GOVERNMENT NOTICE

DEPARTMENT OF MINERALS AND ENERGY

No. 653 **13 June 2008**

Under Section **2 (a) (b) (c) (f)** of the Nuclear Energy Act, 1999 (Act No 46 of 1999). The Minister of Minerals and Energy hereby publishes for comment a draft regulation in schedules on the declaration of certain substances, materials and equipment as restricted material, source material, special nuclear material and nuclear related equipment and material. The regulation intends to repeal the Government Notice No. 740 of 16 April 1994.

All interested parties are invited to comment in writing on the said draft regulation and to direct the comments to: The Director General, Department of Minerals and Energy, Private Bag X59, PRETORIA, 0001, for attention: Ms E Monale: Director: Nuclear Non-Proliferation, Fax No (012) 317 8957 or email:elsie.monale@dme.gov.za.

Comments must reach the Department of Minerals and Energy within 30 days of the date of the publication of this notice.

B P SONJICA
MINISTER OF MINERALS AND ENERGY

DRAFT REGULATION

DEPARTMENT OF MINERALS AND ENERGY

NUCLEAR ENERGY ACT, 1999 (ACT NO. 46 OF 1999)

REGULATION IN TERMS OF SECTION 2 (a) (b) (c) (f) OF THE NUCLEAR ENERGY ACT, 1999 (ACT NO. 46 OF 1999), ON THE DECLARATION OF CERTAIN SUBSTANCES, MATERIALS AND EQUIPMENT AS RESTRICTED MATERIAL, SOURCE MATERIAL, SPECIAL NUCLEAR MATERIAL AND NUCLEAR RELATED EQUIPMENT AND MATERIAL

Under Section **2 (a) (b) (c) (f)** of the Nuclear Energy Act, 1999 (Act No. 46 of 1999), the Minister of Minerals and Energy, by notice in the Gazette hereby declare any substances, materials and equipment as restricted material, source material, special nuclear material and nuclear related equipment and material.

B P SONJICA
MINISTER OF MINERALS AND ENERGY

SCHEDULE

SCHEDULE 1: RESTRICTED MATERIAL

1. Beryllium

Beryllium as follows: Metal, alloys containing more than 50% of beryllium by mass, compounds containing beryllium, and manufactures thereof, except-

(a) metal windows for X-ray machines;

(b) oxide shapes in fabricated or semi-fabricated forms specially designed for electronic component parts or as substrates for electronic circuits.

Technical Note: This control applies to waste and scrap containing beryllium as defined here.

2. Hafnium

Hafnium of the following description: Metal, alloys and compounds of hafnium containing more than 60% hafnium by mass and manufactures thereof.

3. Zirconium

Zirconium as follows: Metal, alloys containing more than 50% zirconium by mass and compounds in which the ration of hafnium content to zirconium content is less than 1 part to 500 parts by mass, and manufactures wholly thereof: except zirconium in the form of foil having a thickness not exceeding 0,10 mm.

Technical Note: This control applies to waste and scrap containing zirconium as defined here.

SCHEDULE 2: SOURCE MATERIAL

Source material

Source material is any substance containing-

(a) uranium, expressed as a conversion to uranium oxide U_3O_8,above-

(i) 0,05% of the mass of the substance; and

(ii) a mass of 3 kilograms; or

(b) thorium, expressed as a conversion to thorium oxide ThO_2, above-

(i) 0,05% of the mass of the substance; and

(ii) a mass of 3 kilograms; or

(c) uranium, depleted in the isotope 235, above 3 kilograms.

SCHEDULE 3: SPECIAL NUCLEAR MATERIAL

Special nuclear material is-

(a) plutonium-239;

(b) uranium-233;

(c) uranium enriched in its uranium-235 isotope;

(d) transuranium elements; or

(e) any compound of any of the materials referred to in subparagraphs (b), (c) and (d) or of anything so referred to and any other substance or substances in a quantity consisting of or containing a mass of any of the isotopes or elements referred to in subparagraphs (b), (c) and (d), above 0,5 gram, regardless of the concentration thereof.

SCHEDULE 4: NUCLEAR RELATED MATERIAL AND EQUIPMENT

CATEGORY A: MATERIAL

1. **Deuterium and heavy water**

Deuterium, heavy water (deuterium oxide) and any other deuterium compound in which the ratio of deuterium to hydrogen atoms exceeds 1 :5 000 for use in a nuclear reactor.

2. **Nuclear grade graphite**

Graphite having a purity level better than 5 parts per million boron equivalent and with a density greater than 1,50 g/cm3.

CATEGORY B: EQUIPMENT

1. Reactors and equipment therefor

(i) Complete nuclear reactor capable of operation so as to maintain a controlled self-sustaining fission chain reaction with a designed maximum rate of production of plutonium not exceeding 100 grams per year.

A nuclear reactor basically includes the items within or attached directly to the reactor vessel, the equipment which controls the level of power in the core, and the components which normally contain or come in direct contact with or control the primary coolant of the reactor core.

(ii) Reactor pressure vessels as complete units or as major shop-fabricated parts which are especially designed or prepared to contain the core of a nuclear reactor referred to in subparagraph (1), and are capable of withstanding the operating pressure of the primary coolant.

(iii) Reactor fuel charging and discharging machines especially designed or prepared for inserting or removing fuel in a nuclear reactor referred to in subparagraph (1), which is capable of on-load operation or employing technically sophisticated positioning or alignment features to allow complex off-load fuelling operations such as those in which direct viewing of or access to the fuel is not normally available.

(iv) Reactor control rods especially designed or prepared rods, support or suspension structures therefore, rod drive mechanism or rod guide tubes for the control of the reaction rate in a nuclear reactor referred to in subparagraph (1).

(v) Reactor pressure tubes which are especially designed or prepared to contain fuel elements and the primary coolant in a reactor referred to in subparagraph (1), at an operating pressure in excess of 5,1 MPa.

(vi) Primary coolant pumps especially designed or prepared for circulating as primary coolant for nuclear reactors referred to in subparagraph (1).

(vii) Zirconium metal and alloys in the form of tubes or assemblies of tubes, especially designed or prepared for use in a reactor referred to in subparagraph (1), and in which the relation of hafnium to zirconium is less than 1 :500 parts by weight.

(viii) Nuclear reactor internals especially designed or prepared for use in a nuclear reactor as defined in paragraph (1) above, including support columns for the core, fuel channels, thermal shields, baffles, core grid plate and diffuser plates.

(ix) Heat exchangers (system generators) especially designed or prepared for use in the primary coolant circuit of a nuclear reactor as defined in paragraph (1) above.

(x) Neutron detection and measuring instruments especially designed or prepared neutron detection and measuring instruments for determining neutron flux levels within the core of a reactor as defined in paragraph (1) above

2. **Plants for the reprocessing of irradiated fuel elements and equipment, especially designed or prepared therefor**

A plant for the reprocessing of irradiated fuel elements includes the equipment and components which normally come in direct contact with and directly control the irradiated fuel and the major nuclear material and fission product processing streams.

(i) Plants for the recovery of fissionable materials from irradiated nuclear materials.

(ii) Irradiated fuel element chopping machines are equipments that breach the cladding of the fuel to expose the irradiated nuclear material to dissolution. They are remotely operated and especially designed or prepared for use in a reprocessing plant and intended to cut, chop or shear irradiated nuclear fuel assemblies, bundles or rods.

(iii) Dissolvers, which are critically safe tanks (e.g. small diameter, annular or slab tanks) especially designed or prepared for use in a reprocessing plant, intended for the dissolution of irradiated nuclear fuel and which are capable of withstanding hot, highly corrosive liquids and which can be remotely loaded and maintained.

(iv) (a) Solvent extractors receive the solution of irradiated fuel from the dissolvers and solvent extraction equipment such as packed or pulse columns, mixer settlers or centrifugal contactors especially designed or prepared for use in a plant for the reprocessing of irradiated fuel.

(b) Solvent extraction equipment -

(i) must be resistant to the corrosive effect of nitric acid; and

(ii) are normally fabricated to extremely high standards (including special welding and inspection and quality assurance and quality control techniques) out of low carbon stainless steels, titanium, zirconium, or other high quality materials.

(v) (a) Chemical holding or storage vessels especially designed or prepared
for use in a plant for the reprocessing of irradiated fuel.

(b) The holding or storage vessels-

(i) must be resistant to the corrosive effect of nitric acid;

(ii) are normally fabricated of materials such as low carbon stainless steels, titanium or zirconium, or other high quality materials; and

(iii) may be designed for remote operation and maintenance and may have the following features for control of nuclear criticality:

(aa) Walls or internal structures with a boron equivalent of at least 2%; or

(bb) a maximum diameter of 175 mm for cylindrical vessels; or

(cc) a maximum width of 75 mm for either a slab or annular vessel.

(vi) Plutonium nitrate to oxide conversion system is a process related to a reprocessing facility, involves fluorination of plutonium oxide, normally with high corrosive hydrogen fluoride, to produce fluoride which is subsequently reduced using high purity calcium to produce metallic plutonium and calcium fluoride slag. The system is especially designed or prepared for the conversion of plutonium nitrate to plutonium oxide, in particular adapted so as to avoid criticality and radiation effects and to minimize toxicity hazards.

(vii) Plutonium oxide to metal production systems especially designed or prepared for the production of plutonium metal, in particular adapted so as to avoid criticality and radiation effects and to minimize toxicity hazards.

3. Plants for the fabrication of fuel elements

A "plant for the fabrication of fuel elements" includes the equipment-

(a) which normally comes in direct contact with or directly processes, or controls, the production flow of nuclear material; or

(b) which seals the nuclear material within the cladding.

4. Plants for the separation of isotopes of uranium and equipment, other than analytical Instruments, especially designed or prepared therefor

(i) Gas centrifuges and assemblies and components especially designed or prepared for use in gas centrifuges, including-

(a) rotating components (ϕ70 mm and 400 mm) such as complete rotor assemblies, rotor tubes, (ϕ75 mm and 400 mm) rings or bellows, baffles (ϕ75 mm and 400 mm) and top and bottom caps (ϕ75 mm and 400 mm);

(b) static components such as magnetic suspension bearings, (permeability (μ), 0,15 H/m) bearings and dampers, molecular pumps (dimensions: 75mm to 400mm internal diameter: 10mm or more wall thickness) and motor stators, (ϕinternal 1-12mm, frequency range 600 – 200Hz) centrifuge housing/recipients, scoops;

(ii) Especially designed or prepared auxiliary systems, equipment and components for gas centrifuge plants, including-

(a) feed systems/product and tails withdrawal systems;

(b) machine header piping systems;

(c) UF_6 mass spectrometers/ion sources; and

(d) frequency changers (600 – 200Hz).

(iii) Especially designed or prepared assemblies and components for use in gaseous diffusion enrichment, including-

(a) gaseous diffusion barriers (pore size 100 –1000Å, thickness 5 mm);
(b) diffusor housings (greater than 300 mm ϕ, greater than 900 mm length);
(c) compressors and gas blowers (present ratio between 2:1 and 6:1);
(d) rotary shaft seals;
(e) heat exchangers for cooling UF_6;and

(iv) Especially designed or prepared auxiliary systems, equipment and components for use in gaseous diffusion enrichment, including-

(a) feed systems/product and tails withdrawal systems(operate pressures of 300 kPa (45psi) or less);
(b) machine header piping systems;
(c) vacuum systems(function capacity 5m3/min (175ft3/min));
(d) special shut-off and control valves (ϕ 40 – 1500 mm);
(e) UF_6 mass spectrometers/ion sources; and
(f) frequency changers.

(v) Especially designed or prepared auxiliary systems, equipment and components for use in gaseous diffusion enrichment, including-

(a) feed systems and product and tails withdrawal systems;
(b) header piping systems;
(c) vacuum systems;
(d) special shut-off and control valves; and
(e) UF_6 mass spectrometers/ion sources.

(vi) Especially designed or prepared systems, equipment and components for use in aerodynamic enrichment plants, including-

(a) separation nozzles;
(b) vortex tubes;
(c) compressors and gas blowers;
(d) rotary shaft seals;
(e) heat exchangers for gas cooling;
(f) separation element housings;
(g) feed systems and product and tails withdrawal systems;

(h) header piping systems;
(i) vacuum systems and pumps;
(j) special shut-off and control valves;
(k) UF_6 mass spectrometers and ion sources; and
(l) UF_6 and carrier gas separation systems.

(vii) **Especially designed or prepared systems, equipment and components for use in chemical exchange or ion exchange enrichment plants, including**

(a) liquid-liquid exchange columns (chemical exchange);
(b) liquid-liquid centrifugal contractors (chemical exchange);
(c) uranium reduction systems and equipment (chemical exchange);
(d) feed preparation systems (chemical exchange);
(e) uranium oxidation systems (chemical exchange);
(f) fast-reacting ion exchange resins and absorbends (ion exchange);
(g) ion exchange columns (ion exchange); and
(h) ion exchange reflux systems (ion exchange).

(viii) **Especially designed or prepared systems, equipment and components for use in laser-based enrichment plants, including-**

(a) uranium vaporization systems (AVLIS – Atomic Vapor Laser Isotope Separation);
(b) liquid uranium metal handling systems (AVLIS);
(c) uranium metal 'product' and 'tails' collector assemblies (AVLIS);
(d) separator module housings (AVLIS);
(e) supersonic expansion nozzles (MLIS – Molecular Laser Isotope Separation);
(f) uranium pentafluoride product collectors (MLIS);
(g) UF_6 with carrier gas compressors (MLIS);
(h) rotary shaft seals (MLIS);
(i) fluorination systems (MLIS);
(j) UF_6 mass spectrometers and ion sources (MLIS);
(k) feed systems and product and tails withdrawal systems (MLIS);
(l) UF_6 and carrier gas separation systems (MLIS); and
(m) laser systems (AVLIS, MLIS and CRISLA (Chemical Reaction by Isotope Selective Laser Activation)).

(ix) **Especially designed or prepared systems, equipment and components for use in plasma separation enrichment plants, including-**

(a) microwave power (frequency >30 GHz, Power > 50 kW) sources and antennae;
(b) ion excitation coils (frequency >100 kHz, Power > 40 kW);
(c) uranium plasma generation systems;
(d) liquid uranium metal handling systems;
(e) uranium metal 'product' and 'tails' collector assemblies; and
(f) separator module housings.

(x) **Especially designed or prepared systems, equipment and components for use in electromagnetic enrichment plants, including-**

(a) electromagnetic isotope separators;
(b) high voltage power supplies; and
(c) magnet power supplies.

5. **Plants for the production of heavy water, deuterium and deuterium compounds and equipment especially designed or prepared therefor**

(i) Water-hydrogen sulphide exchange towers (ϕ 6 m to 9 m).
(ii) Blowers and compressors.
(iii) Ammonia-hydrogen exchange towers.
(iv) Tower internals and stage pumps.
(v) Ammonia crackers.
(vi) Infrared absorption analyzers.
(vii) Catalytic burners.
(viii) Complete heavy water upgrades systems or columns therefore

6. **Plants for the conversion of uranium and plutonium for use in the fabrication of fuel elements and the separation of uranium isotopes and equipment especially designed or prepared therefor**

(i) **Plants for the conversion of uranium and equipment especially designed or prepared therefor**

(a) especially designed or prepared systems for the conversion of uranium ore concentrates to UO_3

(b) especially designed or prepared systems for the conversion of UO_3 to UF_6

(c) especially designed or prepared systems for the conversion of UO_3 to UO_2

(d) especially designed or prepared systems for the conversion of UO_2 to UF_4

(e) especially designed or prepared systems for the conversion of UF_4 to UF_6

(f) especially designed or prepared systems for the conversion of UF_4 to U metal

(g) especially designed or prepared systems for the conversion of UF_6 to UO_2

(h) especially designed or prepared systems for the conversion of UF_6 to UF_4

(i) especially designed or prepared systems for the conversion of UO_2 to UC_{l4}

(ii) **Plants for the conversion of plutonium and equipment especially designed or prepared therefor**

(a) Especially designed or prepared systems for the conversion of plutonium nitrate to oxide

(b) Especially designed or prepared systems for plutonium metal production