U.S. NUCLEAR REGULATORY COMMISSION

10 CFR PART 110



RIN: 3150-AD59



Export of Components for Use in
Gaseous Diffusion Enrichment Plants

AGENCY: U.S. Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is amending its export licensing regulations to clarify the coverage of specially designed or prepared nuclear assemblies and components for use in gaseous diffusion enrichment plants. This action is necessary to implement the decision of the multilateral Non-Proliferation Treaty Nuclear Exporters Group (Zangger Committee) to add new definitions to its international export control "Trigger List" covering gaseous diffusion enrichment components. The NRC also is restructuring portions of its regulations in order to present the provision in a clear manner.

EFFECTIVE DATE: (Upon publication in the Federal Register)

FOR FURTHER INFORMATION CONTACT: Elaine O. Hemby, Office of Governmental and Public Affairs, U.S. Nuclear Regulatory Commission, Washington, DC 20555, telephone 301-492-0341, or Joanna M. Becker, Office of the General Counsel, U.S. Nuclear Regulatory Commission, Washington, DC 20555, telephone 301-492-1740.

SUPPLEMENTARY INFORMATION: During the past several years, the United States and other nuclear supplier governments have engaged in discussions within the framework of the International Atomic Energy Agency's (IAEA) Zangger Committee to clarify the coverage of the international nuclear export control "Trigger List" for specially designed or prepared assemblies and components for use in gaseous diffusion enrichment plants. The purpose of the clarification is to improve the administration of export controls over these items. Recently Zangger Committee members have agreed to specify certain additional components in its control list for these nuclear components.

Currently, all specially designed or prepared gaseous diffusion enrichment assemblies and components are subject in the United States to export licensing by the NRC under its export/import licensing regulations provisions of 10 CFR 110.8(b). As a result of the Zangger Committee's action, the Department of State, as the responsible U.S. Government agency for undertaking the Zangger Committee negotiations, has requested the Commission to implement the Zangger Committee's decision by publishing an interpretative rule in the Federal Register listing the new specified assemblies and components in 10 CFR Part 110.

In support of the decision to add new definitions of gaseous diffusion enrichment components, the Zangger Committee also prepared an introductory note which further clarifies the basis for exercising export controls over the equipment specified. This note reads as follows:

Note - Gaseous Diffusion Trigger List

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 ($UF_6$), all equipment, pipeline and instrumentation surfaces (that come in contact with the gas) must be made of materials that remain stable in contact with $UF_6$. 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 $UF_6$ 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 liquified 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. The items listed below either come into direct contact with the $UF_6$ 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, $UF_6$ resistant materials.

For the purposes of this annex the materials resistant to corrosion by $UF_6$ include stainless steel, aluminum, aluminum alloys, aluminum oxide, nickel or alloys containing 60 percent or more nickel, and $UF_6$-resistant fully fluorinated hydrocarbon polymers.

## Waiver of Notice and Comment

Because this amendment involves a foreign affairs function of the United States, the notice and comment provisions of the Administrative Procedure Act do not apply pursuant to 5 U.S.C. 553(a)(1). The amendments are effective upon publication in the Federal Register. Good cause exists to dispense with

the usual 30-day delay in the effective date because the State Department has requested expeditious action on this amendment in order to meet international commitments.

## Environmental Impact: Categorical Exclusion

The NRC has determined that this final rule in Part 110 is the type of action described as a categorical exclusion under 10 CFR 51.22(c)(1). Therefore, neither an environmental impact statement nor an environmental assessment has been prepared for this final rule.

## Paperwork Reduction Act Statement

This final rule does not contain a new or amended information collection requirement subject to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). Existing requirements were approved by the Office of Management and Budget under approval number 3150-0036.

## Regulatory Analysis

NRC already controls exports of gaseous diffusion enrichment plants and specially designed assemblies and components thereof. The amendments are necessary in order for the nuclear export controls of the United States to be consistent with United States supported international nuclear export control guidelines. The clarification will clearly reflect the nature of the enhanced multilateral export controls of the United States for this category of

equipment. No other NRC regulatory actions or alternative actions by other agencies address this matter nor are any alternative courses of action feasible. While the amendments impact all potential exporters of gaseous diffusion enrichment components, they are not expected to result in any increased regulatory burden since they essentially clarify the scope of existing NRC export licensing controls. To date, NRC has neither received an application to export any gaseous enrichment components nor are any such applications expected in the foreseeable future.

## Regulatory Flexibility Certification

As required by the Regulatory Flexibility Act (5 U.S.C. 605(b)), the Commission certifies that this rule does not have a significant economic impact on a substantial number of small entities. The final rule is an interpretative rule only and, as such, does not, of itself, impose additional obligations on the public.

## Backfit Analysis

The NRC has determined that the backfit rule, 10 CFR 50.109, does not apply to this final rule, and, therefore, a backfit analysis is not required for this final rule because these amendments do not involve any provisions which would impose backfits as defined in 10 CFR 50.109(a)(1).

List of Subjects in 10 CFR Part 110

Administrative practice and procedures, Classified information, Criminal penalty, Export, Import, Incorporation by reference, Intergovernmental relations, Nuclear materials, Nuclear power plants and reactors, Reporting and recordkeeping requirements Scientific equipment.

For the reasons set out in the preamble and under the authority of the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and 5 U.S.C. 552 and 553, the NRC is adopting the following amendments to 10 CFR Part 110.

PART 110 - EXPORT AND IMPORT OF NUCLEAR EQUIPMENT AND MATERIAL

1. The authority citation for Part 110 continues to read:

Authority: Secs. 51, 53, 54, 57, 63, 64, 65, 81, 82, 103, 104, 109, 111, 126, 127, 128, 129, 161, 181, 182, 183, 187, 189, 68 Stat. 929, 930, 931, 932, 933, 936, 937, 948, 953, 954, 955, 956, as amended (42 U.S.C. 2071, 2073, 2074, 2077, 2092-2095, 2111, 2112, 2133, 2134, 2139, 2139a, 2141, 2154-2158, 2201, 2231-2233, 2237, 2239); sec. 201, 88 Stat. 1242, as amended (42 U.S.C. 5841).

Section 110.1(b)(2) also issued under Pub.L. 96-92, 93 Stat. 710 (22 U.S.C. 2403), Section 110.11 also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2152) and secs. 54c and 57d., 88 Stat. 473, 475, (42 U.S.C. 2074).

Section 110.27 also issued under sec. 309(a), Pub.L. 99-440. Section 110.50(b)(3) also issued under sec. 123, 92 Stat. 142 (42 U.S.C. 2153). Section 110.51 also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234); Section 110.52 also issued under sec. 186, 68 Stat. 955 (42 U.S.C. 2236). Sections 110.80-110.113 also issued under 5 U.S.C. 552, 554. Sections 110.30-110.35 also issued under 5 U.S.C. 553.

For the purposes of sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273); secs. 110.20-110.29, 110.50, and 110.120-110.129 also issued under secs. 161 b and i, 68 Stat. 948, 949, as amended (42 U.S.C. 2201 (b) and (i)); and secs. 110.7a and 110.53 are also issued under sec. 161(o), 68 Stat. 950, as amended (42 U.S.C. 2201(o)).

2. Section 110.8 is revised to read as follows:

§110.8 List of Nuclear equipment under NRC export licensing authority.

(a) Nuclear reactors.

(b) Plants for the separation of the isotopes of source material, special nuclear material or lithium, including gas centrifuge plants, gaseous diffusion plants, jet nozzle plants, vortex plants, laser isotope separation plants, and chemical separation plants.

(c) Plants for the reprocessing of irradiated nuclear reactor fuel elements.

(d) Plants for the fabrication of nuclear reactor fuel elements.

(e) Plants for the production of heavy water, deuterium, and deuterium compounds. (See paragraph (f) of this section.)

(f) Any specially designed or prepared assemblies and components for nuclear reactors (see paragraph (a) of this section) and for the plants listed in paragraphs (b) through (e) of this section. (See Appendices A, B, C, and D to Part 110 for an illustrative listing of specially designed or prepared equipment for a nuclear reactor and gas centrifuge, gaseous diffusion, and reprocessing plants.)

§110.9 (Redesignated)

3. Section 110.9 is redesignated as §110.9a.

4. A new §110.9 is added to read as follows:

§110.9 List of Nuclear Material under NRC export licensing authority.

(a) Special Nuclear Material

(b) Source Material

(c) Byproduct Material

(d) Deuterium

(e) Nuclear grade graphite

Appendix B (Redesignated)

5. Appendix B is redesignated as Appendix E.

Appendix A (Redesignated)

6. Appendix A is redesignated as Appendix B.

7. A new Appendix A is added to read as follows:

APPENDIX A - ILLUSTRATIVE LIST OF NUCLEAR REACTOR EQUIPMENT UNDER NRC EXPORT LICENSING AUTHORITY.

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.

(1) Reactor pressure vessels, i.e., metal vessels, as complete units or major shop-fabricated parts, specially designed or prepared to contain the core of a nuclear reactor and capable of withstanding the operating pressure of the primary coolant.

(2) On-line (e.g., CANDU) reactor fuel charging and discharging machines, i.e., manipulative equipment specially designed for inserting or removing fuel in an operating nuclear reactor.

(3) Reactor control rods, i.e., rods specially designed or prepared for the control of the reaction rate in a nuclear reactor.

(4) Reactor primary coolant pumps, i.e., pumps specially designed or prepared for circulating the primary coolant in a nuclear reactor.

(5) Reactor pressure tubes, i.e., tubes specially designed or prepared to contain fuel elements and the primary coolant in a nuclear reactor at an operating pressure in excess of 50 atmospheres.

(6) Zirconium tubes, i.e., zirconium metal and alloys in the form of tubes or assemblies of tubes specially designed or prepared for use in a nuclear reactor.

(7) Reactor internals, e.g., core support structures, control and rod guide tubes, thermal shields, baffles, core grid plates and diffuser plates specially designed or prepared for use in a nuclear reactor.

(8) Reactor control rod drive mechanisms, including detection and measuring equipment to determine flux levels.

8. A new Appendix C is added to read as follows:

APPENDIX C - ILLUSTRATIVE LIST OF GASEOUS DIFFUSION ENRICHMENT PLANT ASSEMBLIES AND COMPONENTS UNDER NRC EXPORT LICENSING AUTHORITY.

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 ($UF_6$),

all equipment, pipeline and instrumentation surfaces (that come in contact with the gas) must be made of materials that remain stable in contact with $UF_6$. A gaseous dirfusion 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 $UF_6$ 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 liquified 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.

The items listed below either come into direct contact with the $UF_6$ 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, $UF_6$ resistant materials. For the purposes of this appendix the materials resistant to corrosion by $UF_6$ include stainless steel, aluminum, aluminum alloys, aluminum oxide, nickel or alloys containing 60 percent or more nickel, and $UF_6$-resistant fully fluorinated hydrocarbon polymers.

1. Assemblies and components especially designed or prepared 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 $UF_6$, 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 $UF_6$-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 $UF_6$ 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 $m^3$/min or more of $UF_6$, and with a discharge pressure of up to several hundred $kN/m^2$ (100 PSI), designed for long-term operation in the $UF_6$ 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 $UF_6$.

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 $UF_6$. Such seals are normally designed for a buffer gas in-leakage rate of less than 1000 $cm^3$/min.

1.5 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 $N/m^2$ (0.0015 PSI) per hour under a pressure difference of 100 $kN/m^2$ (15 PSI).

2. Auxiliary systems, equipment and components especially designed or prepared 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 $kN/m^2$ (45 PSI) or less, including:

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

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

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

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

2.2 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.

2.3 Vacuum Systems.

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

(b) Vacuum pumps especially designed for service in $UF_6$-bearing atmospheres made of, or lined with, aluminum, nickel, or alloys

bearing more than 60 percent nickel. These pumps may be either rotary or positive displacement, may have 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 $UF_6$ 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 $UF_6$ Mass Spectrometers/Ion Sources.

Especially designed or prepared magnetic or quadruple 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:

(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.

9. A new Appendix D is added to read as follows:

APPENDIX D - ILLUSTRATIVE LIST OF REPROCESSING PLANT COMPONENTS UNDER NRC EXPORT LICENSING AUTHORITY.

Note - Reprocessing irradiated nuclear fuel separates plutonium and uranium from intensely radioactive fission products and other transuranic elements. Different technical processes can accomplish this separation. However, over the years Purex has become the most commonly used and accepted process. Purex involves the dissolution of irradiated nuclear fuel in nitric acid, followed by separation of the uranium, plutonium, and fission products by solvent extraction using a mixture of tributyl phosphate in an organic diluent.

Purex facilities have process functions similar to each other, including: irradiated fuel element chopping, fuel dissolution, solvent extraction, and process liquor storage. There may also be equipment for thermal denitration of uranium nitrate, conversion of plutonium nitrate to oxide metal, and treatment of fission product waste liquor to a form suitable for long term storage or disposal. However, the specific type and configuration of the equipment performing these functions may differ between Purex facilities for several reasons, including the type and quantity of irradiated nuclear fuel to be reprocessed and the intended disposition of the recovered materials, and the safety and maintenance philosophy incorporated into the design of the facility. A plant of the reprocessing of irradiated fuel elements, includes the equipment and components which normally come in direct contact with and directly control the irradiated fuel and the major nuclear material and fission product

processing streams.

(1) Fuel element chopping machines, i.e., remotely operated equipment specially designed or prepared to cut, chop, or shear irradiated nuclear reactor fuel assemblies, bundles, or rods.

(2) Critically safe tanks, i.e., small diameter, annular or slab tanks specially designed or prepared for the dissolution of irradiated nuclear reactor fuel.

(3) Solvent extraction equipment.

Especially designed or prepared solvent extractors such as packed or pulse columns, mixer settlers or centrifugal contactors for use in a plant for the reprocessing of irradiated fuel. Because solvent extractors must be resistant to the corrosive effect of nitric acid, they are normally fabricated to extremely high standards (including special welding and inspection and quality assurance and quality control techniques) out of low carbon stainless steels, titanium, zirconium or other high quality materials.

(4) Chemical holding or storage vessels.

Especially designed or prepared holding or storage vessels for use in a plant for the reprocessing of irradiated fuel. Because holding or storage vessels must be resistant to the corrosive effect of nitric acid, they are normally fabricated of materials such as low carbon stainless steels, titanium or zirconium, or other high quality materials. Holding or storage vessels may be designed for remote operation and maintenance and may have the following features for control of nuclear criticality:

(i) Walls or internal structures with a boron equivalent of at least

2 percent, or

(ii) A maximum diameter of 7 inches (17.78 cm) for cylindrical vessels, or

(iii) A maximum width of 3 inches (7.62 cm) for either a slab or annular vessel.

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

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

(7) Process control instrumentation specially designed or prepared for monitoring or controlling the processing of material in a reprocessing plant.

Dated at Rockville, Maryland, this 13th day of July, 1990.

For the Nuclear Regulatory Commission.

James M. Taylor,
Executive Director for Operations.