Information Circular

INFCIRC

GUIDELINES FOR NUCLEAR TRANSFERS

1. The following fundamental principles for safeguards and export controls should apply to nuclear transfers for peaceful purposes to any non-nuclear-weapon State and, in the case of controls on retransfer, to transfers to any State. In this connection, suppliers have defined an export trigger list.

Prohibition on nuclear explosives

2. Suppliers should authorize transfer of items or related technology identified in the trigger list only upon formal governmental assurances from recipients explicitly excluding uses which would result in any nuclear explosive device.

Physical protection

3. (a) All nuclear materials and facilities identified by the agreed trigger list should be placed under effective physical protection to prevent unauthorized use and handling. The levels of physical protection to be ensured in relation to the type of materials, equipment and facilities, have been agreed by the suppliers, taking account of international recommendations.

   (b) The implementation of measures of physical protection in the recipient country is the responsibility of the Government of that country. However, in order to implement the terms agreed upon amongst suppliers, the levels of physical protection on which these measures have to be based should be the subject of an agreement between supplier and recipient.

   (c) In each case special arrangements should be made for a clear definition of responsibilities for the transport of trigger list items.

Safeguards

4. (a) Suppliers should transfer trigger list items or related technology to a non-nuclear weapon State only when the receiving State has brought into force an agreement with the IAEA requiring the application of safeguards on all source and special fissionable material in its current and future peaceful activities. Suppliers should authorize such transfers only upon formal governmental assurances from the recipient that:

   if the above-mentioned agreement should be terminated the recipient will bring into force an agreement with the IAEA based on existing IAEA model safeguards agreements requiring the application of safeguards on all trigger list items or related technology transferred by the supplier or processed, or produced or used in connection with such transfers; and

   if the IAEA decides that the application of IAEA safeguards is no longer possible, the supplier and recipient should elaborate appropriate verification measures. If the recipient does not accept these measures, it should allow at the request of the supplier the restitution of transferred and derived trigger list items.

purposes of this paragraph, “breach” refers only to serious breaches of proliferation concern;

(iii) Is adhering to the NSG Guidelines and has reported to the of the Special Arrangements below must be consistent with NPT principles, in particular Article IV. Any application by the suppliers of the following Special Arrangements may not abrogate the rights of States meeting the criteria in paragraph 6.

(a) For a transfer of an enrichment facility, or equipment or technology therefor, suppliers should seek a legally-binding undertaking from the recipient state that neither the transferred facility, nor any facility incorporating such equipment or based on such technology, will be modified or operated for the production of greater than 20% enriched uranium. Suppliers should seek to design and construct such an enrichment facility or equipment therefor so as to preclude, to the greatest extent practicable, the possibility of production of greater than 20% enriched uranium.

(b) For a transfer of an enrichment facility, or equipment based on a particular enrichment technology which has been demonstrated to produce enriched uranium on a significant scale as of 31 December 2008, suppliers should:

(1) Avoid, as far as practicable, the tran

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(e) Suppliers should make special efforts to ensure effective implementation of IAEA safeguards at supplied enrichment facilities, consistent with paragraphs 13 and 14 of the Guidelines. For a transfer of an enrichment facility, the supplier and recipient state should work together to ensure that the design and construction of the transferred facility is implemented in such a way so as to facilitate IAEA safeguards. The supplier and recipient state should consult with the IAEA about such design and construction features at the earliest possible time during the facility design phase, and in any event before construction of the enrichment facility is started. The supplier and recipient state should also work together to assist the recipient state in developing effective nuclear material and facilities protection measures, consistent with paragraphs 12 and 14 of the Guidelines.

(f) Suppliers should satisfy themselves that recipients have security arrangements in place that are equivalent or superior to their own to protect the facilities and technology from use or transfer inconsistent with the national laws of the receiving state.

Definitions Section:

For the purpose of implementing Paragraph 7 of the Guidelines "Cooperative Enrichment Enterprise" means a multi-country or multi-company (where at least two of the companies are incorporated in different countries) joint development or production effort. It could be a consortium of states or companies or a multinational corporation.

Controls on supplied or derived material usable for nuclear weapons or other nuclear explosive devices

8. Suppliers should, in order to advance the objectives of these guidelines and to provide opportunities further to reduce the risks of proliferation, include, whenever appropriate and practicable, in agreements on supply of nuclear materials or of facilities which produce material usable for nuclear weapons or other nuclear explosive devices, provisions calling for mutual agreement between the supplier and the recipient on arrangements for reprocessing, storage, alteration, use, transfer or retransfer of any material usable for nuclear weapons or other nuclear explosive devices involved.

Controls on retransfer

9. (a) Suppliers should transfer trigger list items or related technology only upon the recipient's assurance that in the case of:

(1) retransfer of such items or related technology,

or

(2) transfer of trigger list items derived from facilities originally transferred by the supplier, or with the help of equipment or technology originally transferred by the supplier;

the recipient of the retransfer or transfer will have provided the same assurances as those required by the supplier for the original transfer.

(b) In addition the supplier's consent should be required for:

(1) any retransfer of trigger list items or related technology and any transfer referred to under paragraph 9(a) (2) from any State which does not require full scope safeguards, in accordance with paragraph 4(a) of these Guidelines, as a condition of supply;

(2) any retransfer of enrichment, reprocessing or heavy water production facilities, equipment or related technology, and for any transfer of facilities or equipment of the same type derived from items originally transferred by the supplier;

(3) any retransfer of heavy water or material usable for nuclear weapons or other nuclear explosive devices.

(c) To ensure the consent right as defined under paragraph 9(b), government to government assurances will be required for any relevant original transfer.

(d) Suppliers should consider restraint in the transfer of items and related technology identified in the trigger list if there is a risk of retransfers contrary to the assurances given under paragraph 9(a) and (c) as a result of a failure by the recipient to develop and maintain appropriate, effective national export and transshipment controls, as identified by UNSC Resolution 1540.

Non-proliferation Principle

10. Notwithstanding other provisions of these Guidelines, suppliers should authorize transfer of items or related technology identified in the trigger list only when they are satisfied that the transfers would not contribute to the proliferation of nuclear weapons or other nuclear explosive devices or be diverted to acts of nuclear terrorism.

Implementation

11. Suppliers should have in place legal measures to ensure the effective implementation of the Guidelines, including export licensing regulations, enforcement measures, and penalties for violations.

SUPPORTING ACTIVITIES

Support for access to nuclear material for peaceful uses

12. Suppliers should, in accordance with the objectives of these guidelines, facilitate access to nuclear material for the peaceful uses of nuclear energy, and encourage, within the scope of Article IV of the NPT, recipients to take the fullest possible advantage of the

international commercial market and other available international mechanisms for nuclear fuel services while not undermining the global fuel market.

Physical security

13. Suppliers should promote international co-operation in the areas of physical security through the exchange of physical security information, protection of nuclear materials in transit, and recovery of stolen nuclear materials and equipment. Suppliers should promote

(b) Suppliers should consult, as each deems appropriate, with other governments concerned on specific sensitive cases, to ensure that any transfer does not contribute to risks of conflict or instability.

(c) Without prejudice to subparagraphs (d) to (f) below:

In the event that one or more suppliers believe that there has been a violation of supplier/recipient understanding resulting from these Guidelines, particularly in the case of an explosion of a nuclear device, illegal termination or violation of IAEA safeguards by a recipient, suppliers should consult promptly through diplomatic channels in order to determine and assess the reality and extent of the alleged violation. Suppliers are also encouraged to consult where nuclear material or nuclear fuel cycles activity undeclared to the IAEA or a nuclear explosive activity is revealed.

Pending the early outcome of such consultations, suppliers will not act in a manner that could prejudice any measure that may be adopted by other suppliers concerning their current contacts with that recipient. Each supplier should also consider

(f) The provisions of subparagraph (e) above do not apply to transfers under paragraph 4 (b) of the Guidelines.

18. Unanimous consent is required for any changes in these Guidelines, including any which might result from the reconsideration mentioned in paragraph 5.

ANNEX A
TRIGGER LIST REFERRED TO IN GUIDELINES

GENERAL NOTES

1. The object of these controls should not be defeated by the transfer of component parts. Each government will take such actions as it can to achieve this aim and will continue to seek a workable definition for component parts, which could be used by all suppliers.

2. With reference to Paragraph 9(b)(2) of the Guidelines, same type should be understood as when the design, construction or operating processes are based on the same or similar physical or chemical processes as those identified in the Trigger List.

3. Suppliers recognize the close relationship for certain isotope separation processes between plants, equipment and technology for uranium enrichment and that for the separation of stable isotopes for research, medical and other non-nuclear industrial purposes. In that regard, suppliers should carefully review their legal measures, including export licensing regulations and information/technology classification and security practices, for stable isotope separation activities to ensure the implementation of approporiate protection measures as warranted. Suppliers recognize that, in particular cases, appropriate protection measures for stable isotope separation activities will be essentially the same as those for uranium enrichment. (See Introductory Note to Section 5 of the Trigger List.) In accordance with Paragraph 16(a) of the Guidelines, suppliers shall consult with other suppliers as appropriate, in order to promote uniform policies and procedures in the transfer and protection of stable isotope separation plants, equipment and technology.

TECHNOLOGY CONTROLS

The transfer of "technology" directly associated with any item in the List will be subject to as great a degree of scrutiny and control as will the item itself, to the extent permitted by national legislation.

Controls on "technology" transfer do not apply to information "in the public domain" or to "development" - is related to all phases before "production" such as:

design
design research

2. Equipment and Non-nuclear Materials

The designation of items of equipment and non-nuclear materials adopted by the Government is as follows (quantities below the levels indicated in the Annex B being regarded as insignificant for practical purposes):

2.1. Nuclear reactors and especially designed or prepared equipment and components therefor (see Annex B, section 1.);

2.2. Non-nuclear materials for reactors (see Annex B, section 2.);

2.3. Plants for the reprocessing of irradiated fuel elements, and equipment especially designed or prepared therefor (see Annex B, section 3.);

2.4. Plants for the fabrication of nuclear reactor fuel elements, and equipment especially designed or prepared therefor (see Annex B, section 4.);

2.5. Plants for the separation of isotopes of natural uranium, depleted uranium or special fissionable material and equipment, other than analytical instruments, especially designed or prepared therefor (see Annex B, section 5.);

2.6. Plants for the production or concentration of heavy water, deuterium and deuterium compounds and equipment especially designed or prepared therefor (see Annex B, section 6.);

2.7. Plants for the conversion of uranium and plutonium for use in the fabrication of fuel elements and the separation of uranium isotopes as defined in sections 4 and 5 respectively, and equipment especially designed or prepared therefor (See Annex B, section 7.).

ANNEX B

CLARIFICATION OF ITEMS ON THE TRIGGER LIST

(as designated in Section 2 of MATERIAL AND EQUIPMENT of Annex A)

1. Nuclear reactors and especially designed or prepared equipment and components therefor

1.1. Complete nuclear reactors

Nuclear reactors capable of operation so as to maintain a controlled self-sustaining fission chain reaction, excluding zero energy reactors, the latter being defined as reactors with a designed maximum rate of production of plutonium not exceeding 100 grams per year.

EXPLANATORY NOTE

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.

It is not intended to exclude reactors which could reasonably be capable of modification to produce significantly more than 100 grams of plutonium per year. Reactors designed for sustained operation at significant power levels, regardless of their capacity for plutonium production are not considered as "zero energy reactors".

EXPORTS

The export of the whole set of major items within this boundary will take place only in accordance with the procedures of the Guidelines. Those individual items within this functionally defined boundary which will be exported only in accordance with the procedures of the Guidelines are listed in paragraphs 1.2. to 1.10. The Government reserves to itself the right to apply the procedures of the Guidelines to other items within the functionally defined boundary.

1.2. Nuclear reactor vessels

Metal vessels, or major shop-fabricated parts therefor, especially designed or prepared to contain the core of a nuclear reactor as defined in paragraph 1.1. above, as well as relevant reactor internals as defined in paragraph 1.8. below.

EXPLANATORY NOTE

The reactor vessel head is covered by item 1.2. as a major shop-fabricated part of a reactor vessel.

1.3. Nuclear reactor fuel charging and discharging machines

Manipulative equipment especially designed or prepared for inserting or removing fuel in a nuclear reactor as defined in paragraph 1.1. above.

EXPLANATORY NOTE

The items noted above are capable of on-load operation or at employing technically sophisticated positioning or alignment features to allow complex off-load fueling operations such as those in which direct viewing of or access to the fuel is not normally available.

1.4. Nuclear reactor control rods and equipment

Especially designed or prepared rods, support or suspension structures therefor, rod drive mechanisms or rod guide tubes to control the fission process in a nuclear reactor as defined in paragraph 1.1. above.

1.5. Nuclear reactor pressure tubes

Tubes which are especially designed or prepared to contain fuel elements and the primary coolant in a reactor as defined in paragraph 1.1. above at an operating pressure in excess of 50 atmospheres.

1.6. Zirconium tubes

Zirconium metal and alloys in the form of tubes or assemblies of tubes, and in quantities exceeding 500 kg for any one recipient country in any period of 12 months, especially designed or prepared for use in a reactor as defined in paragraph 1.1. above, and in which the relation of hafnium to zirconium is less than 1:500 parts by weight.

1.7. Primary coolant pumps

Pumps especially designed or prepared for circulating the primary coolant for nuclear reactors as defined in paragraph 1.1. above.

EXPLANATORY NOTE

Especially designed or prepared pumps may include elaborate sealed or multi-sealed systems to prevent leakage of primary coolant, canned-driven pumps, and pumps with

EXPLANATORY NOTE

"Nuclear reactor internals" are major structures within a reactor vessel which have one or more functions such as supporting the core, maintaining fuel alignment, directing primary coolant flow, providing radiation shields for the reactor vessel, and guiding in-core instrumentation.

1.9. Heat exchangers

Heat exchangers (steam generators) especially designed or prepared for use in the primary coolant circuit of a nuclear reactor as defined in paragraph 1.1 above.

EXPLANATORY NOTE

Steam generators are especially designed or prepared to transfer the heat generated in the reactor (primary side) to the feed water (secondary side) for steam generation. In the case of a liquid metal fast breeder reactor for which an intermediate liquid metal coolant loop is also present, the heat exchangers for transferring heat from the primary side to the intermediate coolant circuit are understood to be within the scope of control in addition to the steam generator. The scope of control for this entry does not include heat exchangers for the emergency cooling system or the decay heat cooling system.

1.10. 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 1.1. above.

EXPLANATORY NOTE

The scope of this entry encompasses in-core and ex-core instrumentation which measure flux levels in a large range, typically from 10^4 neutrons per cm^2 per second to 10^{10} neutrons per cm^2 per second or more. Ex-core refers to those instruments outside the core of a reactor as defined in paragraph 1.1. above, but located within the biological shielding.

2. Non-nuclear materials for reactors

2.1. Deuterium and heavy water

Deuterium, heavy water (deuterium oxide) and any other deuterium compound in which the ratio of deuterium to hydrogen atoms exceeds 1:5000 for use in a nuclear reactor as defined in paragraph 1.1. above in quantities exceeding 200 kg of deuterium atoms for any one recipient country in any period of 12 months.

2.2. 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/cm^3 for use in a nuclear reactor as defined in paragraph 1.1 above, in quantities exceeding 30 metric tons for any one recipient country in any period of 12 months.

EXPLANATORY NOTE

For the purpose of export control, the Government will determine whether or not the exports of graphite meeting the above specifications are for nuclear reactor use.

Boron equivalent (BE) may be determined experimentally or is calculated as the sum of BE_z for impurities (excluding BE_{carbon} since carbon is not considered an impurity) including boron, where:

BE_z (ppm) = CF x concentration of element Z (in ppm);
CF is the conversion factor: (σ_z x A_B) divided by (σ_B x A_z);
σ_B and σ_z are the thermal neutron capture cross sections (in barns) for naturally occurring boron and
element Z respectively; and A_B and A_z are the atomic masses of naturally occurring boron and element Z respectively.

4. Plants for the fabrication of nuclear reactor fuel elements, and equipment especially designed or prepared therefor

INTRODUCTORY NOTE

Nuclear fuel elements are manufactured from one or more of the source or special fissionable materials mentioned in MATERIAL AND EQUIPMENT of this annex. For oxide fuels, the most common type of fuel, equipment for pressing pellets, sintering, grinding and grading will be present. Mixed oxide fuels are handled in glove boxes (or equivalent containment) until they are sealed in the cladding. In all cases, the fuel is hermetically sealed inside a suitable cladding which is designed to be the primary envelope encasing the fuel so as to provide suitable performance and safety during reactor operation. Also, in all cases, precise control of processes, procedures and equipment to extremely high standards is necessary in order to ensure predictable and safe fuel performance.

EXPLANATORY NOTE

Items of equipment that are considered to fall within the meaning of the phrase "and equipment especially designed or prepared" for the fabrication of fuel elements include equipment which:

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

(b) seals the nuclear material within the cladding;

(c) checks the integrity of the cladding or the seal; or

(d) checks the finish treatment of the sealed fuel.

Such equipment or systems of equipment may include, for example:

1) fully automatic pellet inspection stations especially designed or prepared for checking final dimensions and surface defects of the fuel pellets;

2) automatic welding machines especially designed or prepared for welding end caps onto the fuel pins (or rods);

3) automatic test and inspection stations especially designed or prepared for checking the integrity of completed fuel pins (or rods).

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

5. Plants for the separation of isotopes of natural uranium, depleted uranium or special fissionable material and equipment, other than analytical instruments, especially designed or prepared therefor

INTRODUCTORY NOTE

Plants, equipment and technology for the separation of uranium isotopes have, in many instances, a close relationship to plants, equipment and technology for the separation of stable isotopes. In particular cases, the controls under Section 5 also apply to plants and equipment that are intended for the separation of stable isotopes. These controls of plants and equipment for the separation of stable isotopes are complimentary to controls on plants and equipment especially designed or prepared for the processing, use or production of special fissionable material covered by the Trigger List. These complementary Section 5 controls for stable isotope uses do not apply to the electromagnetic isotope separation process, which is addressed under Part 2 of the Guidelines.

nor are they fabricated out of unique materials. A centrifuge facility however requires a large number of these components, so that quantities can provide an important indication of end use.

5.1.1. Rotating components

(a) Complete rotor assemblies:

Thin-walled cylinders, or a number of interconnected thin-walled cylinders, elements of the motor and lower bearing (bottom cap), and manufactured from one of the high strength to density ratio materials described in the EXPLANATORY NOTE to this Section.

EXPLANATORY NOTE

The materials used for centrifuge rotating components are:

(a) Maraging steel capable of an ultimate tensile strength of 2.05×10^9 N/m^2 (300,000 psi) or more;

(b) Aluminium alloys capable of an ultimate tensile strength of 0.46×10^9 N/m^2 (67,000 psi) 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 ('Specific Modulus' is the Young's Modulus in N/m^2 divided by the specific weight in N/m^3; 'Specific Ultimate Tensile Strength' is the ultimate tensile strength in N/ m^2 divided by the specific weight in N/m^3).

5.1.2. Static components

(a) Magnetic suspension bearings:

Especially designed or prepared bearing assemblies consisting of an annular magnet suspended within a housing containing a damping medium. The housing will be manufactured from a UF_6-resistant material (see EXPLANATORY NOTE to Section 5.2.). The magnet couples with a pole piece or a second magnet fitted to the top cap described in Section 5.1.1.(e). The magnet may be ring-shaped with a relation between outer and inner diameter smaller or equal to 1.6:1. The magnet may be in a form having an initial permeability of 0.15 H/m (120,000 in CGS units) or more, or a remanence of 98.5% or more, or an energy product of greater than 80 kJ/m^3 (10^7 gauss-oersteds). In addition to the usual material properties, it is a prerequisite that the deviation of the magnetic axes from the geometrical axes is limited to very small tolerances (lower than 0.1 mm or 0.004 in) or that homogeneity of the material of the magnet is specially called for.

(b) 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 section 5.1.1.(e) 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.

(c) Molecular pumps:

Especially designed or prepared cylinders

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

INTRODUCTORY NOTE

The auxiliary systems, equipment and components for a gas centrifuge enrichment plant are the systems of plant needed to feed UF_6 to the centrifuges, to link the individual centrifuges to each other to form cascades (or stages) to allow for progressively higher enrichments and extract the 'product' and 'tails' UF_6 from the centrifuges, together with the equipment required to drive the centrifuges or to control the plant.

Normally UF_6 is evaporated from the solid using heated autoclaves and is distributed in gaseous form to the centrifuges by way of cascade header pipework. The 'product' and 'tails' UF_6 gaseous streams flowing from the centrifuges are also passed by way of cascade header pipework to cold traps (operating at about 203 K (-70ºC)) where they are condensed prior to onward transfer into suitable containers for transportation or

5.2.3 Special shut-off and control valves

Especially designed or prepared bellows-sealed valves, manual or automated, shut-off or control, made of or protected by materials resistant to corrosion by UF_6, with a diameter of 10 to 160 mm, for use in main or auxiliary systems of gas centrifuge enrichment plants.

5.2.4. UF_6 mass spectrometers/ion sources

Especially designed or prepared magnetic or quadrupole mass spectrometers capable of taking 'on-line' samples of feed, product or tails, from UF_6 gas streams and having all of the following characteristics:

1. Unit resolution for atomic mass unit greater than 320;

2. Ion sources constructed of or lined with nichrome or monel or nickel plated;

3. Electron bombardment ionization sources;

4. Having a collector system suitable for isotopic analysis.

5.2.5. Frequency changers

Frequency changers (also known as converters or invertors) especially designed or prepared to supply motor stators as defined under 5.1.2.(d), or parts, components and sub-assemblies of such frequency changers ha

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

5.3.4. Rotary shaft seals

Especially designed or prepared vacuum seals, with seal feed and seal exhaust connections, for sealing the shaft connecting the compressor or the gas blower rotor with the driver motor so as to ensure a reliable seal against in-leaking of air into the inner chamber of the compressor or gas blower which is filled with UF_6. Such seals are normally designed for a buffer gas in-leakage rate of less than 1000 cm^3/min (60 in^3/min).

5.3.5. Heat exchangers for cooling UF_6

Especially designed or prepared heat exchangers made of or lined with UF_6-resistant materials (except stainless steel) or with copper or any combination of those metals, and intended for a leakage pressure change rate of less than 10 Pa (0.0015 psi) per hour under a pressure difference of 100 kPa (15 psi).

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

INTRODUCTORY NOTE

The auxiliary systems, equipment and components for gaseous diffusion enrichment plants are the systems of plant needed to feed UF_6 to the gaseous diffusion assembly, to link the individual assemblies to each other to form cascades (or stages) to allow for progressively higher enrichments and to extract the "product" and "tails" UF_6 from the diffusion cascades. Because of the high inertial properties of diffusion cascades, any interruption in their operation, and especially their shut-down, leads to serious consequences. Therefore, a strict and constant maintenance of vacuum in all technological systems, automatic protection from accidents, and precise automated regulation of the gas flow is of importance in a gaseous diffusion plant. All this leads to a need to equip the plant with a large number of special measuring, regulating and controlling systems.

Normally UF_6 is evaporated from cylinders placed within autoclaves and is distributed in gaseous form to the entry point by way of cascade header pipework. The "product" and "tails" UF_6 gaseous streams flowing from exit points are passed by way of cascade header pipework to either cold traps or to compression stations where the UF_6 gas is liquefied prior to onward transfer into suitable containers for transportation or storage. Because a gaseous diffusion enrichment plant consists of a large number of gaseous diffusion assemblies arranged in cascades, there are many kilometers of cascade header pipework, incorporating thousands of welds with substantial amounts of repetition of layout. The equipment, components and piping systems are fabricated to very high vacuum and cleanliness standards.

5.4.1. Feed systems/product and tails withdrawal systems

Especially designed or prepared process systems, capable of operating at pressures of 300 kPa (45 psi) or less, including:

Feed autoclaves (or systems), used for passing UF_6 to the gaseous diffusion cascades;

Desublimers (or cold traps) used to remove UF_6 from diffusion cascades;

Liquefaction stations where UF_6 gas from the cascade is compressed and cooled to form liquid UF_6;

"Product" or "tails" stations used for transferring UF_6 into containers.

5.4.2. Header piping systems

Especially designed or prepared piping systems and header systems for handling UF_6 within the gaseous diffusion cascades. This piping network is normally of the "double" header system with each cell connected to each of the headers.

5.4.3. Vacuum systems

(a) Especially designed or prepared large vacuum manifolds, vacuum headers and vacuum pumps having a suction capacity of 5 m^3/min (175 ft^3

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

INTRODUCTORY NOTE

In aerodynamic enrichment processes, a mixture of gaseous UF_6 and light gas (hydrogen or helium) is compressed and then passed through separating elements wherein isotopic separation is accomplished by the generation of high centrifugal forces over a curved-wall geometry. Two processes of this type have been successfully developed: the separation nozzle process and the vortex tube process. For both processes the main components of a se

5.5.3. Compressors and gas blowers

Especially designed or prepared axial, centrifugal or positive displacement compressors or gas blowers made of or protected by materials resistant to corrosion by UF_6 and with a suction volume capacity of 2 m^3/min or more of UF_6/carrier gas (hydrogen or helium) mixture.

EXPLANATORY NOTE

These compressors and gas blowers typically have a pressure ratio between 1.2:1 and 6:1.

5.5.4. Rotary shaft seals

Especially designed or prepared rotary shaft seals, with seal feed and seal exhaust connections, for sealing the shaft connecting the compressor rotor or the gas blower rotor with the driver motor so as to ensure a reliable seal against out-leakage of process gas or in-leakage of air or seal gas into the inner chamber of the compressor or gas blower which is filled with a UF_6/carrier gas mixture.

5.5.5. Heat exchangers for gas cooling

Especially designed or prepared heat exchangers made of or protected by materials resistant to corrosion by UF_6.

5.5.6. Separation element housings

Especially designed or prepared separation element housings, made of or protected by materials resistant to corrosion by UF_6, for containing vortex tubes or separation nozzles.

EXPLANATORY NOTE

These housings may be cylindrical vessels greater than 300 mm in diameter and greater than 900 mm in length, or may be rectangular vessels of comparable dimensions, and may be designed for horizontal or vertical installation.

5.5.7. Feed systems/product and tails withdrawal systems

Especially designed or prepared process systems or equipment for enrichment plants made of or protected by materials resistant to corrosion by UF_6, including:

(a) Feed autoclaves, ovens, or systems used for passing UF_6 to the enrichment process;

(b) Desublimers (or cold traps) used to remove UF_6 from the enrichment process for subsequent transfer upon heating;

(c) Solidification or liquefaction stations used to remove UF_6 from the enrichment process by compressing and converting UF_6 to a liquid or solid form;

(d) 'Product' or 'tails' stations used for transferring UF_6 into containers.

5.5.8. Header piping systems

Especially designed or prepared header piping systems, made of or protected by materials resistant to corrosion by UF_6, for handling UF_6 within the aerodynamic cascades. This piping network is normally of the 'double' header design with each stage or group of stages connected to each of the headers.

5.5.9. Vacuum systems and pumps

(a) Especially designed or prepared vacuum systems having a suction capacity of 5 m^3/min or more, consisting of vacuum manifolds, vacuum headers and vacuum pumps, and designed for service in UF_6-bearing atmospheres,

(b) Vacuum pumps especially designed or prepared for service in UF_6-bearing atmospheres and made of or protected by materials resistant to corrosion by UF_6. These pumps may use fluorocarbon seals and special working fluids.

5.5.10. Special shut-off and control valves

Especially designed or prepared manual or automated shut-off and control bellows valves made of or protected by materials resistant to corrosion by UF_6 with a diameter of 40 to 1500 mm for installation in main and auxiliary systems of aerodynamic enrichment plants.

5.5.11. UF_6 mass spectrometers/Ion sources

Especially designed or prepared magnetic or quadrupole mass spectrometers capable of taking 'on-line' samples of feed, 'product' or 'tails', from UF_6 gas streams and having all of the following characteristics:

1. Unit resolution for mass greater than 320;

2. Ion sources constructed of or lined with nichrome or monel or nickel plated;

3. Electron bombardment ionization sources;

4. Collector system suitable for isotopic analysis.

5.5.12. UF_6/carrier gas separation systems

Especially designed or prepared process systems for separating UF_6 from carrier gas (hydrogen or helium).

EXPLANATORY NOTE

These systems are designed to reduce the UF_6 content in the carrier gas to 1 ppm or less and may incorporate equipment such as:

(a) Cryogenic heat exchangers and cryoseparators capable of temperatures of -120°C or less, or

(b) Cryogenic refrigeration units capable of temperatures of -120°C or less, or

(c) Separation nozzle or vortex tube units for the separation of UF_6 from carrier gas, or

(d) UF_6 cold traps capable of temperatures of -20°C or less.

solutions, the contactors are made of or are lined with suit

5.6.6. Fast-reacting ion exchange resins/adsorbents (Ion exchange)

Fast-reacting ion-exchange resins or adsorbents especially designed or prepared for uranium enrichment using the ion exchange process, including porous macroreticular resins, and/or pellicular structures in which the active chemical exchange groups are limited to a coating on the surface of an inactive porous support structure, and other composite structures in any suitable form including particles or fibers. These ion exchange resins/adsorbents have diameters of 0.2 mm or less and must be chemically resistant to concentrated hydrochloric acid solutions as well as physically strong enough so as not to degrade in the exchange columns. The resins/adsorbents are especially designed to achieve very fast uranium isotope exchange kinetics (exchange rate half-time of less than 10 seconds) and are capable of operating at a temperature in the range of 100°C to 200°C.

5.6.7. Ion exchange columns (Ion exchange)

Cylindrical columns greater than 1000 mm in diameter for containing and supporting packed beds of ion exchange resin/adsorbent, especially designed or prepared for uranium enrichment using the ion exchange process. These columns are made of or protected by materials (such as titanium or fluorocarbon plastics) resistant to corrosion by concentrated hydrochloric acid solutions and are capable of operating at a temperature in the range of 100°C to 200°C and pressures above 0.7 MPa (102 psi).

5.6.8. Ion exchange reflux systems (Ion exchange)

(a) Especially designed or prepared chemical or electrochemical reduction systems for regeneration of the chemical reducing agent(s) used in ion exchange uranium enrichment cascades.

(b) Especially designed or prepared chemical or electrochemical oxidation systems for regeneration of the chemical oxidizing agent(s) used in ion exchange uranium enrichment cascades.

EXPLANATORY NOTE

The ion exchange enrichment process may use, for example, trivalent titanium (Ti^{+3}) as a reducing cation in which case the reduction system would regenerate Ti^{+3} by reducing Ti^{+4}.

The process may use, for example, trivalent iron (Fe^{+3}) as an oxidant in which case the oxidation system would regenerate Fe^{+3} by oxidizing Fe^{+2}.

5.7. Especially designed or prepared systems, equipment and components for use in laser-based enrichment plants.

graphite coated with other rare earth oxides (see INFCIRC/254/Part 2 - (as amended)) or mixtures thereof.

5.7.3. Uranium metal 'product' and 'tails' collector assemblies (AVLIS)

Especially designed or prepared 'product' and 'tails' collector assemblies for uranium metal in liquid or solid form.

EXPLANATORY NOTE

Components for these assemblies are made of or protected by materials resistant to the heat and corrosion of uranium metal vapor or liquid (such as yttria-coated graphite or tantalum) and may include pipes, valves, fittings, 'gutters', feed-throughs, heat exchangers and collector plates for magnetic, electrostatic or other separation methods.

5.7.4. Separator module housings (AVLIS)

Especially designed or prepared cylindrical or rectangular vessels for containing the uranium metal vapor source, the electron beam gun, and the ''product' and 'tails' collectors.

EXPLANATORY NOTE

These housings have multiplicity of ports for electrical and water feed-throughs, laser beam windows, vacuum pump connections and instrumentation diagnostics and monitoring. They have provisions for opening and closure to allow refurbishment of internal components.

5.7.5. Supersonic expansion nozzles (MLIS)

Especially designed or prepared supersonic expansion nozzles for cooling mixtures of UF_6 and carrier gas to 150 K or less and which are corrosion resistant to UF_6.

5.7.6. Uranium pentafluoride product collectors (MLIS)

Especially designed or prepared uranium pentafluoride (UF_5) solid product collectors consisting of filter, impact, or cyclone-type collectors, or combinations thereof, and which are corrosion resistant to the UF_5/UF_6 environment.

5.7.7. UF_6/carrier gas compressors (MLIS)

Especially designed or prepared compressors for UF_6/carrier gas mixtures, designed for long term operation in a UF_6 environment. The components of these compressors that come into contact with process gas are made of or protected by materials resistant to corrosion by UF_6.

5.7.8. Rotary shaft seals (MLIS)

Especially designed or prepared rotary shaft seals, with seal feed and seal exhaust

(d) 'Product' or 'tails' stations used for transferring UF_6 into containers.

5.7.12. UF_6/carrier gas separation systems (MLIS)

Especially designed or prepared process systems for separating UF_6 from carrier gas. The carrier gas may be nitrogen, argon, or other gas.

EXPLANATORY NOTE

These systems may incorporate equipment such as:

(a) Cryogenic heat exchangers or cryoseparat

5.8. Especially designed or prepared systems, equipment and components for use in plasma separation enrichment plants.

INTRODUCTORY NOTE

In the plasma separation process, a plasma of uranium ions passes through an electric field tuned to the ^{235}U ion resonance frequency so that they preferentially absorb energy and increase the diameter of their corkscrew-like orbits. Ions with a large-diameter path are trapped to produce a product enriched in ^{235}U. The plasma, which is made by ionizing uranium vapor, is contained in a vacuum chamber with a high-strength magnetic field produced by a superconducting magnet. The main technological systems of the process incl

5.8.5. Uranium metal 'product' and 'tails' collector assemblies

Especially designed or prepared 'product' and 'tails' collector assemblies for uranium metal in solid form. These collector assemblies are made of or protected by materials resistant to the heat and corrosion of uranium metal vapor, such as yttria-coated graphite or tantalum.

5.8.6. Separator module housings

Cylindrical vessels especially designed or prepared for use in plasma separation enrichment plants for containing the uranium plasma source, radio-frequency drive coil and the 'product' and 'tails' collectors.

EXPLANATORY NOTE

These housings have a multiplicity of ports for electrical feed-throughs, diffusion pump connections and instrumentation diagnostics and monitoring. They have provisions for opening and closure to allow for refurbishment of internal components and are constructed of a suitable non-magnetic material such as stainless steel.

5.9. Especially designed or prepared system

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

INTRODUCTORY NOTE

Heavy water can be produced by a variety of processes. However, the two processes that have proven to be commercially viable are the water-hydrogen sulphide exchange process (GS process) and the ammonia-hydrogen exchange process.

The GS process is based upon the exchange of hydrogen and deuterium between water and hydrogen sulphide within a series of towers which are operated with the top section cold and the bottom section hot. Water flows down the towers while the hydrogen sulphide gas circulates from the bottom to the top of the towers. A series of perforated trays are used to promote mixing between the gas and the water. Deuterium migrates to the water at low temperatures and to the hydrogen sulphide at high temperatures. Gas or water, enriched in deuterium, is removed from the first stage towers at the junction of the hot and cold sections and the process is repeated in subsequent stage towers. The product of the last stage, water enriched up to 30% in deuterium, is sent to a distillation unit to produce reactor grade heavy water; i.e., 99.75% deuterium oxide.

The ammonia-hydrogen exchange process can extract deuterium from synthesis gas through contact with liquid ammonia in the presence of a catalyst. The synthesis gas is system used in the ammonia-hydrogen exchange process and water distillation systems used for the final concentration of heavy water to reactor-grade in either process are examples of such systems.

The items of equipment which are especially designed or prepared for the production of heavy water utilizing either the water-hydrogen sulphide exchange process or the ammonia-hydrogen exchange process include the following:

6.1. Water - Hydrogen Sulphide Exchange Towers

Exchange towers fabricated from fine carbon steel (such as ASTM A516) with diameters of 6 m (20 ft) to 9 m (30 ft), capable of operating at pressures greater than

6.6. Infrared Absorption Analyzers

Infrared absorption analyzers capable of "on-line" hydrogen/deuterium ratio analysis where deuterium concentrations are equal to or greater than 90%.

6.7. Catalytic Burners

Catalytic burners for the conversion of enriched deuterium gas into heavy water especially designed or prepared for heavy water production utilizing the ammonia-hydrogen exchange process.

6.8. Complete heavy water upgrade systems or columns therefor

Complete heavy water upgrade systems, or columns therefor, especially designed or prepared for the upgrade of heavy water to reactor-grade deuterium concentration.

EXPLANATORY NOTE

These systems, which usually employ water distillation to separate heavy water from light water, are especially designed or prepared to produce reactor-grade heavy water (i.e., typically 99.75% deuterium oxide) from heavy water feedstock of lesser concentration.

7. Plants for the conversion of uranium and plutonium for use in the fabrication of fuel elements and the separation of uranium isotopes as defined in sections 4 and 5 respectively, and equipment especially designed or prepared therefor

EXPORTS

The export of the whole set of major items within this boundary will take place only in accordance with the procedures of the Guidelines. All of the plants, systems, and especially designed or prepared equipment within this boundary can be used for the processing, production, or use of special fissionable material.

7.1.2. Especially designed or prepared systems for the conversion of UO_3 to UF_6

EXPLANATORY NOTE

Conversion of UO_3 to UF_6 can be performed directly by fluorination. The process requires a source of fluorine gas or chlorine trifluoride.

7.1.3. Especially designed or prepared systems for the conversion of UO_3 to UO_2

EXPLANATORY NOTE

Conversion of UO_3 to UO_2 can be performed through reduction of UO_3 with cracked ammonia gas or hydrogen.

7.1.4. Especially designed or prepared systems for the conversion of UO_2 to UF_4

EXPLANATORY NOTE

Conversion of UO_2 to UF_4 can be performed by reacting UO_2 with hydrogen fluoride gas (HF) at 300-500°C.

7.1.5. Especially designed or prepared systems for the conversion of UF_4 to UF_6

EXPLANATORY NOTE

Conversion of UF_4 to UF_6 is performed by exothermic reaction with fluorine in a tower reactor. UF_6 is condensed from the hot effluent gases by passing the effluent stream through a cold trap cooled to -10°C. The process requires a source of fluorine gas.

7.1.6. Especially designed or prepared systems for the conversion of UF_4 to U metal

EXPLANATORY NOTE

Conversion of UF_4 to U metal is performed by reduction with magnesium (large batches) or calcium (small batches). The reaction is carried out at temperatures above the melting point of uranium (1130 °C).

7.1.7. Especially designed or prepared systems for the conversion of UF_6 to UO_2

EXPLANATORY NOTE

Conversion of UF_6 to UO_2 can be performed by one of three processes. In the first, UF_6 is reduced and hydrolyzed to UO_2 using hydrogen and steam. In the second, UF_6 is hydrolyzed by solution in water, ammonia is added to precipitate ammonium diuranate, and the diuranate is reduced to UO_2 with hydrogen at 820°C. In the third process, gaseous UF_6, CO_2, and NH_3 are combined in water, precipitating ammonium uranyl carbonate. The ammonium uranyl carbonate is combined with steam and hydrogen at 500-600°C to yield UO_2

UF_6 to UO_2 conversion is often performed as the first stage of a fuel fabrication plant.

7.1.8. Especially designed or prepared systems for the conversion of UF_6 to UF_4

EXPLANATORY NOTE

Conversion of UF_6 to UF_4 is performed by reduction with hydrogen.

7.1.9. Especially designed or prepared systems for the conversion of UO_2 to UCl_4

EXPLANATORY NOTE

Conversion of UO_2 to UCl_4 can be performed by one of two processes. In the first, UO_2 is reacted with carbon tetrachloride (CCl_4) at approximately 400ºC. In the second, UO_2 is reacted at approximately 700ºC in the presence of carbon black (CAS 1333-86-4), carbon monoxide, and chlorine to yield UCl_4.

7.2. Plants for the conversion of plutonium and equipment especially designed or prepared therefor

INTRODUCTORY NOTE

Plutonium conversion plants and systems perform one or more transformations from one plutonium chemical species to another, including: conversion of plutonium nitrate to PuO_2, conversion of PuO_2 to PuF_4, and conversion of PuF_4 to plutonium metal. Plutonium conversion plants are usually associated with reprocessing facilities, but may also be associated with plutonium fuel fabrication facilities. Many of the key equipment items for plutonium conversion plants are common to several segments of the chemical process industry. For example, the types of equipment employed in these processes may include: furnaces, rotary kilns, fluidized bed reactors, flame tower reactors, liquid centrifuges, distillation columns and liquid-liquid extraction columns. Hot cells, glove boxes and remote manipulators may also be required. However, few of the items are available "off-the-shelf"; most would be prepared according to the requirements and specifications of the customer. Particular care in designing for the special radiological, toxicity and criticality hazards associated with plutonium is essential. In some instances, special design and construction considerations are required to address the corrosive properties of some of the chemicals handled (e.g. HF). Finally, it should be noted that, for all plutonium conversion processes, items of equipment which individually are not especially designed or prepared for plutonium conversion can be assembled into systems which are especially designed or prepared for use in plutonium conversion.

7.2.1. Especially designed or prepared systems for the conversion of plutonium nitrate so as to avoid criticality and radiation effects and to minimize toxicity hazards. In most reprocessing facilities, this process involves the conversion of plutonium nitrate to plutonium dioxide. Other processes can involve the precipitation of plutonium oxalate or plutonium peroxide.

7.2.2. Especially designed or prepared systems for plutonium metal production

EXPLANATORY NOTE

This process usually involves the fluorination of plutonium dioxide, normally with highly corrosive hydrogen fluoride, to produce plutonium fluoride which is subsequently reduced using high purity calcium metal to produce metallic plutonium and a calcium fluoride slag. The main functions involved in this process are fluorination (e.g. involving equipment fabricated or lined with a precious metal), metal reduction (e.g. employing ceramic crucibles), slag recovery, product handling, ventilation, waste management and process control. The process systems are particularly adapted so as to avoid criticality and radiation effects and to minimize toxicity hazards. Other processes include the fluorination of plutonium oxalate or plutonium peroxide followed by a reduction to metal.

ANNEX C

CRITERIA FOR LEVELS OF PHYSICAL PROTECTION

1. The purpose of physical protection of nuclear materials is to prevent unauthorized use and handling of these materials. Paragraph 3(a) of the Guidelines document calls for agreement among suppliers on the levels of protection to be ensured in relation to the type of materials, and equipment and facilities containing these materials, taking account of international recommendations.

2. Paragraph 3(b) of the Guidelines document states that implementation of measures of physical protection in the recipient country is the responsibility of the Government of that country. However, the levels of physical protection on which these measures have to be based should be the subject of an agreement between supplier and recipient. In this context these requirements should apply to all States.

3. The document INFCIRC/225 of the International Atomic Energy Agency entitled "The Physical Protection of Nuclear Material"

Transportation under special precautions including prior arrangements among sender, recipient, and carrier, and prior agreement between entities subject to the jurisdiction and regulation of supplier and recipient States, respectively, in case of international transport, specifying time, place and procedures for transferring transport responsibility.

CATEGORY I

Materials in this category shall be protected with highly reliable systems against unauthorized use as follows:

Use and storage within a highly protected area, i.e., a protected area as defined for Category II above, to which, in addition, access is restricted to person whose trustworthiness has been determined, and which is under surveillance by guards who are in close communication with appropriate response forces. Specific measures taken in this context should have as their objective the detection and prevention of any assault, unauthorized access or unauthorized removal of material.

Transportation under special precautions as identified above for transportation of Category II and III materials and, in addition, under constant surveillance by escorts and under conditions which assure close communication with appropriate response forces.

6. Suppliers should request identification by recipients of those agencies or authorities having responsibility for ensuring that levels of protection are adequately met and having responsibility for internally co-ordinating response/recovery operations in the event of unauthorized use or

TABLE: CATEGORIZATION OF NUCLEAR MATERIAL

Material	Form	Category I	Category II	Category III
1. Plutonium*[a]	Unirradiated*[b]	2 kg or more	Less than 2 kg but more than 500 g	500 g or less*[c]
2. Uranium-235	Unirradiated*[b]			
	- uranium enriched to 20% ^{235}U or more	5 kg or more	Less than 5 kg but more than 1 kg	1 kg or less*[c]
	- uranium enriched to 10% ^{235}U but less than 20%	-	10 kg or more	Less than 10 kg*[c]
	- uranium enriched above natural, but less than 10% ^{235}U*[d]		-	10 kg or more
3. Uranium-233	Unirradiated*[b]	2 kg or more	Less than 2 kg but more than 500 g	500 g or less*[c]
4. Irradiated fuel			Depleted or natural uranium, thorium or low-enriched fuel (less than 10% fissile content)*[e][f]	

[a] As identified in the Trigger List.

[b] Material not irradiated in a reactor or material irradiated in a reactor but with a radiation level equal to or less than 100 rads/hour at one metre unshielded.

[c] Less than a radiologically significant quantity should be exempted.

[d] Natural uranium, depleted uranium, and thorium and quantities of uranium enriched to less than 10% not falling in Category III should be protected in accordance with prudent management practice.

[e] Although this level of protection is recommended, it would be open to States, upon evaluation of the specific circumstances, to assign a different category of physical protection.

Comparison Table of Changes to the Guidelines for Nuclear Transfers (INFCIRC/254/Part 1)

Old (Revision 10)	New (Revision 11)
SUPPORTING ACTIVITIES …	SUPPORTING ACTIVITIES Support for access to nuclear material for peaceful uses 12. Suppliers should, in accordance with the objectives of these guidelines, facilitate access to nuclear material for the peaceful uses of nuclear energy, and encourage, within the scope of Article IV of the NPT, recipients to take the fullest possible advantage of the international commercial market and other available international mechanisms for nuclear fuel services while not undermining the global fuel market.

Physical security

12. Suppliers should promote international co-operation in the areas of physical security through the exchange of physical security information, protection of nuclear materials in transit, and recovery of stolen nuclear materials and equipment. Suppliers should promote broadest adherence to the respective international instruments, inter alia, to the Convention on the Physical Protection of Nuclear Material, as well as implementation of INFCIRC/225, as amended from time to time. Suppliers recognize the importance of these activities and other relevant IAEA activities in preventing the

Support for effective IAEA safeguards 13. Suppliers should make special efforts in support of effective implementation of IAEA safeguards. Suppliers should also support the Agency's efforts to assist Member States in the improvement of their national systems of accounting and control of nuclear material and to increase the technical effectiveness of safeguards. Similarly, they should make every effort to support the IAEA in increasing further the adequacy of safeguards in the light of technical developments and the rapidly growing number of nuclear facilities, and to support appropriate initiatives aimed at improving the effectiveness of IAEA safeguards.	Support for effective IAEA safeguards 14. Suppliers should make special efforts in support of effective implementation of IAEA safeguards. Suppliers should also support the Agency's efforts to assist Member States in the improvement of their national systems of accounting and control of nuclear material and to increase the technical effectiveness of safeguards. Similarly, they should make every effort to support the IAEA in increasing further the adequacy of safeguards in the light of technical developments and the rapidly growing number of nuclear facilities, and to support appropriate initiatives aimed at improving the effectiveness of IAEA safeguards.

Trigger list plant design features65 TD .00(b013((.6(13 -1cf.1()6.5(65 TD .00(4018 IAE)7(k-3.99.1(e j)no)-5.1.1((pm)9.3(ents(n(pm)9.c1((pm)9

15. Suppliers should, where appropriate, stress to recipients the need to subject transferred trigger list items and related technology and trigger list items derived from facilities

Consultations	Consultations
16. (a) Suppliers should maintain contact and consult through regular channels on matters connected with the implementation of these Guidelines.	17. (a) Suppliers should maintain contact and consult through regular channels on matters connected with the implementation of these Guidelines.
(b) Suppliers should consult, as each deems appropriate, with other governments concerned on specific sensitive cases, to ensure that any transfer does not contribute to risks of conflict or instability.	(b) Suppliers should consult, as each deems appropriate, with other governments concerned on specific sensitive cases, to ensure that any transfer does not contribute to risks of conflict or instability.
(c) Without prejudice to sub-paragraphs (d) to (f) below:	(c) Without prejudice to sub-paragraphs (d) to (f) below:
In the event that one or more suppliers believe that there has been a violation of supplier/recipient understanding resulting from these Guidelines, particularly in the case of an explosion of a nuclear device, or illegal termination or violation of IAEA safeguards by a recipient, suppliers should consult promptly through diplomatic channels in order to determine and assess the reality and extent of the alleged violation. Suppliers are also encouraged to consult where nuclear material or nuclear fuel cycles activity undeclared to the IAEA or a nuclear explosive activity is revealed.	In the event that one or more suppliers believe that there has been a violation of supplier/recipient understanding resulting from these Guidelines, particularly in the case of an explosion of a nuclear device, or illegal termination or violation of IAEA safeguards by a recipient, suppliers should consult promptly through diplomatic channels in order to determine and assess the reality and extent of the alleged violation. Suppliers are also encouraged to consult where nuclear material or nuclear fuel cycles activity undeclared to the IAEA or a nuclear explosive activity is revealed.
Pending the early outcome of such consultations, suppliers will not act in a manner that could prejudice any measure that may be adopted by other suppliers concerning their current contacts with that recipient. Each supplier should also consider suspending transfers	Pending the early outcome of such consultations, suppliers will not act in a manner that could prejudice any measure that may be adopted by other suppliers concerning their current contacts with that recipient. Each supplier should also consider suspending transfers

recipient to take specific actions to bring itself into compliance with its safeguards obligations; Decides that the Agency is not able to verify that there has been no diversion of nuclear material required to be safeguarded, including situations where actions taken by a recipient have made the IAEA unable to carry out its safeguards mission in that State. An extraordinary Plenary meeting will take place within one month of the Board of Governors' action, at which suppliers will review the situation, compare national policies and decide on an appropriate response. (f) The provisions of subparagraph (e) above do not apply to transfers under paragraph 4 (b) of the Guidelines.	recipient to take specific actions to bring itself into compliance with its safeguards obligations; Decides that the Agency is unable to verify that there has been no diversion of nuclear material required to be safeguarded, including situations where actions taken by a recipient have made the IAEA unable to carry out its safeguards mission in that State. An extraordinary Plenary meeting will take place within one month of the Board of Governors' action, at which suppliers will review the situation, compare national policies and decide on an appropriate response. (f) The provisions of subparagraph (e) above do not apply to transfers under paragraph 4 (b) of the Guidelines.
17. Unanimous consent is required for any changes in these Guidelines, including any which might result from the reconsideration mentioned in paragraph 5.	<u>18.</u> Unanimous consent is required for any changes in these Guidelines, including any which might result from the reconsideration mentioned in paragraph 5.