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GOVERNMENT OF INDIA
MINISTRY OF COMMERCE AND INDUSTRY
DEPARTMENT OF COMMERCE
DIRECTORATE GENERAL OF FOREIGN TRADE

NOTIFICATION No. 05 /(2015-2020)
NEW DELHI, DATED: 29th April, 2016

Subject: Updation of SCOMET list [Appendix 3 to Schedule 2 of ITC (HS) Classification of Export & Import Items].

S.O. (E) In exercise of powers conferred by Section 5 and Section 14 A of the Foreign Trade (Development & Regulation) Act, 1992 {FT(D&R) Act,1992} as amended, the Central Government hereby makes the following amendments to the list of specified goods, services and technologies, i.e. Special Chemicals, Organisms, Materials, Equipment and Technologies (SCOMET) that was notified vide Notification No.37 (RE-2012) /2009-2014 dated 14th March, 2013 and amended vide Notification No.26 (RE-2013) /2009-2014 dated 3rd July, 2013 and vide Notification No. 116 (RE-2013)/2009-2014 dated 13th March, 2015:

2. Amendments in the SCOMET categories will be as follows:

A. For SCOMET Category 0 and the entries there under, the following shall be substituted as follows:

“Category 0 Nuclear materials, nuclear-related other materials, equipment and technology

Note: Export of these items is regulated under the Atomic Energy Act, 1962 and rules framed, and notifications/orders issued there under from time-to-time by the Department of Atomic Energy. The licensing authority for items in this category is the Department of Atomic Energy. An application for licence to export shall be made in writing to the Joint Secretary (I&M), Department of Atomic Energy, Anushakti Bhavan, CSM Marg, Mumbai 400 001

0A PRESCRIBED SUBSTANCES

Note: Any radioactive material in Category 0A shall additionally attract the provisions of Radiation Protection Rules, 2004 made under the Atomic Energy Act, 1962 and the provisions of Section-16 of the Atomic Energy Act, 1962.

0A1 Source Material

0A101 Uranium containing the mixture of isotopes occurring in nature.

0A102 Uranium depleted in the isotope 235.

0A103 Thorium.

0A104 Any of the materials specified above in 0A101, 0A102, or 0A103 in the form of metal, alloy, chemical compound, or concentrate.

0A105 Any other material containing one or more of the foregoing.

Note 1:

Source material includes uranium and thorium ores or concentrates.

Note 2:

Exports of following items, for the use only in non-nuclear activities, to a given recipient country, within a period of one calendar year, not exceeding the limits specified below, are not controlled:

- | | |
|---|-----------------|
| a. Uranium (containing the mixture of isotopes in nature): | 100 kilograms. |
| b. Depleted uranium (uranium depleted in the isotope 235 below that occurring in nature): | 1000 kilograms. |
| c. Thorium: | 1000 kilograms. |

Note 3: 0A1 does not control following –

- i. Uranium and thorium ores, mineral concentrates or other materials that contain less than 300 parts per million (ppm) of uranium or/and thorium;
- ii. Alloys containing less than 5 % thorium;
- iii. Ceramic products containing thorium, which have been manufactured for non-nuclear use.

0A2 Special Fissionable Material

0A201 Plutonium-239.

0A202 Uranium-233.

0A203 Uranium enriched in the isotopes 235 or 233.

0A204 Neptunium.

0A205 Any material containing one or more of the foregoing.

0A206 Such other fissionable material determined by the Central Government from time to time.

Technical note:

The term “uranium enriched in the isotopes 235 or 233” means uranium containing the isotopes 235 or 233 or both in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is greater than the ratio of the isotope 235 to the isotope 238 occurring in nature.

Note:

1. The term “special fissionable material” does not include source material.
2. Any quantity of special fissionable material is prescribed substance.
3. 0A2 does not control -
 - a. Plutonium with an isotopic concentration of plutonium-238 exceeding 80%, and
 - b. Special fissionable material when used in gram quantities or less as a sensing component in instruments.

0A3 Other Materials

‘Other Materials’ means non-nuclear materials for reactors, nuclear related dual-use materials indicated below and such materials as determined by the Central Government from time to time.

0A301

Deuterium and heavy water

Deuterium, heavy water (deuterium oxide) and any other deuterium compound, in which the ratio of deuterium to hydrogen atoms exceeds 1:5000,

- a. for use in a nuclear reactor in quantities exceeding 5 kilograms of deuterium atoms in one consignment or 25 kilograms of deuterium atoms, for any one recipient country within a period of one calendar year;
- b. for use in a non-nuclear activity in quantities exceeding 200 kilograms of deuterium atoms, for any one recipient country within a period of one calendar year.

0A302

Nuclear grade graphite

Nuclear grade graphite having a purity level better than 5 parts per million (ppm) boron equivalent and with a density greater than 1.5 gram/cc -

- a. for use in a nuclear reactor or any other nuclear activities in quantities exceeding 1 kilogram;
- b. for use in non-nuclear activities in quantities exceeding 30 metric tons for any one recipient country within a period of one calendar year.

Note: The item 0A302 does not cover graphite powder.

0A303

Zirconium with hafnium content of less than 1 part to 500 parts of zirconium by weight (i.e. less than 2000 ppm) in the form of metal, alloys containing more than 50% zirconium by weight, compounds, manufactures thereof, waste or scrap of any of the foregoing.

- 0A304** Beryllium metal, its compounds, alloys containing more than 50% beryllium by weight, manufactures thereof, and waste or scrap of any of the foregoing and its minerals / concentrates including beryl but excluding:
- a. beryllium windows used for x-ray machines or for bore-hole logging devices, and
 - b. beryl in the form of emerald, aquamarine or 'cut & polished' semi-precious stones for use in jewellery.
- 0A305** Lithium enriched in the Lithium-6 (^6Li) isotope to greater than its natural isotopic abundance (i.e. more than 7.5%) and the products or devices containing enriched lithium such as elemental lithium, alloys, compounds, mixtures containing lithium, manufactures thereof, waste or scrap of any of the foregoing.
- 0A306** Niobium and Tantalum, their metals, alloys and minerals including columbite and tantalite.
- 0A307** [Reserved]
- 0A308** Tritium, tritium compounds or mixtures containing tritium in which the ratio of tritium to hydrogen atoms exceeds 1 part in 1000, except when utilized in such quantities and for such purposes as for organic labelled compounds, Gas Filled Light Sources and as Tritiated Water for radiotracer studies.
- 0A309** Hafnium
Hafnium metal, alloys containing more than 60% hafnium by weight, hafnium compounds containing more than 60% hafnium by weight, manufactures thereof, and waste or scrap of any of the foregoing.
- 0A310** Radium-226
Radium-226 (^{226}Ra), radium-226 alloys, radium-226 compounds, mixtures containing radium-226, manufactures thereof, and products or devices containing any of the foregoing, except medical applicators and a product or device containing less than 0.37 GBq (10mCi) of Ra-226 in any form.
- 0A311** Boron
Boron enriched in the Boron-10 (^{10}B) isotope to greater than its natural isotopic abundance as follows:
Elemental boron, compounds, mixtures containing boron, manufactures thereof, waste or scrap of any of the foregoing.
- 0A312** Helium-3
Helium-3 (^3He), mixtures containing helium-3, and products or devices containing any of the foregoing.
Note: A product or device containing less than 1gm of Helium-3 is excluded.

- 0A313** ‘Radionuclides’ appropriate for making neutron sources based on alpha-n reaction, in the following forms:
- Elemental;
 - Compounds having a total activity of 37 GBq per kg or greater;
 - Mixtures having a total activity of 37 GBq per kg or greater;
 - Products or devices containing any of the foregoing.

Radionuclides controlled by this item include:

Actinium-225	Actinium-227	Californium-253
Curium-240	Curium-241	Curium-242
Curium-243	Curium-244	Einsteinium-253
Einsteinium-254	Gadolinium-148	Plutonium-236
Plutonium-238	Polonium-209	Polonium-210
Polonium-208	Radium-223	Thorium-228
Thorium-227	Uranium-230	Uranium-232

0B Prescribed Equipment

- 0B001** Nuclear Reactors; associated equipment, components, and systems especially designed, prepared, or adapted or used or intended to be used in such reactors including but not limited to:-

- Complete nuclear reactors
- Nuclear reactor vessels
- Nuclear reactor fuel charging and discharging machines
- Nuclear reactor control rods and equipment
- Nuclear reactor pressure tubes
- Nuclear fuel cladding: Zirconium metal tubes or zirconium alloy tubes (or assemblies of tubes), in which hafnium to zirconium ratio is 1:500 or less, for use as nuclear fuel cladding
- Primary coolant pumps or circulators
- Nuclear reactor internals
- Heat exchangers (steam generators) for use in the primary or intermediate coolant circuit of a nuclear reactor
- Neutron detectors
- External thermal shields.

- 0B002** Plants for processing, production, concentration, conversion or recovery of Prescribed Substances (such as uranium, plutonium, thorium, deuterium, heavy water, tritium, lithium); associated equipment, components and systems especially designed, prepared or adapted or used or intended to be used in such plants including but not limited to:

- a. Plants for production or concentration of deuterium, heavy water or deuterium compounds-
 1. Water - Hydrogen Sulphide Exchange Towers with diameters of 1.5 m or greater and capable of operating at pressures greater than or equal to 2 MPa (300 psi), especially designed or prepared for heavy water production.
 2. Especially designed or prepared blowers and compressors for hydrogen-sulphide gas circulation. These blowers or compressors have a throughput capacity greater than or equal to 56 m³/second (120,000 SCFM) while operating at pressures greater than or equal to 1.8 MPa (260 psi) suction and have seals designed for wet H₂S service
 3. Ammonia-Hydrogen Exchange Towers greater than or equal to 35 m in height with diameters of 1.5 m to 2.5 m capable of operating at pressures greater than 15 MPa especially designed or prepared for heavy water production
 4. Tower Internals and Stage Pumps: Tower internals and stage pumps especially designed or prepared for heavy water production. Tower internals include especially designed stage contactors which promote intimate gas/liquid contact. Stage pumps include especially designed submersible pumps for circulation of liquid ammonia within a contacting stage internal to the stage towers.
 5. Ammonia Crackers with operating pressures greater than or equal to 3 MPa especially designed or prepared for heavy water production.
 6. Infrared Absorption Analyzers capable of 'on-line' hydrogen/deuterium ratio analysis
 7. Catalytic Burners for conversion of enriched deuterium gas into heavy water
 8. Complete heavy water upgrade systems or columns therefor
 9. Ammonia synthesis converters or synthesis units for heavy water production utilizing the ammonia-hydrogen exchange process.

- b. Plants for the conversion of uranium
 1. Systems for the conversion of uranium ore concentrates to UO₃;
 2. Systems for the conversion of UO₃ to UF₆;
 3. Systems for the conversion of UO₃ to UO₂;
 4. Systems for the conversion of UO₂ to UF₄;
 5. Systems for the conversion of UF₄ to UF₆;
 6. Systems for the conversion of UF₄ to uranium metal;
 7. Systems for the conversion of UF₆ to UO₂;
 8. Systems for the conversion of UF₆ to UF₄;
 9. Systems for the conversion of UO₂ to UCl₄.

- c. Plants for the conversion of plutonium
 1. systems for the conversion of plutonium nitrate to oxide
 2. systems for plutonium metal production

- d. Tritium facilities or plants for the production, recovery, extraction, concentration or handling of tritium and equipment therefor including

hydrogen or helium refrigeration units; and hydrogen isotope storage or purification systems using metal hydrides as the storage or purification medium.

- e. Lithium isotope separation facilities or plants, and systems and equipment therefor as follows -
 - 1. Facilities or plants for the separation of lithium isotopes;
 - 2. Equipment for the separation of lithium isotopes based on the lithium-mercury amalgam process, as follows:
 - a) Packed liquid-liquid exchange columns especially designed for lithium amalgams;
 - b) Mercury or lithium amalgam pumps;
 - c) Lithium amalgam electrolysis cells;
 - d) Evaporators for concentrated lithium hydroxide solution;
 - 3. Ion exchange systems especially designed for lithium isotope separation, and especially designed component parts therefor;
 - 4. Chemical exchange systems (employing crown ethers, cryptands, or lariat ethers) especially designed for lithium isotope separation, and especially designed component parts therefor.

0B003 Plants for reprocessing of irradiated nuclear fuel and equipment, components and systems especially designed, prepared or adapted or used or intended to be used in such plants, including but not limited to:

- a. Irradiated fuel element chopping machines designed for remote operation
- b. Dissolvers capable of withstanding hot and highly corrosive liquid for dissolution of irradiated nuclear fuel and which can be remotely loaded and maintained
- c. Solvent extractors and solvent extraction equipment resistant to the corrosive effect of nitric acid
- d. Chemical holding or storage vessels resistant to the corrosive effect of nitric acid
- e. Neutron measurement systems for integration and use with automated process control systems for the reprocessing of irradiated fuel elements.
- f. Industrial equipment including assemblies and components as follows:
 - 1. High density (lead glass or other) radiation shielding windows
 - 2. Radiation hardened TV cameras, or lenses therefor
 - 3. 'Robots' or 'end effectors' especially designed for handling high explosives; and control units therefor
 - 4. Remote manipulators that can be used to provide remote actions in radiochemical separation operations or hot cells

0B004 Plants for treatment, handling, storage and transportation of radioactive wastes from nuclear reactors or from plants for processing Source Materials or Special Fissionable Materials or from nuclear reprocessing plants; irradiated nuclear fuel; Special Fissionable Materials, and equipment especially designed, prepared, adapted, or intended to be used therefor.

0B005 All systems, associated equipment, components for separation or enrichment of isotopes of uranium, plutonium, lithium, boron or other elements, other than analytical instruments, especially designed, prepared, adapted, used or intended to be used therefor as follows:

a. Gas centrifuges and assemblies and components especially designed or prepared for use in gas Centrifuges

1. Gas centrifuges;
2. Complete rotor assemblies; Thin-walled cylinders, or a number of interconnected thin-walled cylinders, manufactured from one or more of the high strength-to-density ratio materials described in the Note-1 in 0B005.a. If interconnected, the cylinders are joined together by flexible bellows or rings as described in 0B005.a.4. The rotor is fitted with an internal baffle(s) and end caps, as described in 0B005.a.5 and 0B005.a.6.
3. Rotor tube cylinders: Especially designed or prepared thin-walled cylinders with thickness of 12 mm or less, a diameter of between 75 mm and 650 mm, and manufactured from one or more of 'high strength-to-density ratio materials' described in the Note-1 in 0B005.a;
4. Rings or bellows: Rings or bellows with wall thickness of 3 mm or less and a diameter of between 75 mm and 650 mm especially designed to give local support to a rotor tube or to join together a number of rotor tubes, made from 'high strength-to-density ratio materials' described in the Note-1 in 0B005.a.
5. Baffles: Disc-shaped components of between 75 mm and 650 mm diameter especially designed or prepared for mounting inside a rotor tube, in order to isolate the take-off chamber from the main separation chamber and manufactured from 'high strength-to-density ratio materials' described in the Note-1 in 0B005.a.
6. Top or bottom caps: Especially designed or prepared disc-shaped components of between 75 mm and 400 mm diameter especially designed or prepared to fit the ends of a rotor tube, and so contain the UF₆ within the rotor tube, and in some cases to support, retain or contain as an integrated part an element of the upper bearing (top cap) or to carry the rotating elements of the motor and lower bearing (bottom cap), and manufactured from 'high strength-to-density ratio materials' described in the Note-1 in 0B005.a;
7. Especially prepared Magnetic Suspension Bearings with both of the following attributes:
 - a. Bearing assemblies consisting of an annular magnet suspended within a housing made of or protected by "materials resistant to corrosion by UF₆" (see Note 3 of 0B005) containing a damping medium and having the magnet coupling with a pole piece or second magnet fitted to the top cap of the rotor;
 - b. Active magnetic bearings especially designed or prepared for use with gas centrifuges. These bearings usually have the following characteristics: i) Designed to keep centred a rotor spinning at 600 Hz or more; and ii) Associated to a reliable electrical power supply and/or to an uninterruptible power supply (UPS) unit in order to function for more than one hour.
8. Bearings / Dampers: Especially designed or prepared bearings comprising a pivot/cup assembly mounted on a damper. The pivot is normally a hardened

steel shaft with a hemisphere at one end with a means of attachment to the bottom cap described in 0B005.a.6 at the other. The shaft may however have a hydrodynamic bearing attached. The cup is pellet-shaped with a hemispherical indentation in one surface. These components are often supplied separately to the damper.

9. Molecular pumps: Molecular pumps are high vacuum pumps consisting of especially designed or prepared cylinders having internally machined or extruded helical grooves and internally machined bores. Typical dimensions are as follows: 75 mm to 650 mm internal diameter, 10 mm or more wall thickness, with the length equal to or greater than the diameter. The grooves are typically rectangular in cross-section and 2 mm or more in depth.
10. Ring-shaped motor stators: Especially designed or prepared ring-shaped stators for high speed multiphase AC hysteresis (or reluctance) motors for synchronous operation within a vacuum at a frequency of 600 Hz or greater and a power of 40 VA or greater. The stators may consist of multi-phase windings on a laminated low loss iron core comprised of thin layers typically 2.0 mm thick or less.
11. Centrifuge housing/recipient to contain the rotor tube assembly of a gas centrifuge consisting of rigid cylinder of wall thickness up to 30 mm with precision machined ends that are parallel to each other and perpendicular to the cylinder's longitudinal axis to within 0,05 degrees or less.
12. Scoops consisting of tubes for the extraction of UF₆ gas from within the rotor tube by a Pitot tube action and capable of being fixed to the central gas extraction system.

Note 1: The high strength-to-density ratio materials used for centrifuge rotating components include the following:

- (a) Maraging steel capable of an ultimate tensile strength of 1.95 GPa or more;
- (b) Aluminium alloys capable of an ultimate tensile strength of 0.46 GPa or more;
- (c) Filamentary materials suitable for use in composite structures and having a specific modulus of 3.18×10^6 m or greater and a specific ultimate tensile strength of 7.62×10^4 m or greater-

Note 2: 'Specific Modulus' is the Young's Modulus in N/m² divided by the specific weight in N/m³; 'Specific Ultimate Tensile Strength' is the ultimate tensile strength in N/m² divided by the specific weight in N/ m³.

b. Especially designed or prepared auxiliary systems, equipment and components for gas centrifuge enrichment plants

1. Machine header piping systems for handling UF₆ within the centrifuge cascades;
2. Frequency changers (converters or inverters) especially designed or prepared to supply motor stators for gas centrifuge enrichment, having all of the following characteristics, and especially designed components therefor:
 - a. A multiphase frequency output of 600 Hz or greater; and
 - b. High stability (with frequency control better than 0.2 %).

c. Especially designed or prepared assemblies and components for use in gaseous diffusion enrichment

1. Gaseous diffusion barriers and barrier materials resistant to corrosion by UF_6 described in the Note-3 in 0B005;
2. Gaseous diffuser housings made of or protected by materials resistant to corrosion by UF_6 described in the Note-3 in 0B005;
3. Compressors (positive displacement, centrifugal and axial flow types) or gas blowers with a suction volume capacity of $1 \text{ m}^3 / \text{min}$ or more of UF_6 , discharge pressure up to 500 kPa and having a pressure ratio of 10:1 or less designed for long term operation in the UF_6 environment and made of or protected by materials resistant to corrosion by UF_6 described in the Note-3 in 0B005.

d. Especially designed or prepared auxiliary systems, equipment and components for use in gaseous diffusion enrichment:

Piping systems and header systems for handling UF_6 within the gaseous diffusion cascades.

e. Especially designed or prepared systems, equipment and components for use in aerodynamic enrichment plants:

1. Especially designed or prepared separation nozzles and assemblies thereof. The separation nozzles consist of slit-shaped, curved channels having a radius of curvature less than 1 mm, made of materials resistant to corrosion by UF_6 described in the Note-3 in 0B005 and having a knife-edge within the nozzle that separates the gas flowing through the nozzle into two fractions;
2. Especially designed or prepared vortex tubes and assemblies thereof. The vortex tubes are cylindrical or tapered, made of or protected by materials resistant to corrosion by UF_6 described in the Note-3 in 0B005 and with one or more tangential inlets. The tubes may be equipped with nozzle type appendages at either or both ends;
3. Especially designed or prepared compressors or gas-blowers made of or protected by materials resistant to corrosion by the UF_6 (see the Note-3 in 0B005) / carrier gas (hydrogen or helium) mixture;
4. Especially designed or prepared separation element housings made of or protected by materials resistant to corrosion by UF_6 described in the Note-3 in 0B005, for containing vortex tubes or separation nozzles;
5. Especially designed or prepared header-piping systems, made of or protected by materials resistant to corrosion by UF_6 described in the Note-3 in 0B005, for handling UF_6 within the aerodynamic cascades;
6. UF_6 /carrier gas separation systems for separating UF_6 from carrier gas (hydrogen or helium).

f. Especially designed or prepared systems, equipment and components for use in chemical exchange or ion exchange enrichment plants.

1. Countercurrent Liquid-liquid exchange columns (Chemical exchange), having mechanical power input, especially designed or prepared for uranium enrichment using the chemical exchange process. For corrosion resistance to

concentrated hydrochloric acid solutions, these columns and their internals are normally made of or protected by materials resistant to corrosion by concentrated hydrochloric acid solutions. The stage residence time of the columns is normally designed to be 30 seconds or less.

2. Liquid-liquid centrifugal contactors (Chemical exchange), especially designed or prepared for uranium enrichment using the chemical exchange process. Such contactors are made of or protected by materials resistant to corrosion by concentrated hydrochloric acid solutions, The stage residence time of the columns is normally designed to be 30 seconds or less.
3. Uranium reduction systems and equipment (Chemical exchange):
 - a. Especially designed or prepared electrochemical reduction cells to reduce uranium from one valence state to another for uranium enrichment using the chemical exchange process. The cell materials in contact with process solutions must be corrosion resistant to concentrated hydrochloric acid solutions;
 - b. Especially designed or prepared systems consisting of solvent extraction equipment and pumps or other transfer devices at the product end of the cascade for taking the U^{+4} out of the organic stream.
4. Feed preparation systems (Chemical exchange) consisting of dissolution, solvent extraction and/or ion exchange equipment for producing high-purity uranium chloride.
5. Uranium oxidation systems (Chemical exchange) for oxidation of U^{+3} to U^{+4}
6. Fast-reacting ion exchange resins/adsorbents (Ion exchange):

Fast-reacting ion-exchange resins or adsorbents, especially designed or prepared for uranium enrichment using the chemical exchange process, including porous macroporous resins, and/or pellicular structures and other composite structures in any suitable form including particles or fibres chemically resistant to concentrated hydrochloric acid solutions.
7. Ion exchange columns (Ion exchange):

Cylindrical columns for containing and supporting packed beds of ion exchange resin/adsorbent and made of or protected by materials resistant to corrosion by concentrated hydrochloric acid solutions.
8. Ion exchange reflux systems (Ion exchange):

Chemical or electrochemical oxidation or reduction systems for regeneration of the chemical oxidizing or reducing agent(s) used in ion exchange enrichment cascades.
- g.** Especially designed or prepared systems, equipment and components for use in laser-based enrichment plants.
 1. Uranium vaporization systems (atomic vapour based methods)
 2. Liquid or vapour uranium metal handling systems and components (atomic vapour based methods)
 3. Uranium metal 'product' and 'tails' collector assemblies (atomic vapour based methods)
 4. Separator module housings (atomic vapour based methods)

5. Supersonic expansion nozzles (molecular based methods)
 6. 'Product' or 'tails' collectors (molecular based methods)
 7. UF₆/carrier gas compressors (molecular based methods)
 8. Rotary shaft seals (molecular based methods)
 9. Fluorination systems (molecular based methods)
 10. UF₆/carrier gas separation systems (molecular based methods)
 11. 'Lasers' or 'laser systems or components' for the separation of uranium isotopes.
- h.** Especially designed or prepared systems, equipment and components for use in plasma separation enrichment plants
1. Microwave power sources and antennae: Especially designed or prepared microwave power sources and antennae for producing or accelerating ions and having the following characteristics: greater than 30 GHz frequency and greater than 50 kW mean power output for ion production.
 2. Radio frequency ion excitation coils for frequencies of more than 100 kHz
 3. Uranium plasma generation systems
 4. Uranium metal 'product' and 'tails' collector assemblies made of or protected by materials resistant to the heat and corrosion of uranium metal vapour.
 5. Separator module housings (cylindrical vessels) for containing the uranium plasma source, radio-frequency drive coil and the 'product' and 'tails' collectors.
- i.** Especially designed or prepared systems, equipment and components for use in electromagnetic enrichment plants.
1. Electromagnetic isotope separators for separation of uranium isotopes and equipment and components therefor, including ion sources (consisting of a vapour source, ionizer, and beam accelerator), ion collectors (consisting of collector plates), vacuum housings and magnet pole pieces;
 2. High voltage power supplies for ion sources: Especially designed or prepared high-voltage power supplies for ion sources, having all of the following characteristics: capable of continuous operation, output voltage of 20,000 V or greater, output current of 1 A or greater, and voltage regulation of better than 0.01% over a time period of 8 hours
 3. High-power, direct current magnet power supplies: Especially designed or prepared high-power, direct current magnet power supplies having all of the following characteristics: capable of continuously producing a current output of 500 A or greater at a voltage of 100 V or greater and with a current or voltage regulation better than 0.01% over a period of 8 hours.

j. Especially designed or prepared other equipment and components for use in enrichment plants:

1. Feed systems / product and tails withdrawal systems such as feed autoclaves, ovens, or systems, desublimers, cold traps or pumps, solidification or liquefaction stations, 'product' or 'tails' stations used for handling UF₆;
2. Special shut-off valves, control valves, bellow sealed valves, manual or automated, shut-off or control, made of or protected by materials resistant to corrosion by UF₆;
3. UF₆ mass spectrometers / ion sources capable of taking on-line samples from UF₆ gas stream; ;
4. Rotary shaft seals for compressors or blowers;
5. Heat exchangers made of or protected by "materials resistant to corrosion by UF₆";
6. Vacuum systems including vacuum manifolds, vacuum headers and vacuum pumps made of, or protected by, materials resistant to corrosion by UF₆.

Notes to 0B005:

1: Controls under 0B005 also apply to the plants and equipment that are intended for isotope separation of other elements.

2: "Other elements" means all elements other than hydrogen, uranium and plutonium.

3: Materials resistant to corrosion by UF₆ include copper, copper alloys, stainless steel, aluminium, aluminium oxide, aluminium alloys, nickel or alloys containing 60% or more nickel and fluorinated hydrocarbon polymers.

0B006 Plants for the fabrication of nuclear reactor fuel elements, and equipment especially designed or prepared therefor including but not limited to:

- a. fully automatic pellet inspection stations especially designed or prepared for checking final dimensions and surface defects of the fuel pellets;
- b. automatic welding machines especially designed or prepared for welding end caps onto the fuel pins (or rods);
- c. automatic test and inspection stations especially designed or prepared for checking the integrity of completed fuel pins (or rods);
- d. systems especially designed or prepared to manufacture nuclear fuel cladding.

Item 'c' typically includes equipment for: 1) x-ray examination of pin (or rod) end cap welds, 2) helium leak detection from pressurized pins (or rods), and 3) gamma-ray scanning of the pins (or rods) to check for correct loading of the fuel pellets inside.

0B007 Plants or systems for production, handling, storage and transportation of Radioisotopes in quantities exceeding 100 Curies (3.7×10^{12} Becquerel).

0B008 Neutron generators including neutron chain reacting assemblies and fusion assemblies of all kinds for producing fissile materials.

0C Technology and software

Technology and software for the development, production or use of prescribed substances or prescribed equipment specified in 0A or 0B. ”

B. For SCOMET 3A103, the following shall be substituted:-

“**3A103** Tungsten , molybdenum, and alloys of those metals in particulate form and a particle size of 50×10^{-6} m (50 μ m) or less; ”

C. For SCOMET 3A107, the following shall be substituted:-

“**3A107** Titanium-stabilised Duplex Stainless Steel (Ti-DSS) ”

D. For SCOMET 3A114, the following shall be substituted:-

“**3A114** a. Nickel powder of purity 99.0% or greater by weight; and having a mean particle size of less than 10 μ m measured by the ASTM B 330 standard;

b. Porous nickel metal produced from the nickel powder specified above ”

E. After SCOMET 3A117 and the entry relating thereto, the following shall be inserted:-

“**3A118** Titanium alloys having both of the following characteristics:

a. Capable of an ultimate tensile strength of 900 MPa or more at 293 K (20 degrees C); and

b. In the form of tubes or cylindrical solid forms (including forgings) with an outside diameter of more than 75 mm.

Technical note: The phrase ‘capable of’ encompasses titanium alloys before or after heat treatment

3A119 Rhenium, and alloys containing 90% by weight or more rhenium; and alloys of rhenium and tungsten containing 90% by weight or more of any combination of rhenium and tungsten, have both of the following characteristics:

- a. In forms with a hollow cylindrical symmetry (including cylinder segments) with an inside diameter between 100 and 300 mm; and
- b. A mass greater than 20kg

3A120 Technology and Software

Technology and software for the development, production or use of items specified in 3A1 or 3A4 ”

F. For SCOMET 3A401, the following shall be substituted

- “ **3A401** High explosive substances or mixtures, containing more than 2 % by weight of any of the following:
- a. Cyclotetramethylenetetranitramine (HMX) (CAS 2691-41-0);
 - b. Cyclotrimethylenetrinitramine (RDX) (CAS 121-82-4);
 - c. Triaminotrinitrobenzene (TATB) (CAS 3058-38-6);
 - d. Aminodinitrobenzo-furoxan or 7-amino-4,6 nitrobenzofurazane-1-oxide (ADNBF) (CAS 97096-78-1);
 - e. 1,1-diamino-2,2-dinitroethylene (DADE or FOX7) (CAS 145250-81-3);
 - f. 2,4-dinitroimidazole (DNI) (CAS 5213-49-0);
 - g. Diaminoazoxyfurazan (DAAOF or DAAF) (CAS 78644-89-0);
 - h. Diaminotrinitrobenzene (DATB) (CAS 1630-08-6);
 - i. Dinitroglycoluril (DNGU or DINGU) (CAS 55510-04-8);
 - j. 2,6-Bis (picrylamino)-3,5-dinitropyridine (PYX) (CAS 38082-89-2);
 - k. 3,3'-diamino-2,2',4,4',6,6'-hexanitrobiphenyl or dipicramide (DIPAM) (CAS 17215-44-0);
 - l. Diaminoazofurazan (DAAzF) (CAS 78644-90-3);
 - m. 1,4,5,8-tetranitro-pyridazino[4,5-d] pyridazine (TNP) (CAS 229176-04-9);
 - n. Hexanitrostilbene (HNS) (CAS 20062-22-0); or
 - o. Any explosive with a crystal density greater than 1.8 g/cm³ and having a detonation velocity greater than 8000 m/s.

Note: License applications for the export of items at 3A401a and 3A401b will normally be denied. ”

G. SCOMET Category 4A, 4B and 4C and the entries relating thereto shall be substituted as follows:-

“4A Equipment, assemblies, components including test and production equipment

- 4A001** Flow-forming machines, spin-forming machines capable of flow-forming functions, and mandrels, as follows:
- a. For flow forming machines refer to 5A205
 - b. Spin forming machines having both of the following characteristics:
 1. Three or more rollers (active or guiding); and
 2. Which, according to the manufacturer’s technical specification, can be equipped with ‘numerical control’ units or a computer control.
 - c. Rotor-forming mandrels designed to form cylindrical rotors of inside diameter between 75 and 400 mm.

Note:

Item 4A001a and 4A001b include machines which have only a single roller designed to deform metal plus two auxiliary rollers which support the mandrel, but do not participate directly in the deformation process.

- 4A002** Machine tools, as follows, and any combination thereof, for removing or cutting metals, ceramics, or composites, which, according to the manufacturer’s technical specifications, can be equipped with electronic devices for simultaneous “contouring control” in two or more axes;

see N.B.: For “numerical control” units controlled by their associated “software”,
Item 4C

- a. Machine tools for turning, that have “positioning accuracies” with all compensations available better (less) than 6 µm according to ISO 230/2 (1988) along any linear axis (overall positioning) for machines capable of machining diameters greater than 35 mm;

Note: Item 4A002.a. does not control bar machines (Swissturn), limited to machining only bar feed thru, if maximum bar diameter is equal to or less than 42 mm and there is no capability of mounting chucks. Machines may have drilling and/or milling capabilities for machining parts with diameters

less than 42 mm.

- b. Machine tools for milling, having any of the following characteristics:
 - 1. “Positioning accuracies” with all compensations available better (less) than 6 μm according to ISO 230/2 (1988) along any linear axis (overall positioning);
 - 2. Two or more contouring rotary axes; or
 - 3. Five or more axes which can be coordinated simultaneously for “contouring control”.

Note: Item 4A002.b. does not control milling machines having both of the following characteristics:

- 1. X-axis travel greater than 2 m; and
- 2. Overall “positioning accuracy” on the x-axis worse (more) than 30 μm according to ISO 230/2 (1988).

- c. Machine tools for grinding, having any of the following characteristics:
 - 1. “Positioning accuracies” with all compensations available better (less) than 4 μm according to ISO 230/2 (1988) along any linear axis (overall positioning);
 - 2. Two or more contouring rotary axes; or
 - 3. Five or more axes which can be coordinated simultaneously for “contouring control”.

Note: Item 4A002.c. does not control grinding machines as follows:

- 1. Cylindrical external, internal, and external-internal grinding machines having all the following characteristics:
 - a. Limited to a maximum workpiece capacity of 150 mm outside diameter or length; and
 - b. Axes limited to x, z and c.
- 2. Jig grinders that do not have a z-axis or a w-axis with an overall positioning accuracy less (better) than 4 microns. Positioning accuracy is according to ISO 230/2 (1988).

- d. Non-wire type Electrical Discharge Machines (EDM) that have two or more contouring rotary axes and that can be coordinated simultaneously for “contouring control”.

Notes: 1. Stated “positioning accuracy” levels derived under the

following procedures from measurements made according to ISO 230/2 (1988) or national equivalents may be used for each machine tool model if provided to, and accepted by, national authorities instead of individual machine tests.

Stated “positioning accuracy” are to be derived as follows:

- a. Select five machines of a model to be evaluated;
 - b. Measure the linear axis accuracies according to ISO 230/2 (1988)
 - c. Determine the accuracy values (A) for each axis of each machine. The method of calculating the accuracy value is described in the ISO 230/2 (1988) standard;
 - d. Determine the average accuracy value of each axis. This average value becomes the stated “positioning accuracy” of each axis for the model ($\hat{A}_x, \hat{A}_y, \dots$);
 - e. Since Item 4A002 refers to each linear axis, there will be as many stated “positioning accuracy” values as there are linear axes;
 - f. If any axis of a machine tool not controlled by Items 4A002.a., 4A002.b., or 4A002.c. has a stated “positioning accuracy” of 6 μm or better (less) for grinding machines, and 8 μm or better (less) for milling and turning machines, both according to ISO 230/2 (1988), then the builder should be required to reaffirm the accuracy level once every eighteen months.
2. Item 4A002. does not control special purpose machine tools limited to the manufacture of any of the following parts:
- a. Gears
 - b. Crankshafts or cam shafts
 - c. Tools or cutters
 - d. Extruder worms

Technical Notes: 1. *Axis nomenclature shall be in accordance with International Standard ISO 841, “Numerical Control Machines - Axis and Motion Nomenclature”.*

2. *Not counted in the total number of contouring axes are secondary parallel contouring axes (e.g., the w-axis on horizontal boring mills or a secondary rotary axis the centerline of which is parallel to the primary rotary*

axis).

3. *Rotary axes do not necessarily have to rotate over 360 degrees. A rotary axis can be driven by a linear device, e.g., a screw or a rack-and-pinion.*
4. *For the purposes of 4A002, the number of axes which can be coordinated simultaneously for “contouring control” is the number of axes along or around which, during processing of the workpiece, simultaneous and interrelated motions are performed between the workpiece and a tool. This does not include any additional axes along or around which other relative motions within the machine are performed, such as:*
 - a. *Wheel-dressing systems in grinding machines;*
 - b. *Parallel rotary axes designed for mounting of separate workpieces;*
 - c. *Co-linear rotary axes designed for manipulating the same workpiece by holding it in a chuck from different ends.*
5. *A machine tool having at least 2 of the 3 turning, milling or grinding capabilities (e.g., a turning machine with milling capability) must be evaluated against each applicable entry, 4A002.a., 4A002.b. and 4A002.c.*
6. *Items 4A002.b.3 and 4A002.c.3 include machines based on a parallel linear kinematic design (e.g., hexapods) that have 5 or more axes none of which are rotary axes.*

4A003

Dimensional inspection machines, instruments, or systems, as follows:

- a. Computer controlled or numerically controlled coordinate measuring machines (CMM) having either of the following characteristics:
 1. Having only two axes and having a maximum permissible error of length measurement along any axis (one dimensional), identified as any combination of E0x MPE, E0y MPE or E0z MPE, equal to or less(better) than $(1.25 + L/1000) \mu\text{m}$ (where L is the measured length in mm) at any point within the operating range of the machine (i.e., within the length of the axis), according to ISO 10360-2(2009); or
 2. Three or more axes and having a three dimensional (volumetric) maximum permissible error of length measurement (E0, MPE equal to

or less (better) than $(1.7 + L/800)$ μm (where L is the measured length in mm) at any point within the operating range of the machine (i.e., within the length of the axis), according to ISO 10360-2(2009).

Technical Note: The E0, MPE of the most accurate configuration of the CMM specified according to ISO 10360-2(2009) by the manufacturer (e.g., best of the following: probe stylus length, motion parameters, environment) and with all compensations available shall be compared to the $1.7 + L/800$ μm threshold.

- b. Linear displacement measuring instruments, as follows:
 - 1. Non-contact type measuring systems with a “resolution” equal to or better (less) than 0.2 μm within a measuring range up to 0.2 mm;
 - 2. Linear variable differential transformer (LVDT) systems having both of the following characteristics:
 - a. 1. “Linearity” equal to or less (better) than 0.1% measured from 0 to the full operating range, for LVDTs with an operating range up to 5 mm; or
 - 2. “Linearity” equal to or less (better) than 0.1% measured from 0 to 5 mm for LVDTs with an operating range greater than 5 mm; and
 - b. Drift equal to or better (less) than 0.1% per day at a standard ambient test room temperature ± 1 K;
- 3. Measuring systems having both of the following characteristics:
 - a. Contain a laser; and
 - b. Maintain for at least 12 hours, over a temperature range of ± 1 K around a standard temperature and a standard pressure:
 - 1. A “resolution” over their full scale of 0.1 μm or better; and
 - 2. With a “measurement uncertainty” equal to or better (less) than $(0.2 + L/2000)$ μm (L is the measured length in millimeters);

Note: Item 1.B.3.b.3. does not control measuring interferometer systems, without closed or open loop feedback, containing a laser to measure slide movement errors of machine tools, dimensional inspection machines, or similar equipment.

Technical Note: In Item 1.B.3.b. 'linear displacement' means the change of distance between the measuring probe and the measured object.

- c. Angular displacement measuring instruments having an “angular position deviation” equal to or better (less) than 0.00025°;

Note: Item 1.B.3.c. does not control optical instruments, such as autocollimators, using collimated light (e.g., laser light) to detect angular displacement of a mirror.

- d. Systems for simultaneous linear-angular inspection of hemishells, having both of the following characteristics:

1. “Measurement uncertainty” along any linear axis equal to or better (less) than 3.5 μm per 5 mm; and
2. “Angular position deviation” equal to or less than 0.02°.

- Notes:
1. Item 1.B.3. includes machine tools that can be used as measuring machines if they meet or exceed the criteria specified for the measuring machine function.
 2. Machines described in Item 1.B.3. are controlled if they exceed the threshold specified anywhere within their operating range

Technical Note: All parameters of measurement values in this item represent plus/minus, i.e., not total band.

4A004 Controlled atmosphere (vacuum or inert gas) induction furnaces, and power supplies therefor, as follows:

- a. Furnaces having all of the following characteristics:

1. Capable of operation at temperatures above 1123 K (850 °C);
2. Induction coils 600 mm or less in diameter; and
3. Designed for power inputs of 5 kW or more;

Note: Item 4A004.a. does not control furnaces designed for the processing of semiconductor wafers.

- b. Power supplies, with a specified output power of 5 kW or more, specially designed for furnaces specified in Item 4A004.a.

4A005 Isostatic presses', and related equipment, as follows:

- a. 'Isostatic presses' as specified in 5A208;
- b. Dies, moulds, and controls specially designed for the 'isostatic presses' specified in Item 4A005.a.

Technical Notes:

1. *In Item 4A005 'Isostatic presses' means equipment capable of pressurizing a closed cavity through various media (gas, liquid, solid particles, etc.) to create equal pressure in all directions within the cavity upon a work piece or material.*
2. *In Item 4A005 the inside chamber dimension is that of the chamber in which both the working temperature and the working pressure are achieved and does not include fixtures. That dimension will be the smaller of either the inside diameter of the pressure chamber or the inside diameter of the insulated furnace chamber, depending on which of the two chambers is located inside the other.*

4A006 Vibration test systems, equipment, and components as follows:

- a. Electrodynamic vibration test systems, having all of the following characteristics:
 1. Employing feedback or closed loop control techniques and incorporating a digital control unit;
 2. Capable of vibrating at 10 g RMS or more between 20 and 2000 Hz; and
 3. Capable of imparting forces of 50 kN or greater measured 'bare table';
- b. Digital control units, combined with 'software' specially designed for vibration testing, with a real-time bandwidth greater than 5 kHz and being designed for a system specified in Item 4A006.a.;

- c. Vibration thrusters (shaker units), with or without associated amplifiers, capable of imparting a force of 50 kN or greater measured 'bare table', which are usable for the systems specified in Item 4A006.a.;
- d. Test piece support structures and electronic units designed to combine multiple shaker units into a complete shaker system capable of providing an effective combined force of 50 kN or greater, measured 'bare table,' which are usable for the systems specified in Item 4A006.a..

Technical Note: In Item 4A006 'bare table' means a flat table, or surface, with no fixtures or fittings.

4A007 Vacuum or other controlled atmosphere metallurgical melting and casting furnaces and related equipment, as follows:

- a. Arc re-melt and casting furnaces having both of the following characteristics:
 - 1. Consumable electrode capacities between 1000 and 20000 cm³; and
 - 2. Capable of operating with melting temperatures above 1973 K (1700 °C);
- b. Electron beam melting furnaces and plasma atomisation and melting furnaces, having both of the following characteristics:
 - 1. A power of 50 kW or greater; and
 - 2. Capable of operating with melting temperatures above 1473 K (1200 °C);
- c. Computer control and monitoring systems specially configured for any of the furnaces specified in Item 4A007.a. or 4A007.b.

4A008 Crucibles made of materials resistant to liquid actinide metals, as follows:

- a. Crucibles having both of the following characteristics:
 - 1. A volume of between 150 cm³ (150 ml) and 8000 cm³ (8 litres); and
 - 2. Made of or coated with any of the following materials, or combination of

the following materials, having an overall impurity level of 2% or less by weight:

- a. Calcium fluoride (CaF_2);
 - b. Calcium zirconate (metazirconate) (CaZrO_3);
 - c. Cerium sulphide (Ce_2S_3);
 - d. Erbium oxide (erbia) (Er_2O_3);
 - e. Hafnium oxide (hafnia) (HfO_2);
 - f. Magnesium oxide (MgO);
 - g. Nitrided niobium-titanium-tungsten alloy (approximately 50% Nb, 30% Ti, 20% W);
 - h. Yttrium oxide (yttria) (Y_2O_3); or
 - i. Zirconium oxide (zirconia) (ZrO_2);
- b. Crucibles having both of the following characteristics:
1. A volume of between 50 cm^3 (50 ml) and 2000 cm^3 (2 litres); and
 2. Made of or lined with tantalum, having a purity of 99.9% or greater by weight;
- c. Crucibles having all of the following characteristics:
1. A volume of between 50 cm^3 (50 ml) and 2000 cm^3 (2 litres);
 2. Made of or lined with tantalum, having a purity of 98% or greater by weight; and
 3. Coated with tantalum carbide, nitride, boride, or any combination thereof.

4A009 Platinized catalysts specially designed or prepared for promoting the hydrogen isotope exchange reaction between hydrogen and water for the recovery of tritium from heavy water or for the production of heavy water.

4A010 Composite structures in the form of tubes having both of the following characteristics:

- a. An inside diameter of between 75 and 400 mm; and
- b. Made with any of the materials specified in Item 3A116.

4A011 Frequency changers or generators, usable as a variable frequency or fixed frequency motor drive, having all of the following characteristics:

N.B.1: Frequency changers and generators specially designed or prepared for the gas centrifuge process are controlled under Prescribe Equipment (0B)

N.B.2: “Software” specially designed to enhance or release the performance of frequency changers or generators to meet the characteristics below is controlled (see Item 4C).

- a. Multiphase output providing a power of 40 VA or greater;
- b. Operating at a frequency of 600 Hz or more; and
- c. Frequency control better (less) than 0.2%.

Notes: 1. Item 4A011 only controls frequency changers intended for specific industrial machinery and/or consumer goods (machine tools, vehicles, etc.) if the frequency changers can meet the characteristics above when removed,

- 2. For the purpose of export control, the Government will determine whether or not a particular frequency changer meets the characteristics above, taking into account hardware and software constraints.

Technical Notes: 1. *Frequency changers in Item 4A011. are also known as converters or inverters.*

- 2. *The characteristics specified in item 4A011 may be met by certain equipment marketed such as: Generators, Electronic Test Equipment, AC Power*

Supplies, Variable Speed Motor Drives, Variable Speed Drives (VSDs), Variable Frequency Drives (VFDs), Adjustable Frequency Drives (AFDs), or Adjustable Speed Drives (ASDs).

4A012 Lasers, laser amplifiers and oscillators as follows:

- a. Copper vapour lasers having both of the following characteristics:
 1. Operating at wavelengths between 500 and 600 nm; and
 2. An average output power equal to or greater than 40 W;

- b. Argon ion lasers having both of the following characteristics:
 1. Operating at wavelengths between 400 and 515 nm; and
 2. An average output power greater than 40 W;

- c. Neodymium-doped (other than glass) lasers with an output wavelength between 1000 and 1100 nm having either of the following:
 1. Pulse-excited and Q-switched with a pulse duration equal to or greater than 1 ns, and having either of the following:
 - a. A single-transverse mode output with an average output power greater than 40 W; or
 - b. A multiple-transverse mode output with an average output power greater than 50 W;

or

 2. Incorporating frequency doubling to give an output wavelength between 500 and 550 nm with an average output power of greater than 40 W;

- d. Tuneable pulsed single-mode dye laser oscillators having all of the following characteristics:
 1. Operating at wavelengths between 300 and 800 nm;
 2. An average output power greater than 1 W;
 3. A repetition rate greater than 1 kHz; and
 4. Pulse width less than 100 ns;

- e. Tuneable pulsed dye laser amplifiers and oscillators having all of the

following characteristics:

1. Operating at wavelengths between 300 and 800 nm;
2. An average output power greater than 30 W;
3. A repetition rate greater than 1 kHz; and
4. Pulse width less than 100 ns;

Note: Item 4A012e does not control single mode oscillators.

f. Alexandrite lasers having all of the following characteristics:

1. Operating at wavelengths between 720 and 800 nm;
2. A bandwidth of 0.005 nm or less;
3. A repetition rate greater than 125 Hz; and
4. An average output power greater than 30 W;

g. Pulsed carbon dioxide lasers having all of the following characteristics:

1. Operating at wavelengths between 9000 and 11000 nm;
2. A repetition rate greater than 250 Hz;
3. An average output power greater than 500 W; and
4. Pulse width of less than 200 ns;

Note: Item 4A012g does not control the higher power (typically 1 to 5 kW) industrial CO₂ lasers used in applications such as cutting and welding, as these latter lasers are either continuous wave or are pulsed with a pulse width greater than 200 ns.

h. Pulsed excimer lasers (XeF, XeCl, KrF) having all of the following characteristics:

1. Operating at wavelengths between 240 and 360 nm;
2. A repetition rate greater than 250 Hz; and
3. An average output power greater than 500 W;

i. Para-hydrogen Raman shifters designed to operate at 16 μm output wavelength and at a repetition rate greater than 250 Hz.

j. Pulsed carbon monoxide lasers having all of the following characteristics:

1. Operating at wavelengths between 5000 and 6000 nm;
2. A repetition rate greater than 250 Hz;

3. An average output power greater than 200 W; and
4. Pulse width of less than 200 ns.

Note: Item 4A012.j. does not control the higher power (typically 1 to 5 kW) industrial CO lasers used in applications such as cutting and welding, as these latter lasers are either continuous wave or are pulsed with a pulse width greater than 200 ns.

4A013 Valves having all of the following characteristics:

- a. A nominal size of 5 mm or greater;
- b. Having a bellows seal; and
- c. Wholly made of or lined with aluminium, aluminium alloy, nickel, or nickel alloy containing more than 60% nickel by weight.

Technical Note: For valves with different inlet and outlet diameter, the nominal size parameter in Item 4A013a refers to the smallest diameter.

4A014 Superconducting solenoidal electromagnets having all of the following characteristics:

- a. Capable of creating magnetic fields greater than 2 T;
- b. A ratio of length to inner diameter greater than 2;
- c. Inner diameter greater than 300 mm; and
- d. Magnetic field uniform to better than 1% over the central 50% of the inner volume.

Note: Item 4A014 does not control magnets specially designed for and exported as part of medical nuclear magnetic resonance (NMR) imaging systems. ('As part of' does not necessarily mean physical part in the same shipment. Separate shipments from different sources are allowed, provided the related export documents clearly specify the 'as part of' relationship.)

4A015 High-power direct current power supplies having both of the following characteristics:

- a. Capable of continuously producing, over a time period of 8 hours, 100 V

- or greater with current output of 500 A or greater; and
- b. Current or voltage stability better than 0.1% over a time period of 8 hours

4A016 High-voltage direct current power supplies having both of the following characteristics:

- a. Capable of continuously producing, over a time period of 8 hours, 20 kV or greater with current output of 1 A or greater; and
- b. Current or voltage stability better than 0.1% over a time period of 8 hours.

4A017 All types of pressure transducers capable of measuring absolute pressures and having all of the following characteristics:

- a. Pressure sensing elements made of or protected by aluminium, aluminium alloy, aluminium oxide (alumina or sapphire), nickel, nickel alloy with more than 60% nickel by weight, or fully fluorinated hydrocarbon polymers;
- b. Seals, if any, essential for sealing the pressure sensing element, and in direct contact with the process medium, made of or protected by aluminium, aluminium alloy, aluminium oxide (alumina or sapphire), nickel, nickel alloy with more than 60% nickel by weight, or fully fluorinated hydrocarbon polymers; and
- c. Having either of the following characteristics:
1. A full scale of less than 13 kPa and an “accuracy” of better than $\pm 1\%$ of full scale; or
 2. A full scale of 13 kPa or greater and an “accuracy” of better than ± 130 Pa when measuring at 13 kPa.

Technical Notes: 1. In Item 4A017, pressure transducers are devices that convert pressure measurements into a signal.

2. In Item 4A017, “accuracy” includes non-linearity, hysteresis and repeatability at ambient temperature.

4A018 Vacuum pumps having all of the following characteristics:

- a. Input throat size equal to or greater than 380 mm;
- b. Pumping speed equal to or greater than 15 m³/s; and
- c. Capable of producing an ultimate vacuum better than 13.3 mPa.

Technical Notes:

- 1. *The pumping speed is determined at the measurement point with nitrogen gas or air.*
- 2. *The ultimate vacuum is determined at the input of the pump with the input of the pump blocked off.*

4A019 Electrolytic cells for fluorine production with an output capacity greater than 250 g of fluorine per hour.

4A020 Rotor fabrication or assembly equipment, rotor straightening equipment, bellows-forming mandrels and dies, as follows:

- a. Rotor assembly equipment for assembly of gas centrifuge rotor tube sections, baffles, and end caps; *Note:* Item 4A020a includes precision mandrels, clamps, and shrink fit machines.
- b. Rotor straightening equipment for alignment of gas centrifuge rotor tube sections to a common axis;

Technical Note: In Item 4A020b such equipment normally consists of precision measuring probes linked to a computer that subsequently controls the action of, for example, pneumatic rams used for aligning the rotor tube sections.

- c. Bellows-forming mandrels and dies for producing single -convolution bellows.

Technical Note: The bellows referred to in Item 4A020c have all of the following characteristics:

- 1. *Inside diameter between 75 and 400 mm;*

2. *Length equal to or greater than 12.7 mm;*
3. *Single convolution depth greater than 2 mm; and*
4. *Made of high-strength aluminium alloys, maraging steel, or high strength fibrous or filamentary materials.*

4A021 Centrifugal multi-plane balancing machines, fixed or portable, horizontal or vertical, as follows:

- a. Centrifugal balancing machines designed for balancing flexible rotors having a length of 600 mm or more and having all of the following characteristics:
 1. Swing or journal diameter greater than 75 mm;
 2. Mass capability of from 0.9 to 23 kg; and
 3. Capable of balancing speed of revolution greater than 5000 rpm;
- b. Centrifugal balancing machines designed for balancing hollow cylindrical rotor components and having all of the following characteristics:
 1. Journal diameter greater than 75 mm;
 2. Mass capability of from 0.9 to 23 kg;
 3. A minimum achievable residual specific unbalance equal to or less than 10 g-mm/kg per plane; and
 4. Belt drive type.

4A022 Filament winding machines and related equipment, as follows:

- a. Filament winding machines as specified in 5A206; and having all of the following characteristics:
 1. Having motions for positioning, wrapping, and winding fibers coordinated and programmed in two or more axes;
 2. Specially designed to fabricate composite structures or laminates from “fibrous or filamentary materials”; and
 3. Capable of winding cylindrical tubes with an internal diameter between 75 and 650 mm and lengths of 300 mm or greater;
- b. Coordinating and programming controls for the filament winding machines specified in Item 4A022a;
- c. Precision mandrels for the filament winding machines specified in Item

4A022a.

4A023 Electromagnetic isotope separators designed for, or equipped with, single or multiple ion sources capable of providing a total ion beam current of 50 mA or greater.

Notes:

1. Item 4A023 includes separators capable of enriching stable isotopes as well as those for uranium. (A separator capable of separating the isotopes of lead with a one-mass unit difference is inherently capable of enriching the isotopes of uranium with a three-unit mass difference.)
2. Item 4A023 includes separators with the ion sources and collectors both in the magnetic field and those configurations in which they are external to the field.

Technical Note: A single 50 mA ion source cannot produce more than 3 g of separated highly enriched uranium (HEU) per year from natural abundance feed.

4A024 Mass spectrometers capable of measuring ions of 230 atomic mass units or greater and having a resolution of better than 2 parts in 230, as follows, and sources therefor:
ion

N.B.: Mass spectrometers specially designed or prepared for analyzing on-line samples of uranium hexafluoride are controlled under Prescribed Equipment (0B Category).

- a. Inductively coupled plasma mass spectrometers (ICP/MS);
- b. Glow discharge mass spectrometers (GDMS);
- c. Thermal ionization mass spectrometers (TIMS);
- d. Electron bombardment mass spectrometers having both of the following features:
 1. A molecular beam inlet system that injects a collimated beam of analyte molecules into a region of the ion source where the

molecules are ionized by an electron beam; and

2. One or more cold traps that can be cooled to a temperature of 193 K (-80 °C) or less in order to trap analyte molecules that are not ionized by the electron beam;
- e. Mass spectrometers equipped with a microfluorination ion source designed for actinides or actinide fluorides.

Technical Notes:

1. *Item 4A024.d. describes mass spectrometers that are typically used for isotopic analysis of UF₆ gas samples.*
2. *Electron bombardment mass spectrometers in Item 4A024.d. are also known as electron impact mass spectrometers or electron ionization mass spectrometers.*
3. *In Item 4A024.d.2, a 'cold trap' is a device that traps gas molecules by condensing or freezing them on cold surfaces. For the purposes of this entry, a closed-loop gaseous helium cryogenic vacuum pump is not a cold trap.*

- 4A025** Specialized packings which may be used in separating heavy water from ordinary water, having both of the following characteristics:
- a. Made of phosphor bronze mesh chemically treated to improve wettability; and
 - b. Designed to be used in vacuum distillation towers.

- 4A026** Pumps capable of circulating solutions of concentrated or dilute potassium amide catalyst in liquid ammonia (KNH₂/NH₃), having all of the following characteristics:

- a. Airtight (i.e., hermetically sealed);
- b. A capacity greater than 8.5 m³/h; and
- c. Either of the following characteristics:
 1. For concentrated potassium amide solutions (1% or greater), an operating pressure of 1.5 to 60 MPa; or

2. For dilute potassium amide solutions (less than 1%), an operating pressure of 20 to 60 MPa.

4A027 Turboexpanders or turboexpander-compressor sets having both of the following characteristics:

- a. Designed for operation with an outlet temperature of 35 K (- 238 °C) or less; and
- b. Designed for a throughput of hydrogen gas of 1000 kg/h or greater.

4A028 Water-hydrogen sulphide exchange tray columns and internal contactors, as follows:

N.B.: For columns which are specially designed or prepared for the production of heavy water, see Prescribed Equipment (0B002).

- a. Water-hydrogen sulphide exchange tray columns, having all of the following characteristics:
 1. Can operate at pressures of 2 MPa or greater;
 2. Constructed of carbon steel having an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; and
 3. With a diameter of 1.8 m or greater;
- b. Internal contactors for the water-hydrogen sulphide exchange tray columns specified in Item 4A028a.

Technical Note: Internal contactors of the columns are segmented trays which have an effective assembled diameter of 1.8 m or greater; are designed to facilitate counter current contacting and are constructed of stainless steels with a carbon content of 0.03% or less. These may be sieve trays, valve trays, bubble cap trays or turbo grid trays.

4A029 Hydrogen-cryogenic distillation columns having all of the following characteristics:

- a. Designed for operation at internal temperatures of 35 K (-238 °C) or less;
- b. Designed for operation at internal pressures of 0.5 to 5 MPa;

- c. Constructed of either:
1. Stainless steel of the 300 series with low sulfur content and with an austenitic ASTM (or equivalent standard) grain size number of 5 or greater; or
 2. Equivalent materials which are both cryogenic and H₂-compatible; and
- d. With internal diameters of 30 cm or greater and 'effective lengths' of 4 m or greater.

Technical Note: The term 'effective length' means the active height of packing material in a packed-type column, or the active height of internal contactor plates in a plate-type column.

4A030 Bellows-sealed scroll-type compressors and bellows-sealed scroll-type
vacuum pumps having all of the following characteristics:

- a. Capable of an inlet volume flow rate of 50 m³/h or greater;
- b. Capable of a pressure ratio of 2:1 or greater; and
- c. Having all surfaces that come in contact with the process gas made from any of the following materials:
 1. Aluminium or aluminium alloy;
 2. Aluminium oxide;
 3. Stainless steel;
 4. Nickel or nickel alloy;
 5. Phosphor bronze; or
 6. Fluoropolymers.

Technical Notes: 1. In a scroll compressor or vacuum pump, crescent-shaped pockets of gas are trapped between one or more pairs of intermeshed spiral vanes, or scrolls, one of which moves while the other remains stationary. The moving scroll orbits the stationary scroll; it does not rotate. As the moving scroll orbits the stationary scroll, the gas pockets diminish in size (i.e., they are compressed) as they move toward the

outlet port of the machine.

2. *In a bellows-sealed scroll compressor or vacuum pump, the process gas is totally isolated from the lubricated parts of the pump and from the external atmosphere by a metal bellows. One end of the bellows is attached to the moving scroll and the other end is attached to the stationary housing of the pump.*
3. *Fluoropolymers include, but are not limited to, the following materials:*
 - a. *Polytetrafluoroethylene (PTFE),*
 - b. *Fluorinated Ethylene Propylene (FEP),*
 - c. *Perfluoroalkoxy (PFA),*
 - d. *Polychlorotrifluoroethylene (PCTFE); and*
 - e. *Vinylidene fluoride-hexafluoropropylene copolymer.*

4A031 Industrial equipment including assemblies and components (other than those specified under Prescribed Equipment in 0B003.e) as follows:

- a. High-density (lead glass or other) radiation shielding windows, having all of the following characteristics, and specially designed frames therefor:
 1. A 'cold area' greater than 0.09 m²;
 2. A density greater than 3 g/cm³; and
 3. A thickness of 100 mm or greater.

Technical Note: In Item 4A031.a.1. the term 'cold area' means the viewing area of the window exposed to the lowest level of radiation in the design application.

- b. Radiation-hardened TV cameras, or lenses therefor, specially designed or rated as radiation hardened to withstand a total radiation dose greater than 5 x 10⁴ Gy (silicon) without operational degradation.

Technical Note: The term Gy (silicon) refers to the energy in Joules per

kilogram absorbed by an unshielded silicon sample when exposed to ionizing radiation.

- c. 'Robots', 'end-effectors' and control units as follows:
1. 'Robots' or 'end-effectors' having either of the following characteristics:
 - (a) Specially designed to comply with national safety standards applicable to handling high explosives (for example, meeting electrical code ratings for high explosives); or
 - (b) Specially designed or rated as radiation hardened to withstand a total radiation dose greater than 5×10^4 Gy (silicon) without operational degradation;
 2. Control units specially designed for any of the 'robots' or 'end-effectors' specified in Item 4A031.c.1.

Note: Item 1.A.3. does not control 'robots' specially designed for non-nuclear industrial applications such as automobile paint-spraying booths.

Technical Notes:

1. 'Robots'

In Item 4A031.c. 'robot' means a manipulation mechanism, which may be of the continuous path or of the point-to-point variety, may use "sensors", and has all of the following characteristics:

 - (a) is multifunctional;*
 - (b) is capable of positioning or orienting material, parts, tools, or special devices through variable movements in three-dimensional space;*
 - (c) incorporates three or more closed or open loop servo-devices which may include stepping motors; and*

- (d) has “user-accessible programmability” by means of teach/playback method or by means of an electronic computer which may be a programmable logic controller, i.e., without mechanical intervention.

N.B.1:

In the above definition “sensors” means detectors of a physical phenomenon, the output of which (after conversion into a signal that can be interpreted by a control unit) is able to generate “programs” or modify programmed instructions or numerical “program” data. This includes “sensors” with machine vision, infrared imaging, acoustical imaging, tactile feel, inertial position measuring, optical or acoustic ranging or force or torque measuring capabilities.

N.B.2:

In the above definition “user-accessible programmability” means the facility allowing a user to insert, modify or replace “programs” by means other than:

- (a) a physical change in wiring or interconnections; or
- (b) the setting of function controls including entry of parameters.

N.B.3:

The above definition does not include the following devices:

- (a) Manipulation mechanisms which are only manually/teleoperator controllable;
- (b) Fixed sequence manipulation mechanisms which are automated moving devices operating according to mechanically fixed programmed motions. The “program” is mechanically limited by fixed stops, such as pins or cams. The sequence of motions and the selection of paths or angles are not variable or changeable by mechanical, electronic, or electrical means;
- (c) Mechanically controlled variable sequence manipulation mechanisms which are automated moving devices operating

according to mechanically fixed programmed motions. The “program” is mechanically limited by fixed, but adjustable, stops such as pins or cams. The sequence of motions and the selection of paths or angles are variable within the fixed “program” pattern. Variations or modifications of the “program” pattern (e.g., changes of pins or exchanges of cams) in one or more motion axes are accomplished only through mechanical operations;

(d) Non-servo-controlled variable sequence manipulation mechanisms which are automated moving devices, operating according to mechanically fixed programmed motions. The “program” is variable but the sequence proceeds only by the binary signal from mechanically fixed electrical binary devices or adjustable stops;

(e) Stacker cranes defined as Cartesian coordinate manipulator systems manufactured as an integral part of a vertical array of storage bins and designed to access the contents of those bins for storage or retrieval.

2. ‘End-effectors’

In Item 4A031.c. ‘end-effectors’ are grippers, ‘active tooling units’, and any other tooling that is attached to the baseplate on the end of a ‘robot’ manipulator arm.

N.B.:

In the above definition ‘active tooling units’ is a device for applying motive power, process energy or sensing to the workpiece.

- d. Remote manipulators that can be used to provide remote actions in radiochemical separation operations or hot cells, having either of the following characteristics:
1. A capability of penetrating 0.6 m or more of hot cell wall (through-the-wall operation); or
 2. A capability of bridging over the top of a hot cell wall with a thickness of 0.6 m or more (over-the-wall operation).

Technical Note: Remote manipulators provide translation of human operator actions to a remote operating arm and terminal fixture. They may be of a master/slave type or operated by joystick or keypad.

4B Equipment, assemblies and components, including test and measurement equipment usable in development of nuclear explosive devices

4B001 Photomultiplier tubes having both of the following characteristics:

- a. Photocathode area of greater than 20 cm²; and
- b. Anode pulse rise time of less than 1 ns.

4B002 Flash X-ray generators or pulsed electron accelerators having either of the following sets of characteristics:

- a. 1. An accelerator peak electron energy of 500 keV or greater but less than 25 MeV; and
2. With a figure of merit (K) of 0.25 or greater; or
- b. 1. An accelerator peak electron energy of 25 MeV or greater; and
2. A peak power greater than 50 MW.

Note: Item 4B002 does not control accelerators that are component parts of devices designed for purposes other than electron beam or X-ray radiation (electron microscopy, for example) nor those designed for medical purposes.

Technical Notes: 1. The figure of merit K is defined as: $K=1.7 \times 10^3 V^{2.65}Q$. V is the peak electron energy in million electron volts. If the accelerator beam pulse duration is less than or equal to $1\mu s$, then Q is the total accelerated charge in Coulombs. If the accelerator beam pulse duration is greater than $1\mu s$, then Q is the maximum accelerated charge in $1\mu s$. Q equals the integral of i with respect to t , over the lesser of $1\mu s$ or the time duration of the beam pulse ($Q = \int i dt$) where i is beam current in amperes and t is the time in seconds.

2. Peak power = (peak potential in volts) x (peak beam

current in amperes).

3. *In machines based on microwave accelerating cavities, the time duration of the beam pulse is the lesser of 1 μ s or the duration of the bunched beam packet resulting from one microwave modulator pulse.*
4. *In machines based on microwave accelerating cavities, the peak beam current is the average current in the time duration of a bunched beam packet.*

4B003 High-velocity gun systems (propellant, gas, coil, electromagnetic, and electrothermal types, and other advanced systems) capable of accelerating projectiles to 1.5 km/s or greater.

 Note: This item does not control guns specially designed for high velocity weapon systems.

4B004 High-speed cameras and imaging devices and components therefor, as follows:

N.B.: “Software” specially designed to enhance or release the performance of cameras or imaging devices to meet the characteristics below is controlled (See Item 4C).

- a. Streak cameras, and specially designed components therefor, as follows:
 1. Streak cameras with writing speeds greater than 0.5 mm/ μ s;
 2. Electronic streak cameras capable of 50 ns or less time resolution;
 3. Streak tubes for cameras specified in 4B004.a.2.;
 4. Plug-ins specially designed for use with streak cameras which have modular structures and that enable the performance specifications in 4B004.a.1 or 4B004.a.2.;
 5. Synchronizing electronics units, rotor assemblies consisting of turbines, mirrors and bearings specially designed for cameras specified in 4B004.a.1.

- b. Framing cameras and specially designed components therefor as follows:
 - 1. Framing cameras with recording rates greater than 225,000 frames per second;
 - 2. Framing cameras capable of 50 ns or less frame exposure time;
 - 3. Framing tubes and solid-state imaging devices having a fast image gating (shutter) time of 50ns or less specially designed for cameras specified in 4B004.b.1 or 4B004.b.2.;
 - 4. Plug-ins specially designed for use with framing cameras which have modular structures and that enable the performance specifications in 4B004.b.1 or 4B004.b.2.;
 - 5. Synchronizing electronics units, rotor assemblies consisting of turbines, mirrors and bearings specially designed for cameras specified in 4B004.b.1 or 4B004.b.2.

- c. Solid state or electron tube cameras and specially designed components therefor as follows:
 - 1. Solid-state cameras or electron tube cameras with a fast image gating (shutter) time of 50 ns or less;
 - 2. Solid-state imaging devices and image intensifiers tubes having a fast image gating (shutter) time of 50 ns or less specially designed for cameras specified in 4B004.c.1.;
 - 3. Electro-optical shuttering devices (Kerr or Pockels cells) with a fast image gating (shutter) time of 50 ns or less;
 - 4. Plug-ins specially designed for use with cameras which have modular structures and that enable the performance specifications in 4B004.c.1.

Technical Note: High speed single frame cameras can be used alone to produce a single image of a dynamic event, or several such cameras can be combined in a sequentially-triggered system to produce multiple images of an event.

- 4B005** High explosive containment vessels, chambers, containers and other similar containment devices designed for the testing of high explosives or explosive devices and having both of the following characteristics:
- a. Designed to fully contain an explosion equivalent to 2 kg of TNT or greater; and
 - b. Having design elements or features enabling real time or delayed transfer of diagnostic or measurement information.

4B006 Specialized instrumentation for hydrodynamic experiments, as follows:

- a. Velocity interferometers for measuring velocities exceeding 1 km/s during time intervals of less than 10 μ s;
- b. Shock pressure gauges capable of measuring pressures greater than 10 GPa, including gauges made with manganin, ytterbium, and polyvinylidene bifluoride (PVBF, PVF₂);
- c. Quartz pressure transducers for pressures greater than 10 GPa.

Note: Item 4B006.a. includes velocity interferometers such as VISARs (Velocity Interferometer Systems for Any Reflector), DLIs (Doppler Laser Interferometers) and PDV (Photonic Doppler Velocimeters) also known as Het-V (Heterodyne Velocimeters).

- 4B007** High-speed pulse generators, and pulse heads therefor, having both of the following characteristics:
- a. Output voltage greater than 6 V into a resistive load of less than 55 ohms; and
 - b. 'Pulse transition time' less than 500 ps.

Technical Notes:

1. In Item 4B007.b. 'pulse transition time' is defined as the time interval between 10% and 90% voltage amplitude.
2. Pulse heads are impulse forming networks designed to accept a voltage step function and shape it into a variety of pulse forms that can include rectangular, triangular, step, impulse, exponential, or monocycle types. Pulse heads can be an integral part of the pulse generator, they can be a plug-in module to the device or they can be an externally connected device.

4B008 Detonators and multipoint initiation systems, as follows:

- a. Electrically driven explosive detonators, as follows:
 1. Exploding bridge (EB);
 2. Exploding bridge wire (EBW);
 3. Slapper;
 4. Exploding foil initiators (EFI);
- b. Arrangements using single or multiple detonators designed to nearly simultaneously initiate an explosive surface over an area greater than 5000 mm² from a single firing signal with an initiation timing spread over the surface of less than 2.5 μs.

Note: Item 4B008. does not control detonators using only primary explosives, such as lead azide.

Technical Note:

In Item 4B008. the detonators of concern all utilize a small electrical conductor (bridge, bridge wire, or foil) that explosively vaporizes when a fast, high-current electrical pulse is passed through it. In nonslapper types, the exploding conductor starts a chemical detonation in a contacting high-explosive material such as PETN (pentaerythritoltetranitrate). In slapper detonators, the explosive vaporization of the electrical conductor drives a flyer or slapper across a gap, and the impact of the slapper on an explosive starts a chemical detonation. The slapper in some designs is driven by magnetic force. The term exploding foil detonator may refer to either an EB or a slapper-type detonator. Also, the word initiator is sometimes used in place of the word detonator.

4B009 Firing sets and equivalent high-current pulse generators, as follows:

- a. Detonator firing sets (initiation systems, firesets), including electronically-charged, explosively-driven and optically-driven firing sets designed to drive multiple controlled detonators specified by Item 4B008 above;
- b. Modular electrical pulse generators (pulsers) having all of the following

characteristics:

1. Designed for portable, mobile, or ruggedized-use;
 2. Capable of delivering their energy in less than 15 μ s into loads of less than 40 ohms;
 3. Having an output greater than 100 A;
 4. No dimension greater than 30 cm;
 5. Weight less than 30 kg ; and
 6. Specified to operate over an extended temperature range of 223 to 373 K (-50 °C to 100 °C) or specified as suitable for aerospace applications.
- c. Micro-firing units having all of the following characteristics:
1. No dimension greater than 35 mm;
 2. Voltage rating of equal to or greater than 1 kV; and
 3. Capacitance of equal to or greater than 100 nF.

Note: Optically driven firing sets include both those employing laser initiation and laser charging. Explosively-driven firing sets include both explosive ferroelectric and explosive ferromagnetic firing set types. Item 4B009.b. includes xenon flashlamp drivers.

4B010 Switching devices as follows:

- a. Cold-cathode tubes, whether gas filled or not, operating similarly to a spark gap, having all of the following characteristics:
 1. Containing three or more electrodes;
 2. Anode peak voltage rating of 2.5 kV or more;
 3. Anode peak current rating of 100 A or more; and
 4. Anode delay time of 10 μ s or less;

Note: Item 4B010.a. includes gas krytron tubes and vacuum spraytron tubes.

- b. Triggered spark-gaps having both of the following characteristics:
 - 1. Anode delay time of 15 μ s or less; and
 - 2. Rated for a peak current of 500 A or more;
- c. Modules or assemblies with a fast switching function having all of the following characteristics:
 - 1. Anode peak voltage rating greater than 2 kV;
 - 2. Anode peak current rating of 500 A or more; and
 - 3. Turn-on time of 1 μ s or less.

4B011 Pulse discharge capacitors having either of the following sets of characteristics:

- a.
 - 1. Voltage rating greater than 1.4 kV;
 - 2. Energy storage greater than 10 J;
 - 3. Capacitance greater than 0.5 μ F; and
 - 4. Series inductance less than 50 nH; or
- b.
 - 1. Voltage rating greater than 750 V;
 - 2. Capacitance greater than 0.25 μ F; and
 - 3. Series inductance less than 10 nH.

4B012 Neutron generator systems, including tubes, having both of the following characteristics:

- a. Designed for operation without an external vacuum system; and
- b.
 - 1. Utilizing electrostatic acceleration to induce a tritium-deuterium

nuclear reaction; or

2. Utilizing electrostatic acceleration to induce a deuterium-deuterium nuclear reaction and capable of an Output of 3×10^9 neutrons/s or greater.

4B013 Striplines to provide low inductance path to detonators with the following characteristics:

- a. Voltage rating greater than 2 kV; and
- b. Inductance of less than 20 nH

4C Technology and Software

Technology and software for the development, production or use of items specified in 4A or 4B. '

3. **Purpose of this notification:** Amendments/additions to Categories 0, 3 & 4 of SCOMET list [Appendix 3 to Schedule 2 of ITC(HS) Classification of Export & Import Items] have been notified.

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