INF

INFCIRC/209/Mod.4
February 1990

International Atomic Energy Agency
INFORMATION CIRCULAR

GENERAL Distr.
Original: ENGLISH and RUSSIAN

COMMUNICATIONS RECEIVED FROM MEMBERS REGARDING THE EXPORT OF NUCLEAR MATERIAL AND OF CERTAIN CATEGORIES OF EQUIPMENT AND OTHER MATERIAL

1. The Director General has received letters dated 1 December 1989 from the Resident Representatives to the Agency of the following Member States concerning the commitments of these Member States under Article III, paragraph 2, of the Treaty on the Non-Proliferation of Nuclear Weapons: Australia, Canada, Czechoslovakia, Finland, the German Democratic Republic, Greece, Hungary, Japan, the Netherlands, Norway, Sweden, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

2. In the light of the wish expressed at the end of each of the letters, both the text of the letters and their annex are attached.

90-00702

LETTER

"I have the honour to refer to [relevant previous communication(s)] from the Resident Representative of [Member State] to the International Atomic Energy Agency.

In the years since the procedures described in INFCIRC/209 were formulated for the export of certain categories of equipment and material especially designed or prepared for the processing, use or production of special fissionable material, developments in nuclear technology have brought about the need to clarify parts of the Trigger List originally incorporated in Memorandum B of INCIRC/209. Such clarifications have been covered in INFCIRC/209/Mods.1,2 and 3.

My Government now thinks it desirable further to clarify that part of the Trigger List which refers to equipment especially designed or prepared for the separation of isotopes of uranium. I therefore wish to inform you that in paragraph 11 of the Annex to INFCIRC/209 ("Clarification of items on the Trigger List"), as amended by INFCIRC/209/Mod.1, the items "gaseous diffusion barriers" and "gaseous diffuser housings" have been deleted and replaced by the texts at (A) and (B) in the Annex to this letter. These texts are introduced by an explanatory note.

As hitherto, my Government reserves the right to exercise discretion with regard to the interpretation and implementation of the procedures set out in the above-mentioned documents and the right to control, if it wishes, the export of items relevant to gaseous diffusion uranium separation other than those specified in the Annex to this letter.

I should be grateful if you would circulate the text of this letter and its Annex to all Member States for their information".

A N N E X

GASEOUS DIFFUSION TRIGGER LIST

Introductory Note

In the gaseous diffusion method of uranium isotope separation, the main technological assembly is a special porous gaseous diffusion barrier, heat exchanger for cooling the gas (which is heated by the process of compression), seal valves and control valves, and pipelines. Inasmuch as gaseous diffusion technology uses uranium hexafluoride (UF6), all equipment, pipeline and instrumentation surfaces (that come in contact with the gas) must be made of materials that remain stable in contact with UF6. A gaseous diffusion facility requires a number of these assemblies, so that quantities can provide an important indication of end use.

The auxiliary systems, equipment and components for gaseous diffusion enrichment plants are the systems of plant needed to feed UF6 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” UF6 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 UF6 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” UF6 gaseous streams flowing from exit points are passed by way of cascade header pipework to either cold traps or to compression stations where UF6 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 kilometres of cascade header pipework, incorporating thousands of welds with substantial amounts of repetition of layout. The equipment, components and piping systems are fabricate to very high vacuum and cleanliness standards. The items listed below either come into direct contact with the UF6 process gas or directly control the flow within the cascade. All surfaces which come into contact with the process gas are wholly made of, or lined with, UF6 resistant materials.

For the purposes of this annex the materials resistant to corrosion by UF6 include stainless steel, aluminum, aluminum alloys, aluminum oxide, nickel or alloys containing 60 percent or more nickel, and UF6-resistant fully fluorinated hydrocarbon polymers.

(A)

1. ESPECIALLY DESIGNED OR PREPARED ASSEMBLIES AND COMPONENTS FOR USE IN GASEOUS DIFFUSION ENRICHMENT.

1.1 Gaseous Diffusion Barriers

Especially designed or prepared thin, porous filters, with a pore size of 100-1000 A (angstroms), a thickness of 5 mm or less, and for tubular forms, a diameter of 25 mm or less, made of metallic, polymer or ceramic materials resistant to corrosion by UF6, and especially prepared compounds or powders for the manufacture of such filters. Such compounds and powders include nickel or alloys containing 60 percent or more nickel, aluminum oxide, or UF6-resistant fully fluorinated hydrocarbon polymers having a purity of 99.9 percent or more, a particle size less than 10 microns, and a high degree of particle size uniformity, which are especially prepared for the manufacture of gaseous diffusion barriers.

1.2 Diffuser Housings

Especially designed or prepared hermetically sealed cylindrical vessels greater than 30 cm in diameter and greater than 90 cm in length, or rectangular vessels of comparable dimensions which have an inlet connection and two outlet connections all of which are greater than 5 cm in diameter, for containing the gaseous diffusion barrier, made of or lined with UF6 resistant materials and designed for horizontal or vertical installation.

1.3 Compressors and gas blowers

Especially designed or prepared axial, centrifugal, or positive displacement compressors or gas blowers with a suction volume capacity of 1 m3/min or more of UF6, and with a discharge pressure of up to several hundred kN/m2 (100 PSI), designed for long-term operation in the UF6 environment with or without an electrical motor of appropriate power, as well as separate assemblies of such compressors and gas blowers. These compressors and gas blowers have a pressure ratio between 2/1 and 6/1 and are made of, or lined with, materials resistant to UF6.

1.4 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 UF6. Such seals are normally designed for a buffer gas in-leakage rate of less than 1000 cm3/min.

1.5 Heat Exchangers for Cooling UF6

Especially designed or prepared heat exchangers made of or line with UF6 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 N/m2 (0.0015 PSI) per hour under a pressure difference of 100 kN/m2 (15 PSI).

(B)

2. ESPECIALLY DESIGNED OR PREPARED AUXILIARY SYSTEMS, EQUIPMENT AND COMPONENTS FOR USE IN GASEOUS DIFFUSION ENRICHMENT.

2.1 Feed Systems/Product and Tails withdrawal Systems

Especially designed or prepared process systems, capable of operating at pressures of 300 kN/m2 945 PSI) or less, including:

Feed autoclaves (or systems) used for passing UF6 to the gaseous diffusion cascades;

Desublimers (or cold traps) used to remove UF6 from diffusion

cascades;

Liquefaction stations where UF6 gas from the cascade is compressed and cooled to form liquid UF6;

“Product” of “tails” stations used for transferring UF6 into containers.

2.2 Header Piping Systems

Especially designed or prepared piping systems and header systems for handling UF6 within the gaseous diffusion cascades. This piping network is normally of the “double” header system with each cell connected to each of the headers.

2.3 Vacuum Systems

(A) Especially designed or prepared large vacuum manifolds vacuum headers and vacuum pumps having a suction capacity of 5 m3/min or more.

(B) Vacuum pumps especially designed for service n UF6-bearing atmospheres made of, or line with, aluminum, nickel, or alloys bearing more than 60 percent nickel. These pumps may be either rotary or positive, may have displacement and fluorocarbon seals, and may have special working fluids present.

2.4 Special Shut-Off and Control Valves

Especially designed or prepared manual or automated shut-off and control bellows valves made of UF6 resistant materials with a diameter of 4 cm to 1.5 m for installation in main and auxiliary systems of gaseous diffusion enrichment plants.

2.5 UF6 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 UF6 gas streams and having all of the following characteristics:

- (A) unit resolution for mass greater than 320;

- (B) Ion sources constructed of or lined with nichrome or monel or nickel plated;

- (C) Electron bombardment ionization sources;

- (D) Having a collector system suitable for isotopic analysis.