UNITED STATES NUCLEAR REGULATORY COMMISSION OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS WASHINGTON, DC 20555

December 5, 1996

NRC INFORMATION NOTICE 96-63:

POTENTIAL SAFETY ISSUE REGARDING THE SHIPMENT OF FISSILE MATERIAL

Addressees

All U.S. Nuclear Regulatory Commission licensees authorized to possess special nuclear material in unsealed quantities greater than a critical mass.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to an issue with potential safety significance regarding shipments using the fissile material exemption provisions and general licenses. It is expected that recipients will review this information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action nor written response is required.

Description of Circumstances

An NRC licensee recently informed NRC of a potential situation where one of the fissile material exemptions in 10 CFR 71.53 would not have provided adequate criticality safety if large amounts of an exempt concentration of fissile material were to be transported in the presence of a special moderating material (i.e., beryllium). A recent contract was awarded to the licensee to process weapons-usable enriched uranium materials. The waste product, a uranium-beryllium filtercake, met the fissile exemption provisions in 10 CFR 71.53 and 49 CFR 173.453. The presence of beryllium in significant quantities in NRC-regulated fissile exempt shipments is extraordinary, and was not considered in the development of the fissile exemptions in the regulations. NRC has reviewed and verified the licensee's calculations, and has concluded that the current regulations need to be revised to preclude criticality in fissile exempt shipments made under 10 CFR 71.53, and fissile shipments made under the general licenses in 10 CFR 71.18 and 10 CFR 71.22. This information notice is being issued to provide additional, timely notice, to licensees, of this potential safety issue, while the regulatory revisions are made.

Discussion

The licensee proposed to employ the provision in 10 CFR 71.53(d), or the parallel provision in the U.S. Department of Transportation (DOT) regulations, 49 CFR 173.453(d).

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IN 96-63 December 5, 1996 Page 2 of 3

Section 71.53(d) exempts fissile material from the requirements in 10 CFR 71.55 and 71.59 (i.e., the additional requirements placed on fissile packages and shipments to preclude criticality), provided the package does not contain more than 5 grams (0.18 ounces) of fissile material in any 10-liter (610-cubic-inch) volume. The fissile exemptions appearing in 10 CFR 71.53 are assumed to provide inherent criticality control for all practical cases in which fissile materials exist at or below the applicable regulatory limits (i.e., independent calculations would generally not be expected nor required). Consequently, the fissile exemptions generally do not place limits on the types of moderating or reflecting material present in fissile exempt packages, nor the number of fissile exempt packages that can be shipped in a single consignment, and do not require that a transport index (see 10 CFR 71.4) be assigned to packages for criticality control. Further, the fissile material exemptions and general license provisions allow any licensee to make shipments without first seeking NRC approval.

A fairly realistic computer model of the enriched uranium-beryllium oxide waste packages, as loaded for shipment into a sea-land container, and at 0.5 grams per liter, could not be demonstrated to provide adequate nuclear criticality safety. Because the current regulations would allow the possibility of criticality in fissile exempt shipments, and since there is no assurance that such shipments will not occur, NRC intends to revise 10 CFR Part 71 to address exclusion of beryllium and other special moderating material (e.g., deuterium and graphite) in the shipment of fissile materials, and to limit the amount of fissile exempt material that can be transported in a single consignment.

NRC has contacted the U.S. Department of Energy (DOE) and the DOT on this issue. DOE is a shipper of fissile material, which could include the special moderating materials in question. NRC and DOT are coordinating the revisions to their respective regulations.

NRC notes that very few licensees are involved in the shipment of fissile materials with beryllium, graphite, or deuterium. However, for those licensees that are involved in such shipments, it is important that programs be assessed to ensure that adequate criticality safety is provided where fissile materials are transported with materials known or expected to have moderating properties greater than water. As demonstrated by the licensee in this case, the existing fissile material exemptions cannot be presumed, without independent analysis, to preclude nuclear criticality in all cases.

IN 96-63 December 5, 1996 Page 3 of 3

This information notice requires no specific action nor written response. If you have any questions about the information in this notice, please contact the individual listed below, or the appropriate NRC regional office.

Charles J. Haughney, Acting Director Spent Fuel Project Office Office of Nuclear Material Safety and Safeguards

Technical contact:

Earl P. Easton, NMSS (301) 415-8520 e-mail: exe@nrc.gov

Attachments:

- 1. List of Recently Issued NMSS Information Notices
- 2. List of Recently Issued NRR Information Notices

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Attachment 1

IN 96-63

December 5, 1996

Page 1 of 1

LIST OF RECENTLY ISSUED NMSS INFORMATION NOTICES

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mation Notice No.	Subject	Date of Issuance	Issued to
96-57	Incident-Reporting Require- ments Involving Intakes, During a 24-Hour Period that May Cause a Total Effective Dose Equivalent in Excess of 0.05 Sv (5 rem)	10/30/96	All U.S. Nuclear Regulatory Commission licensees
96-54	Vulnerability of Stainless Steel to Corrosion When Sensitized	10/17/96	All material licensees
96-53	Retrofit to Amersham 660 Posilock Radiography Camera to Correct Incon- sistency in 10 CFR Part 34 Compatibility	10/15/96	All industrial radiography licensees
96-52	Cracked Insertion Rods on Troxler Model 3400 Series Portable Moisture Density Gauges	09/26/96	All U.S. Nuclear Regulatory Commission portable gauge licensees and vendors
96-51	Residual Contamination Remaining in Krypton-85 Handling System After Venting	09/11/96	All material licensees
96-47	Recordkeeping, Decommis- sioning Notifications for Disposals of Radioactive Waste by Land Burial Authorized Under Former 10 CFR 20.304, 20.302, and Current 20.2002	08/19/96	All U.S. Nuclear Regulatory Commission licensees

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Attachment 2 IN 96-63 December 5, 1996 Page 1 of 1

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LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
96-62	Potential Failure of the Instantaneous Trip Function of General Electric RMS-9 Programmers	11/20/96	All holders of OLs and CPs for nuclear power plants
96-61	Failure of a Main Steam Safety Valve to Reseat Caused by an Improperly Installed Release Nut	11/20/96	All holders of OLs or CPs for nuclear power reactors
96-60	Potential Common-Mode Post- Accident Failure of Residual Heat Removal Heat Exchangers	11/14/96	All holders of OLs or CPs for nuclear power reactors
96-59	Potential Degradation of Post Loss-of-Coolant Recirculation Capability as a Result of Debris	10/30/96	All holders of OLs or CPs for nuclear power reactors
96-58	RCP Seal Replacement with Pump on Backseat	10/30/96	All holders of OLs or CPs for pressurized-water reactors
96-57	Incident-Reporting Require- ments Involving Intakes, During a 24-Hour Period That May Cause a Total Effective Dose Equivalent in Excess of 0.05 Sv (5 rems)	10/29/96	All U.S. Nuclear Regulatory Commission licensees

OL = Operating License CP = Construction Permit

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Original Signed By: Charles J. Haughney

Charles J. Haughney, Acting Director Spent Fuel Project Office Office of Nuclear Material Safety and Safeguards

Technical contact:

Earl P. Easton, NMSS (301) 415-8520 e-mail: exe@nrc.gov

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*See Previous Concurrence.

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present in fissile exempt packages, nor the number of fissile exempt packages that can be shipped in a single consignment, and do not require that a transport index (see 10 CFR 71.4) be assigned to packages for criticality control. Further, the fissile material exemptions and general license provisions allow any licensee to make shipments without first seeking NRC approval.

A fairly realistic computer model of the enriched uranium-beryllium oxide waste packages, as loaded for shipment into a sea-land container, and at 0.5 grams per liter, could not be demonstrated to provide adequate nuclear criticality safety. Because the current regulations would allow the possibility of criticality in fissile exempt shipments, and since there is no assurance that such shipments will not occur, NRC intends to revise 10 CFR Part 71 to address exclusion of beryllium and other special moderating material (e.g., deuterium and graphite) in the shipment of fissile materials, and to limit the amount of fissile exempt material that can be transported in a single consignment.

NRC has contacted the U.S. Department of Energy (DOE) and the DOT on this issue. DOE is a shipper of fissile material, which could include the special moderating materials in question. NRC and DOT are coordinating the revisions to their respective regulations.

NRC notes that very few licensees are involved in the shipment of fissile materials with beryllium, graphite, or deuterium. However, for those licensees that are involved in such shipments, it is important that programs be assessed to ensure that adequate criticality safety is provided where fissile materials are transported with materials known or expected to have moderating properties greater than water. As demonstrated by the licensee in this case, the existing fissile material exemptions cannot be presumed, without independent analysis, to preclude nuclear criticality in all cases.

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considerations and shipping experience indicate that the criticality of fissile exempt packages is not an immediate threat to worker and public health and safety, the possibility of criticality in fissile exempt shipments has prompted NRC to revise 10 CFR Part 71, to address the possible inclusion of beryllium and other special moderating material (e.g., deuterium and graphite) in the shipment of fissile materials, and to limit the amount of fissile exempt material which can be transported in a single consignment.

NRC staff has also contacted the Department of Transportation (DOT) on this issue, as DOT regulations contain a parallel provision to 10 CFR 71.53 (i.e., 49 CFR 173.453). NRC and DOT are coordinating the revisions to their respective regulations.

In practice, operating and administrative limits and procedures should prevent the collection of fissile materials in amounts or geometries which could achieve criticality as a result of any single change in the conditions necessary for criticality safety. Nevertheless, NRC notes that until the expedited regulatory revisions are made, good practice would be for licensees to exercise caution in deciding whether to ship: (1) fissile materials with materials known or expected to have moderating properties greater than water; or (2) single consignments of fissile exempt packages in excess of 290 grams of uranium-235 or 180 grams of other fissile radionuclides. As demonstrated by the licensee in this case, the existing fissile material exemptions cannot be presumed, without independent analysis, to preclude nuclear criticality in all cases.

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William D. Travers, Director Spent Fuel Project Office Office of Nuclear Material Safety and Safeguards

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