclear security efforts. This function would have to be integrated with the regulatory activities for nuclear energy.

12.6 National Nuclear Architectural Capability

To fulfil Government's intent of developing a national supplier of nuclear equipment and nuclear reactors, a national nuclear architectural capability will be established. This will include the ability to design, manufacture, market, commercialise, sell and export nuclear energy systems.

12.7 National Radioactive Waste Management Agency

In terms of the Radioactive Waste Management Policy and Strategy, the NRWMA shall be responsible for the Management of radioactive waste disposal on a national basis.

13. Strategic Actions on the Nuclear Fuel Cycle

In order to implement a sustainable nuclear programme and obtain all the potential economic benefits South Africa shall endeavour to implement, or obtain interests in, ***the complete nuclear fuel cycle*** *as follows:*

13.1 Uranium Mining and Milling

Although South Africa is 5th in terms of uranium resources in the world, the country ranked 11th in terms of production in 2005. This is mainly due to existing infrastructure for concentration of ores as well as a lag between response to the increased uranium price and renewed investment in uranium exploration and mining. There has been an upsurge in uranium exploration and there is now a need to increase capacity of uranium ore processing (calcining).

Government shall ensure that the balance between the immediate exploitation of our mineral resources and the securing of a long term supply of these resources always guarantees security of supply. In addition, government shall actively promote investment in uranium exploration and mining, and in very specific instances shall make investments in these industries, as a way of ensuring security of nuclear fuel supply for South Africa.

13.2 Uranium Conversion

In order to achieve the vision of this policy, South Africa will need to invest in world class conversion facilities.

Government, through Necsa, shall undertake and lead the development of uranium conversion capabilities as part of the beneficiation of uranium. Private sector participation in the conversion process will be promoted.

13.3 Uranium Enrichment

There is no uranium enrichment infrastructure or technological capabilities in South Africa. Government's strategic intent is to develop national capacity in uranium enrichment as part of uranium beneficiation.

Government, through Necsa, shall investigate the viability of developing its own uranium enrichment capabilities and will simultaneously actively seek to acquire established uranium enrichment technologies to ensure security of supply.

13.4 Fuel Fabrication

The South African facility for nuclear fuel fabrication for light water reactors was shutdown in the 1990s and dismantled. PBMR is in the process of establishing a pebble fuel manufacturing facility at Pelindaba. It is recognised there is currently sufficient capacity and diversity of nuclear fuel supply globally for conventional nuclear reactors. However, as part of uranium beneficiation and the strategic intent of building a globally competitive nuclear fuel cycle industry and securing the supply chain, South Africa will have to develop a plan for development of fuel fabrication capacity.

Government, through Necsa shall design a strategy to develop nuclear fuel fabrication capabilities and will in the intervening period actively seek to obtain established fuel fabrication technologies to ensure security of supply.

13.5 Spent (used) nuclear fuel and Radioactive waste management

In 2005 Government approved the Radioactive Waste Management Policy and Strategy for South Africa. The strategy talks to management of radioactive waste on a national scale. Legislation giving effect to the policy is being developed.

Radioactive Waste including used nuclear fuel shall be managed in terms of the radioactive waste management policy and strategy.

13.6 Reprocessing of used (spent) fuel and recycling of fissile materials

In order to fully implement the principles of the radioactive waste management policy and meet the objective of sustainability the reprocessing of used nuclear fuel and recycling of fissile materials for re-use will have to be considered.

Government, through Necsa, shall investigate the viability of building an indigenous reprocessing facility. In the short-term South Africa shall make use of existing commercial reprocessing facilities in other countries.

13.7 Implementation Considerations

In investigating the feasibility of expanding South Africa's nuclear energy programme and in implementing any phases of the nuclear fuel cycle government will consider and clarify the responsibilities of all role players and identify the challenges involved. Timeframes will be allocated to the completion of all activities and be monitored by the executive coordination committee.

14. Nuclear Reactor Construction and Operation

South Africa has a declared intention to pursue a Pressurised Water Reactor (PWR) Program and a nationally developed Pebble Bed Modular Reactor Program. Government, through Eskom, is taking the lead in respect of the extensive PWR program to substantially diversify the generation base and reduce overall carbon emissions. Government, through the PBMR Company, is focused on the electricity and nuclear heat applications of Pebble Bed technology.

Government's intention is to use the opportunity created by these programs to establish a modern nuclear technology industry including fabrication, manufacture, construction and services. In particular,

where viable, the conventional nuclear build program must be associated with technology transfer, an investment program and the building of institutional capacity to establish a national industrial capability for the design, manufacture and construction of nuclear energy systems.

In order to systematically proceed towards meeting the national strategic intent on nuclear energy a phased approach will have to be adopted. These phases are outlined below:

Phase 1 2007 – 2010

1. Maintain and enhance current national nuclear infrastructure
2. Conduct preparatory work for expansion of the nuclear infrastructure across the nuclear fuel cycle including preparations for the construction of nuclear power plants
3. Continue research into advanced nuclear energy systems
4. Accelerate skills development initiatives in line with expected expansion including increased capacity at institutions of higher learning.
5. Promote uranium exploration and mining

Phase 2 2011 – 2015

1. Construction of new nuclear infrastructure including nuclear power plants
2. Continued maintenance of existing nuclear infrastructure
3. Demonstration of advanced nuclear energy systems
4. Initiate localisation of nuclear equipment and component manufacturing – construction of heavy machinery infrastructure
5. Build capacity for nuclear technology transfer

Phase 3 2016- 2025

1. Operation of new power plants
2. Maintenance of existing nuclear infrastructure
3. Local manufacturing of nuclear equipment and components
4. Commercialisation of advanced nuclear energy systems
5. Accelerate research into further advanced nuclear energy systems

15. Cross Cutting Issues

15.1 Security of Uranium Supply

The growing demand for energy in South Africa will necessitate that the export of unprocessed uranium ore be restricted. A minimum level of uranium ore concentrates shall always be safely secured in order to ensure that local utilities have adequate and reliable supply of ore for the nuclear power stations.

Due to the anticipated level of local demand for uranium, the granting of uranium mining rights will have to be made conditional to production being availed for domestic use as and when the need arises, at the prevailing market prices. Government shall ensure that the granting of uranium mining rights provide sufficient guarantees of enough resources remaining in reserve for future allocation, to cater for local demand.

15.2 Security of Energy Supply

The operation of a nuclear power plant requires fuel which is currently and for the foreseeable future being provided by uranium. South Africa therefore has to ensure reliable and sustainable supply of uranium. The country has abundant uranium resources and as such can provide for the needs of its nuclear programme.

A nuclear fuel supply strategy will have to be developed which will maximise the use of South African mineral resources.

15.3 Employment

The vision of Government for the nuclear sector can contribute significantly to the country's social and economic development through amongst others the creation and maintenance of jobs. Uranium mining alone is conservatively expected to create and sustain at least 10000 additional jobs in the next decade.

Activities in the sector shall therefore be undertaken in a manner that seeks to maximise job creation while maintaining the necessary efficiency and safety.

15.4 Economic Development

The demand for uranium in the country is growing in the same way as it is globally. Uranium has become one of the world's most important minerals due to its applications. It is used almost entirely for producing electricity though a small proportion is used for the important task of producing medical isotopes. Uranium averages about 2.8 parts per million of the earth's crust. That puts producers in a good position to produce more ore to satisfy the demand.

15.5 Awareness Creation

The use of nuclear energy is generally misunderstood by the public due in-part to lack of appropriate information. For this reason it is important to inform the public about the risks, benefits and safety of nuclear energy.

To this end Government shall initiate and sustain public awareness campaigns, education programs and information dissemination by conducting public seminars and consultative meetings amongst others.

15.6 Human Resource Development

Competent personnel are critical to the success of this programme. Only suitably qualified, skilled persons should be utilised in activities covered in this policy. Consistent with achieving technical excellence, there shall be commitment to workforce diversity in order to increase the representation of women, previously disadvantaged communities and where appropriate people with disabilities.

Government is committed to developing and maintaining a technically competent workforce to accomplish the objectives of this policy. To this end a strategy for development and recruitment of suitable persons will be developed.

15.7 Environmental Protection

In implementing the country's nuclear energy policy existing environmental protection legislation and regulations need to be applied.

15.8 Funding

A number of the initiatives forming part of the strategic framework will require substantial level of funding. The initiatives can be categorised in the following manner:

Institutional: The establishment of the various Entities identified in the policy as well as amalgamation of some existing ones as proposed. Examples are the consolidation of the Nuclear and Radiation safety regulation as well as the establishment of the National Nuclear Architectural capability.

Technological: This includes funding for research, development and innovation as well as enrichment, fuel fabrication as well as waste management (including reprocessing and recycling)

Industrial: the scale to which enrichment, nuclear fuel fabrication, reprocessing or recycling and nuclear power plant roll-out will influence the requirement for a sectoral industrial strategy, and hence the level of funding required.

The most appropriate funding instruments will depend on the relevant category. For instance, levies on production or consumption (i.e. mining or electricity consumption, respectively) for the establishment of the nuclear safety and security agencies and other capital incentives (e.g. for technology demonstration or industrialisation requirements) and equity for the National Nuclear Architectural Capability. The sources of equity in respect of the latter will depend on the ownership structure.

Estimates of the quanta of funding requirements will be required to ascertain the appropriateness of any proposed funding arrangement.

ANNEXURE A

A. Key Role players in the South African Nuclear Energy Sector

A.1 Department of Minerals and Energy (DME)

The DME has overall responsibility for nuclear energy in South Africa. The DME also administers the Nuclear Energy Act and the National Nuclear Regulator Act and discharges government obligations regarding the Comprehensive Safeguards, Non-Proliferation, Zangger Committee, Nuclear Suppliers Group and Nuclear Dual-Use Community.

A.2 Department of Science and Technology (DST)

Administers the PBMR Human Capital Development Research and Innovation Frontier Programme (PHRIFP), which oversees the University Chairs Nuclear Energy Development Program.

A.3 Department of Health (DOH)

Issues licences for Group III and Group IV Hazardous Substances, medical use of radioactive materials, and oversees medical research facilities.

A.4 Department of Trade and Industry (DTI)

Administers the SA Council for Non-Proliferation of Weapons of Mass Destruction. The DTI is also the custodian of the country's industrial policy.

A.5 Department of Public Enterprises (DPE)

Exercises oversight for state-owned enterprises (SOE's): Alexkor, Denel, Eskom, the PBMR, SAA, Transnet and Safcol. The DPE is coordinating the SOE Competitive supplier development Programme, which provides an alternative policy to the National Industrial Participation Programme for achieving the goal of leveraging expenditure on infrastructure investment and local industrial development.

A.6 Nuclear Energy Corporation of South Africa (NECSA)

A wholly-owned state company established by the Nuclear Energy Act of 1999. Commissioned in 1965, it operates the 20MW Safari-1 research reactor, and undertakes research in nuclear technology, radiation sciences, radioisotope production, nuclear liabilities management, as well as decommissioning. It operates the Vaalputs Low-level Waste (LLW) and Intermediate Level Waste (ILW) site and administers the State's institutional obligations in respect of the NPT and international Safeguards. It also hosts the PBMR fuel fabrication plant and the Helium Test Facility (HTF).

A.7 National Nuclear Regulator (NNR)

Oversees safety and regulation of nuclear installations and certain mines, and issues operating licences.

A.8 Eskom Holdings Limited

Eskom owns and operates the Koeberg Nuclear Power Plant.

A.9 iThemba Laboratories

Established in 1977, the research centre consists of site in Faure, Western Cape, as well as another in Gauteng and produces isotopes for medical applications. The centre has sub-atomic particle accelerators including a 200MeV proton accelerator and a 6MV van der Graaff accelerator. Facilities provide for basic and applied research using particle beams, particle radiotherapy for cancer treatment and production of radioisotope for nuclear medicine research medicine research. It is administered by the DST.

A.10 Universities

A few South Africa Universities offer formal training and research in nuclear energy systems. Some have on-site research and testing state-of-the-art facilities in the nuclear energy field.

A.11 National Research Foundation (NRF)

Established in 1999 by an Act of Parliament, this organization allocates grants for post-graduate research. Supports iThemba Labs research through public funding.

A.12 PBMR (Pty) Ltd

Is currently developing the High Temperature Gas Cooled Reactor known as the Pebble Bed Modular Reactor.