

February 26, 1997  
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SECY-97-

FOR: The Commissioners

FROM: L. Joseph Callan /s/  
Executive Director for Operations

SUBJECT: CHANGES TO 10 CFR 71.63, REQUIREMENTS FOR SHIPPING  
PACKAGES USED TO TRANSPORT VITRIFIED HIGH-LEVEL WASTE

PURPOSE:

To request Commission approval to issue a proposed rule that would remove plutonium from the double containment requirement for sealed canisters containing vitrified high-level waste (HLW) that meet specific waste package design criteria. This rule change is being proposed as a result of a petition for rulemaking (PRM-71-11) submitted by the Department of Energy (DOE). The primary purpose for double containment is to ensure that any respirable plutonium will not be leaked into the atmosphere. The staff believes that vitrified HLW containing plutonium is essentially nonrespirable, and therefore, the packaging requirement for double containment is unnecessary. This proposed rule would also make a minor correction to the usage of metric and English units to be consistent with existing NRC policy.

CATEGORY:

This paper covers a routine matter.

BACKGROUND:

CONTACTS:

Robert Lewis, NMSS, 415-8527  
Mark Haisfield, RES, 415-6196

This proposed rulemaking is consistent with an SRM dated October 31, 1996, in which the Commission (1) disapproved a staff recommendation in SECY-96-215 to make a determination under 10 CFR 71.63(b)(3) regarding canisters containing plutonium-bearing vitrified wastes; and (2) requested the staff develop a rulemaking on an expedited basis to satisfy the timeliness requirements of the DOE.

#### DISCUSSION:

SECY-96-215, dated October 8, 1996, and the Federal Register notice (Attachment 1) provide a detailed discussion of why the NRC established a double containment requirement for plutonium shipments, DOE's petition, and the interaction with the DOE to hold the petition in abeyance until a decision has been reached on a determination request filed under 10 CFR 71.63(b)(3). Based on the SRM mentioned above, the staff has prepared a proposed rule to remove plutonium from the double containment requirement for sealed canisters containing vitrified HLW that meet the specific waste package design criteria in 10 CFR Part 60.

The staff agrees with the petitioner that canisters containing vitrified HLW are in an essentially nonrespirable form and should not be included in the double containment requirement. To provide the NRC reasonable assurance that the process the DOE uses to prepare and transport the HLW package are acceptable, the staff is proposing that the containment system meet the design criteria for disposal under 10 CFR Part 60. The proposed rule change would allow a more cost effective means of transporting this waste with no significant impact to public health and safety.

#### COORDINATION:

The Office of the General Counsel has no legal objection to the proposed rulemaking. The Office of the Chief Financial Officer has no resource-related objection to this rulemaking. The Office of the Chief Information Officer concurs that there will be no information technology impacts.

#### RECOMMENDATION:

That the Commission:

1. Approve for publication in the Federal Register the proposed amendments to 10 CFR Part 71 on vitrified HLW shipments (Attachment 1).

2. Note:

- a. That the proposed amendments will be published in the Federal Register allowing 75 days for public comment.
- b. That the Chief Counsel for Advocacy of the Small Business Administration will be informed of the certification and the reasons for it, as required by the Regulatory Flexibility Act, 5 U.S.C. 605(b).
- c. A regulatory analysis has been prepared for this rulemaking (Attachment 2).

- d. An Environmental Assessment has been prepared for this rulemaking (Attachment 3).
- e. The appropriate Congressional committees will be informed of this action (Attachment 4).
- f. That a public announcement will be issued by the Office of Public Affairs when the proposed rulemaking is filed with the Office of the Federal Register (Attachment 5).
- g. That resources to complete and implement this rulemaking are included in the current budget.

L. Joseph Callan  
Executive Director  
for Operations

Attachments: As stated (5)

[7590-01-P]

**NUCLEAR REGULATORY COMMISSION**

**10 CFR Part 71**

**RIN 3150-AF59**

**Requirements for Shipping Packages Used to  
Transport Vitrified High-Level Waste**

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Proposed rule.

**SUMMARY:** The Nuclear Regulatory Commission (NRC) is proposing to amend its regulations to remove canisters containing vitrified high-level waste (HLW) containing plutonium from the packaging requirement for double containment. This amendment is being proposed in response to a petition for rulemaking (PRM-71-11) submitted by the Department of Energy (DOE). This proposed rule would also make a minor correction to the usage of metric and English units to be consistent with existing NRC policy.

**DATE:** The comment period expires (75 days after publication). Comments received after this date will be considered if it is practical to do so, but the Commission is able to assure consideration only for comments received on or before this date.

**ADDRESSES:** Send comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Attention: Docketing and Service Branch.

Hand deliver comments to: 11555 Rockville Pike, Rockville, Maryland, between 7:45 am and 4:15 pm on Federal workdays.

For information on submitting comments electronically, see the discussion under Electronic Access in the Supplementary Information Section.

Certain documents related to this rulemaking, including comments received and the environmental assessment and finding of no significant impact, may be examined at the NRC Public Document Room, 2120 L Street NW. (Lower Level), Washington, DC. These same documents may also be viewed and downloaded electronically via the Electronic Bulletin Board established by NRC for this rulemaking as discussed under Electronic Access in the Supplementary Information Section.

**FOR FURTHER INFORMATION CONTACT:** Robert Lewis, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone (301) 415-8527, e-mail RXL1@nrc.gov or Mark Haisfield, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone (301) 415-6196, e-mail MFH@nrc.gov.

**SUPPLEMENTARY INFORMATION:**

## Background

In 10 CFR 71.63, the NRC imposed special requirements on licensees who ship plutonium in excess of 0.74 terabecquerels (20 curies). These requirements specify that plutonium must be in solid form and that packages used to ship plutonium must provide a separate inner containment (the "double containment" requirement). In adopting these requirements, the NRC specifically excluded plutonium in the form of reactor fuel elements, metal or metal alloys, and, on a case-by-case basis, other plutonium-bearing solids that the NRC determines do not require double containment.

On November 30, 1993, the DOE petitioned the NRC to amend § 71.63 to add a provision that would specifically remove canisters containing plutonium-bearing vitrified waste from the packaging requirement for double containment. The NRC published a notice of receipt for the petition, docketed as PRM-71-11, in the Federal Register on February 18, 1994 (59 FR 8143), requesting public comment by May 4, 1994. On May 23, 1994 (59 FR 26608), the public comment period was extended to June 3, 1994, at the request of the Idaho National Engineering Laboratory (INEL) Oversight Program of the State of Idaho.

Pursuant to the Nuclear Waste Policy Act of 1982, as amended,

the DOE is the Federal agency responsible for developing and administering a geologic repository for the deep disposal of HLW and spent nuclear fuel. In the petition, the DOE proposes to ship the HLW from each of its three storage locations at Aiken, South Carolina; Hanford, Washington; and West Valley, New York; directly to the geologic repository in casks certified by the NRC. Currently, this HLW exists mostly in the form of liquid and sludge resulting from the reprocessing of defense reactor fuels. The DOE proposes to solidify this material into a borosilicate glass form in which the HLW is dispersed and immobilized. The glass would then be placed into stainless steel canisters for storage and eventual transport to the geologic repository. DOE's purpose in requesting an amendment to the rule is to allow the transportation and disposal of HLW in a more cost-effective and efficient manner without adversely affecting public health and safety.

The containers used to transport canisters of vitrified HLW will be Type B packages certified by the NRC. These packages are required to meet accident resistant standards. The HLW will also be subject to the special transport controls for a "Highway Route Controlled Quantity" pursuant to U.S. Department of Transportation regulations. In addition, the Nuclear Waste Policy Act of 1982, as amended, requires the DOE to provide technical assistance and funds to train emergency responders along the planned route.

The DOE asserts that shipment of vitrified HLW without double containment will not adversely affect safety. This is because the



canistered, vitrified HLW provides a comparable level of protection to the packaging of reactor fuel elements, which does not require double containment. The DOE also noted that the plutonium concentrations in the vitrified HLW will be considerably lower than the concentration in spent nuclear fuel and that vitrified HLW is in an essentially nonrespirable form.

Comments on the petition were received from three parties: the U.S. Environmental Protection Agency (EPA); Nye County, Nevada (the site for the proposed spent fuel and HLW repository at Yucca Mountain); and the INEL Oversight Program of the State of Idaho. EPA reviewed the petition in accordance with its responsibilities under Section 309 of the Clean Air Act and had no specific comments. Nye County agreed with the rationale and arguments advanced by the DOE, and had no objection to DOE's petition. The State of Idaho commented that the petition was premature because it did not specify the parameters or performance standards that HLW must meet.

On June 1, 1995, the NRC staff met with the DOE in a public meeting to discuss the petitioner's request and the possible alternative of requesting an NRC determination under § 71.63(b)(3) to exempt vitrified HLW from the double containment requirement. The DOE informed the NRC in a letter dated January 25, 1996, of its intent to seek this exemption and the NRC received DOE's request on July 16, 1996. The DOE requested that the original petition for rulemaking be held in abeyance until a decision was reached on the

exemption request.

In response to DOE's request, the NRC staff prepared a Commission paper (SECY-96-215, dated October 8, 1996) outlining and requesting Commission approval of the NRC staff's proposed approach for making a determination under § 71.63(b)(3). The determination would have been the first made after the promulgation of the original rule, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Materials Under Certain Conditions," published on June 17, 1974 (39 FR 20960). In a staff requirements memorandum dated October 31, 1996, the Commission disapproved the NRC staff's plan and directed that this policy issue be addressed by rulemaking. In response, the NRC staff has developed this proposed rule in response to the DOE petition.

#### Discussion

In the final 1974 rule, the NRC anticipated that a large number of shipments of plutonium nitrate liquids could result from spent nuclear fuel reprocessing and revised its regulations to require that plutonium in excess of 0.74 terabecquerels (20 curies) be shipped in solid form. The NRC did so because shipment of plutonium liquids is susceptible to leakage, particularly if a shipping package is improperly or not tightly sealed. The value of 0.74 terabecquerels (20 curies) was chosen because it was equal to a large quantity of plutonium as defined in 10 CFR Part 71 in effect

in 1974. Although this definition no longer appears in 10 CFR Part 71, the value as applied to double containment of plutonium has been retained. The concern about leakage of liquids arose because of the potential for a large number of packages (probably of more complex design) to be shipped due to reprocessing and the increased possibility of human error resulting from handling this expanded shipping load.

The NRC treats dispersible plutonium oxide powder in the same way because it also is susceptible to leakage if packages are improperly sealed. Plutonium oxide powder was of particular concern because it was the most likely alternative form (as opposed to plutonium nitrate liquids) for shipment in a fuel reprocessing economy. To address the concern with dispersible powder, the NRC required that plutonium not only must be in solid form, but also that solid plutonium be shipped in packages requiring double containment.

In the accompanying statement of considerations to the final 1974 rule, the NRC stated that the additional inner containment requirements are intended to take into account that the plutonium may be in a respirable form and that solid forms that are essentially nonrespirable, such as reactor fuel elements, are suitable for exemption from the double containment requirement. The Commission further stated that:

Since the double containment provision compensates for

the fact that the plutonium may not be in a "nonrespirable" form, solid forms of plutonium that are essentially nonrespirable should be exempted from the double containment requirement. Therefore, it appears appropriate to exempt from the double containment requirements reactor fuel elements, metal or metal alloy, and other plutonium bearing solids that the Commission determines suitable for such exemption. The latter category provides a means for the Commission to evaluate, on a case-by-case basis, requests for exemption of other solid material where the quantity and form of the material permits a determination that double containment is unnecessary.

DOE's petition to amend § 71.63, by adding a provision that exempts canisters containing vitrified HLW from the packaging requirement for a separate inner containment is partly based on the rationale that the vitrified HLW meets the intent of the rule because the plutonium will be in an essentially nonrespirable form. The DOE petition contends that the vitrified HLW contained in stainless steel canisters provides a comparable level of safety protection to that provided by spent fuel elements.

Specifically, in the technical information supporting the

petition<sup>1</sup>, the DOE sought to demonstrate that the waste acceptance specifications and process controls in the vitrification process and the waste and canister characteristics compare favorably to spent nuclear fuel in terms of the dispersability and respirability of the contents during normal conditions of transport and after an accident. The DOE maintained that impact and leak tests on the canisters, chemical analyses of spent nuclear fuel and simulated HLW borosilicate glass mixtures, and other studies of the levels of radioactivity present in the proposed transportation packages demonstrate that vitrified HLW canisters are analogous to reactor spent fuel elements.

The DOE petition refers to plutonium in the form of borosilicate glass as being essentially nonrespirable. This is because a minute quantity of respirable particles could result if the glass fractures such as during cooldown processes after being poured into the HLW canisters, normal handling and transport conditions, and accident conditions.

In the technical information supporting the petition, the DOE compared the physical and chemical characteristics of the vitrified HLW glass mixture to spent nuclear fuel pellets. Because impact studies of simulated waste glass from the DOE Savannah River site (Aiken, South Carolina) have shown comparable levels of fracture

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<sup>1</sup> Technical Justification to Support the PRM by the DOE to Exempt HLW Canisters from 10 CFR 71.63(b), dated September 30, 1993.

resistance and similar fractions of respirable particles when compared to unirradiated uranium fuel pellets and other potential waste form materials, the fracture resistance of HLW glass is expected to be comparable to that of uranium fuel pellets.

The DOE also noted that evaluations show that the total concentration of plutonium in an individual fuel assembly is more than 100 times greater than that in a HLW canister from the Savannah River site. The DOE stated that the maximum concentration of plutonium projected for the Hanford and West Valley HLW canisters is much less than that of the Savannah River HLW canisters. The DOE also noted that canisters containing vitrified HLW will be enclosed within a shipping cask that has been certified by the NRC. The shipping casks would further reduce the potential for canister damage and for release of respirable particles.

Based on DOE documents, it is estimated that there will be 3,500 shipments of vitrified HLW by 2030. These shipments would not start until a HLW repository or an interim storage facility becomes available. This proposed rule would decrease loading and unloading time (and resultant expense), including the time to return the cask for the next shipment; reduce unnecessary handling steps and resultant occupational dose; potentially reduce the number of shipments due to reduced payload of double-containment casks versus normal cask; and reduce the cost of the containment system.

## Proposed Regulatory Action

The NRC is proposing to amend 10 CFR 71.63 based on our evaluation of the petition submitted by the DOE, its attachment, "Technical Justification to Support the PRM by the DOE to Exempt HLW Canisters from 10 CFR 71.63(b)," and the three public comments received on the petition after its publication in the Federal Register. 10 CFR 71.63 specifies special provisions when shipping plutonium in excess of 0.74 TBq (20 Ci) per package, including a separate inner containment system, except when plutonium is in solid form in reactor fuel elements, metal, or metal alloys. In proposing to amend § 71.63, the NRC is accepting, with modifications, the petition submitted by DOE, for the reasons set forth in the following paragraphs.

In an accompanying statement of considerations to the 1974 rule on shipping plutonium, the Commission stated that the additional inner containment requirements are intended to take into account the fact that the plutonium may be in a respirable form. The safety goal achieved in § 71.63 is the prevention of releases of respirable forms of plutonium (when shipping over 0.74 TBq) during both normal conditions of transportation and during accidents. The 1974 rule considered both increased numbers of shipments of potentially respirable forms of plutonium, as a result of commercial reprocessing of spent nuclear fuel, and an increased potential for a human packaging error associated with the larger

shipping load. However, these large numbers of plutonium shipments have not occurred, due in part to policy, technical, and economic decisions to abandon commercial reprocessing in the late 1970s.

Because of the material properties of the vitrified HLW, the sealed canisters, and the approved quality assurance programs as described in the petition, canisters of vitrified HLW packaged in accordance with 10 CFR Part 71 are highly unlikely to result in releases of dispersible or respirable forms of plutonium under normal transportation conditions, as identified under 10 CFR Part 71. Therefore, for normal transportation, the vitrified HLW canisters meet the intent of the § 71.63(b) requirement without the need for double containment.

As for accident conditions, transportation packages for vitrified HLW will be required to be certified by the NRC pursuant to Section 180 of the Nuclear Waste Policy Act of 1982, as amended (42 USC 10175), and 10 CFR Part 71. Every package for vitrified HLW will be required to meet the standards for accident resistant (i.e., Type B) packages as set forth in 10 CFR Part 71. The shipping casks for vitrified HLW are anticipated to be similar in design and robustness, and provide a comparable level of protection to shipping casks for spent nuclear fuel. Because spent nuclear fuel is excluded from the double containment requirement, a favorable comparison of the canisters of vitrified HLW to spent nuclear fuel would support removal of the vitrified HLW forms from double containment.



The tests described in the technical justification demonstrate that the canisters containing the vitrified HLW compare favorably to the cladding surrounding spent fuel pellets in reactor assemblies. The comparison is in terms of physical integrity and containment, based upon the material properties, dimensions, and the effects of radiation damage to materials.

In the technical justification, the DOE described the physical characteristics and acceptance standards of the canisters of vitrified HLW, including that the canistered waste form be capable of withstanding a 7-meter drop onto a flat, essentially unyielding surface, without breaching or dispersing radionuclides. This requirement is imposed by the DOE's "Waste Acceptance System Requirements Document (WASRD)," Rev. 0, which is referenced in the technical justification supporting the petition. This test should not be confused with the 9-meter drop test onto an essentially unyielding surface, as required by the hypothetical accident conditions in 10 CFR 71.73. The 9-meter drop test is performed on the entire package under 10 CFR Part 71 certification review by the NRC. The 7-meter drop applies to the canistered HLW, which is the content of the NRC-certified Type B package.

The NRC agrees that the 7-meter drop test requirement is relevant to the demonstration that the canistered HLW represents an essentially nonrespirable form for shipping plutonium. It is reasonable to expect that the 7-meter drop test on the canister

would be a more severe test than the 9-meter drop test on an NRC-approved Type B package, due to the energy absorption by the packaging and impact limiters. The WASRD acceptance criterion of no "breaching or dispersing radionuclides" could be used to demonstrate that the waste is essentially nonrespirable under accident conditions.

However, the NRC does not control the requirements in, or changes to, the DOE's WASRD. Many requirements in the WASRD are apparently derived from, or are DOE's interpretations of, the NRC or other applicable regulations. There are no NRC regulations or other requirements specifying a 7-meter drop test onto an essentially unyielding surface for canistered HLW. Accordingly, the NRC does not have assurance that this test will be retained in future revisions to the WASRD. Therefore, this test itself does not represent a sufficient basis for removing the regulatory requirement in 10 CFR 71.63 for a separate inner containment.

To address this concern, the proposed rulemaking provides additional requirements beyond those presented in the petition for rulemaking that requested exemption of "Canisters containing vitrified high-level waste." The NRC is proposing to amend 10 CFR 71.63(b) by excluding sealed canisters containing vitrified HLW from the double containment requirement if these canisters meet the specific waste package design criteria in 10 CFR Part 60. The additional requirement to meet 10 CFR Part 60 is responsive to the public comment received on the DOE petition from the State of Idaho

by establishing criteria relevant to the intent of the double containment rule.

The design criteria for HLW forms in 10 CFR 60.135(b) and (c) require that the waste be in solid form, in sealed containers, and that particulate waste forms be consolidated to limit the availability and generation of particulate. The basis for these technical requirements under 10 CFR Part 60 is to limit particulates for reduced leaching versus limiting particulate for respirability. Nevertheless, the bases are generally consistent. The DOE WASRD, and its associated quality assurance programs, are primarily based upon compliance with 10 CFR Part 60 requirements.

In addition, the NRC is proposing to make a minor formatting change in the language of the regulation and a minor correction to the usage of units in this section to be consistent with existing NRC policy. Metric units are reported first with English units in parenthesis.

#### Compatibility of Agreement State Regulations

The proposed compatibility level for this rulemaking is Division 4 because the change only affects the DOE plutonium shipments. Division 4 rules pertain to those regulatory functions that are reserved solely to the authority of the NRC pursuant to the Atomic Energy Act of 1954, as amended, and 10 CFR Part 150.

## Electronic Access

Comments may be submitted electronically, in either ASCII text or WordPerfect format (version 5.1 or later), by calling the NRC Electronic Bulletin Board (BBS) on FedWorld. The bulletin board may be accessed using a personal computer, a modem, and one of the commonly available communications software packages, or directly via Internet. Background documents on the rulemaking are also available, as practical, for downloading and viewing on the bulletin board.

If using a personal computer and modem, the NRC rulemaking subsystem on FedWorld can be accessed directly by dialing the toll free number (800) 303-9672. Communication software parameters should be set as follows: parity to none, data bits to 8, and stop bits to 1 (N,8,1). Using ANSI or VT-100 terminal emulation, the NRC rulemaking subsystem can then be accessed by selecting the "Rules Menu" option from the "NRC Main Menu." Users will find the "FedWorld Online User's Guides" particularly helpful. Many NRC subsystems and data bases also have a "Help/Information Center" option that is tailored to the particular subsystem.

The NRC subsystem on FedWorld also can be accessed by a direct dial phone number for the main FedWorld BBS, (703) 321-3339, or by using Telnet via Internet: fedworld.gov. If using (703) 321-3339 to contact FedWorld, the NRC subsystem will be accessed from the

main FedWorld menu by selecting the "Regulatory, Government Administration and State Systems," then selecting "Regulatory Information Mall." At that point, a menu will be displayed that has an option "U.S. Nuclear Regulatory Commission" that will take you to the NRC Online main menu. The NRC Online area also can be accessed directly by typing "/go nrc" at a FedWorld command line. If you access NRC from FedWorld's main menu, you may return to FedWorld by selecting the "Return to FedWorld" option from the NRC Online Main Menu. However, if you access NRC at FedWorld by using NRC's toll-free number, you will have full access to all NRC systems, but you will not have access to the main FedWorld system.

If you contact FedWorld using Telnet, you will see the NRC area and menus, including the Rules Menu. Although you will be able to download documents and leave messages, you will not be able to write comments or upload files (comments). If you contact FedWorld using FTP, all files can be accessed and downloaded but uploads are not allowed; all you will see is a list of files without descriptions (normal Gopher look). An index file listing all files within a subdirectory, with descriptions, is available. There is a 15-minute time limit for FTP access.

Although FedWorld also can be accessed through the World Wide Web, like FTP, that mode only provides access for downloading files and does not display the NRC Rules Menu.

For more information on the NRC bulletin boards call Mr. Arthur Davis, Systems Integration and Development Branch, NRC, Washington, DC 20555-0001, telephone (301) 415-5780; e-mail AXD3@nrc.gov.

#### Finding of No Significant Environmental Impact: Availability

The Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in Subpart A of 10 CFR Part 51, that this rule, if adopted, would not be a major Federal action significantly affecting the quality of the human environment, and therefore, an environmental impact statement is not required. The proposed rule change removes shipments of sealed canisters containing vitrified HLW that meet the design criteria in 10 CFR 60.135(b) and (c) from the double containment packaging requirement. The additional design requirement supports consistency with the intent of the original 1974 rule. The primary purpose for double containment is to ensure that any respirable plutonium will not leak into the atmosphere. Vitrified HLW is essentially nonrespirable, and therefore, the packaging requirement for double containment is unnecessary.

The NRC has sent a copy of the environmental assessment and this proposed rule to every State Liaison Officer and requested their comments on the environmental assessment. The environmental assessment and finding of no significant impact on which this

determination is based are available for inspection at the NRC Public Document Room, 2120 L Street NW. (Lower Level), Washington, DC. Single copies of the environmental assessment and the finding of no significant impact are available from Mark Haisfield, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone (301) 415-6196.

#### Paperwork Reduction Act Statement

This proposed rule does not contain a new or amended information collection requirement subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing requirements were approved by the Office of Management and Budget, approval number 3150-0008.

#### Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

### Regulatory Analysis

The Commission has prepared a draft regulatory analysis on this proposed regulation. The analysis examines the costs and benefits of the alternatives considered by the Commission. The draft analysis is available for inspection in the NRC Public Document Room, 2120 L Street NW. (Lower Level), Washington, DC. Single copies of the draft analysis may be obtained from Mark Haisfield, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone (301) 415-6196.

The Commission requests public comment on the draft regulatory analysis. Comments on the draft analysis may be submitted to the NRC as indicated under the ADDRESSES heading.

### Regulatory Flexibility Certification

As required by the Regulatory Flexibility Act of 1980 (5 U.S.C. 605(b)), the Commission certifies that this rule, if adopted, will not have a significant economic impact upon a substantial number of small entities. The rulemaking only affects the DOE shipments of vitrified HLW. No other entities are involved.

### Backfit Analysis



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

### List of Subjects

#### 10 CFR Part 71

Criminal penalties, Hazardous materials transportation, Nuclear materials, Packaging and containers, Reporting and recordkeeping requirements.

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. 553; the NRC is proposing to adopt the following amendments to 10 CFR Part 71.

#### PART 71--PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIAL

1. The authority citation for Part 71 continues to read as follows:

**AUTHORITY:** Secs. 53, 57, 62, 63, 81, 161, 182, 183, 68 Stat. 930, 932, 933, 935, 948, 953, 954, as amended, sec. 1701, 106 Stat. 2951, 2952, 2953 (42 U.S.C. 2073, 2077, 2092, 2093, 2111, 2201,

2232, 2233, 2297f); secs. 201, as amended, 202, 206, 88 Stat. 1242, as amended, 1244, 1246 (42 U.S.C. 5841, 5842, 5846). Section 71.97 also issued under sec. 301, Pub. L. 96-295, 94 Stat. 789-790.

2. Section 71.63 is revised to read as follows:

§ 71.63 Special requirements for plutonium shipments.

(a) Plutonium in excess of 0.74 TBq (20 Ci) per package must be shipped as a solid.

(b) Plutonium in excess of 0.74 TBq (20 Ci) per package must be packaged in a separate inner container placed within outer packaging that meets the requirements of subparts E and F of this part for packaging of material in normal form. If the entire package is subjected to the tests specified in § 71.71 ("Normal conditions of transport"), the separate inner container must not release plutonium as demonstrated to a sensitivity of  $10^{-6}$  A<sub>2</sub>/h. If the entire package is subjected to the tests specified in § 71.73 ("Hypothetical accident conditions"), the separate inner container must restrict the loss of plutonium to not more than A<sub>2</sub> in 1 week. The requirements of this paragraph do not apply to solid plutonium in the following forms:

- (1) Reactor fuel elements;
- (2) Metal or metal alloy;
- (3) Sealed canisters containing vitrified high-level waste that meet the design criteria in 10 CFR 60.135(b) and (c); and

(4) Other plutonium bearing solids that the Commission determines should be exempt from the requirements of this section.

Dated at Rockville, Maryland, this \_\_\_\_\_ day of \_\_\_\_\_  
\_\_\_\_\_, 1997.

Commission. For the Nuclear Regulatory

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John C. Hoyle,  
Secretary of the Commission.

Regulatory Analysis for Rulemaking on  
Requirements for Shipping Packages Used to  
Transport Vitrified High-Level Waste

1. Statement of the Problem and Objectives

BACKGROUND

In 10 CFR 71.63, the Commission imposed special requirements on licensees who ship plutonium in excess of 0.74 terabecquerels (20 curies). These requirements specify that plutonium must be in solid form and that packages used to ship plutonium must provide a separate inner containment (the "double containment" requirement). In adopting these requirements, the Commission specifically excluded plutonium in the form of reactor fuel elements, metal or metal alloys, and other plutonium-bearing solids that the Commission determines, on a case-by-case basis, do not require double containment.

On November 30, 1993, the DOE petitioned the Commission to amend § 71.63 to add a provision that would specifically remove canisters containing plutonium-bearing vitrified waste from the packaging requirement for double containment. DOE's main arguments were that the canistered vitrified waste provided a comparable level of protection to reactor fuel elements, that the plutonium concentrations in the vitrified waste will be lower than in spent nuclear fuel, and that the vitrified waste is in an essentially nonrespirable form. The Commission published a notice of receipt for the petition, docketed as PRM-71-11, in the Federal Register on February 18, 1994, requesting public comment by May 4, 1994. The public comment period was subsequently extended to June 3, 1994, at the request of the Idaho National Engineering Laboratory (INEL) Oversight Program of the State of Idaho.

Comments were received from three parties: the U.S. Environmental Protection Agency (EPA); Nye County, Nevada (the site for the proposed spent fuel and high-level waste (HLW) repository at Yucca Mountain); and the INEL Oversight Program of the State of Idaho. EPA reviewed the petition in accordance with its responsibilities under Section 309 of the Clean Air Act, and had no specific comments. Nye County agreed with the rationale and arguments advanced by DOE, and had no objection to DOE's petition. The State of Idaho commented that the petition was premature because it did not specify the parameters or performance standards that HLW must meet.

On June 1, 1995, the NRC staff met with the DOE in a public meeting to discuss the petitioner's request and the possible

alternative of requesting an NRC determination under § 71.63(b)(3) to exempt vitrified HLW from the double containment requirement. The DOE informed the NRC in a letter dated January 25, 1996, of its intent to seek this exemption and the NRC received DOE's request on July 16, 1996. The original petition for rulemaking was requested to be held in abeyance until a decision was reached on the exemption request.

In response to DOE's request, the NRC staff prepared a Commission paper (SECY-96-215, dated October 8, 1996) outlining and requesting Commission approval of the NRC staff's proposed approach for making a determination under § 71.63(b)(3). The determination would have been the first made after the promulgation of the original rule, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Materials Under Certain Conditions," published on June 17, 1974 (39 FR 20960). In a staff requirements memorandum dated October 31, 1996, the Commission disapproved the NRC staff's plan and directed that this policy issue be addressed by rulemaking. In response, the NRC staff has reactivated the DOE petition and developed this proposed rule.

#### DISCUSSION

In the final 1974 rule, the NRC anticipated that a large number of shipments of plutonium nitrate liquids could result from spent nuclear fuel reprocessing and revised its regulations to require that plutonium in excess of 0.74 terabequerels (20 curies) be shipped in solid form. The NRC did so because shipment of plutonium liquids is susceptible to leakage, particularly if a shipping package is improperly or not tightly sealed. The value of 0.74 terabequerels (20 curies) was chosen because it was equal to a large quantity of plutonium as defined in 10 CFR Part 71 in effect in 1974. Although this definition no longer appears in 10 CFR Part 71, the value as applied to double containment of plutonium has been retained. The concern about leakage of liquids arose because of the potential for a large number of packages (probably of more complex design) to be shipped due to reprocessing and the increased possibility of human error resulting from handling this expanded shipping load.

The NRC treats dispersible plutonium oxide powder in the same way because it also is susceptible to leakage if packages are improperly sealed. Plutonium oxide powder was of particular concern because it was the most likely alternative form (as opposed to plutonium nitrate liquids) for shipment in a fuel reprocessing economy. To address the concern with dispersible powder, the NRC required that plutonium not only must be in solid form, but also that solid plutonium be shipped in packages requiring double containment.

In the accompanying statement of considerations to the final 1974 rule, the NRC stated that the additional inner containment requirements are intended to take into account that the plutonium may be in a respirable form and that solid forms that are essentially nonrespirable, such as reactor fuel elements, are suitable for exemption from the double containment requirement. The Commission further stated that:

Since the double containment provision compensates for the fact that the plutonium may not be in a "nonrespirable" form, solid forms of plutonium that are essentially nonrespirable should be exempted from the double containment requirement. Therefore, it appears appropriate to exempt from the double containment requirements reactor fuel elements, metal or metal alloy, and other plutonium bearing solids that the Commission determines suitable for such exemption. The latter category provides a means for the Commission to evaluate, on a case-by-case basis, requests for exemption of other solid material where the quantity and form of the material permits a determination that double containment is unnecessary.

DOE's petition to amend § 71.63, by adding a provision that specifically exempts canisters containing vitrified HLW from the packaging requirement for a separate inner containment is partly based on the rationale that the vitrified HLW meets the intent of the rule because the plutonium will be in an essentially nonrespirable form. The DOE petition contends that the vitrified HLW contained in stainless steel canisters provides a comparable level of safety protection to that provided by spent nuclear fuel elements.

Specifically, in the technical information supporting the petition<sup>2</sup>, the DOE sought to demonstrate that the waste acceptance specifications and process controls in the vitrification process and the waste and canister characteristics compare favorably to spent nuclear fuel in terms of the dispersability and respirability of the contents during normal conditions of transport and after an accident. The DOE maintained that impact and leak tests on the canisters, chemical analyses of spent nuclear fuel and simulated HLW borosilicate glass mixtures, and other studies of the levels of radioactivity present in the proposed transportation packages demonstrate that vitrified HLW canisters are analogous to reactor

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<sup>2</sup> Technical Justification to Support the PRM by the DOE to Exempt HLW Canisters from 10 CFR 71.63(b), dated September 30, 1993.

spent fuel elements.

The DOE petition refers to plutonium in the form of borosilicate glass as being essentially nonrespirable. This is because a minute quantity of respirable particles could result if the glass fractures such as during cooldown processes after being poured into the HLW canisters, normal handling and transport conditions, and accident conditions.

In the technical information supporting the petition, the DOE compared the physical and chemical characteristics of the vitrified HLW glass mixture to spent nuclear fuel pellets. Because impact studies of simulated waste glass from the DOE Savannah River site (Aiken, South Carolina) have shown comparable levels of fracture resistance and similar fractions of respirable particles when compared to unirradiated uranium fuel pellets and other potential waste form materials, the fracture resistance of HLW glass is expected to be comparable to that of uranium fuel pellets.

The DOE also noted that evaluations show that the total concentration of plutonium in an individual fuel assembly is more than 100 times greater than that in a HLW canister from the Savannah River site. The DOE stated that the maximum quantity of plutonium projected for the Hanford and West Valley HLW canisters is much less than that of the Savannah River HLW canisters. The DOE also noted that canisters containing vitrified HLW will be enclosed within a shipping cask that has been certified by the NRC. The shipping casks would further reduce the potential for canister damage and for release of respirable particles.

## 2. Identification and Preliminary Analysis of Alternative Approaches

There are three alternatives to resolving the petition from the DOE:

ALTERNATIVE 1: Deny the petition. This would require the DOE to use a double containment system for shipping vitrified plutonium waste or attempt to use alternative 2. The NRC agrees with DOE's assessment that there are no significant health and safety impacts to using single containment canisters containing vitrified HLW wastes because they are essentially nonrespirable. Therefore, denying the petition would impose an unnecessary regulatory burden on the DOE.

ALTERNATIVE 2: Make a determination under 10 CFR 71.63(b)(3) on whether canisters containing vitrified HLW should be removed from the double containment requirement. In SECY-96-215, dated October

8, 1996, the NRC staff proposed this approach to the Commission. In the staff requirements memorandum, dated October 31, 1996, the Commission stated that this is a policy issue, and therefore, should be addressed through rulemaking.

ALTERNATIVE 3: Change the regulations in 10 CFR 71.63(b)(3) to remove canisters containing vitrified HLW from the packaging requirement for double containment. As discussed above, the NRC maintains that the petitioner is correct that canisters containing vitrified HLW are in an essentially nonrespirable form and should not be included in the requirement for double containment. The NRC is also proposing that for this alternative the containment system meet the specific waste package design criteria in 10 CFR Part 60. This would provide the NRC assurance that the process DOE uses to prepare and transport the HLW package is acceptable. This alternative would allow a more cost effective means of transporting this waste with no significant impact to public health and safety.

### 3. Estimate and Evaluation of Values and Impacts

The DOE has not quantitatively evaluated the cost saving of removing the double containment requirement. However, they have identified potential benefits. Because the NRC agrees with the DOE that there are no significant health and safety issues, a detailed quantitative analysis is not necessary. The DOE has identified the following benefits: (1) decrease loading and unloading time (and resultant expense), including the time to return the cask for the next shipment; (2) reduce unnecessary handling steps and resultant occupational dose; (3) potentially reduce the number of shipments due to reduced payload of double-containment casks versus normal cask; and (4) reduce the cost of the containment system. Based on DOE documents, it is estimated that there will be 3,500 shipments of this type of vitrified HLW. These shipments would not start until a HLW repository, or an interim storage facility, becomes available.

### 4. Decision Rationale

The NRC is proposing to amend § 71.63. This section requires special provisions when shipping plutonium in excess of 0.74 TBq (20 Ci) per package. The provisions require a double containment system except when plutonium is in solid form in reactor fuel elements, metal, or metal alloys. For the reasons presented under the heading "Discussion," the NRC maintains that the petitioner is correct that canisters containing vitrified HLW are in an essentially nonrespirable form and should not be included in the double containment requirement. The NRC is also proposing that the



containment system meet the specific waste package design criteria in 10 CFR Part 60. This will provide the NRC reasonable assurance that the process the DOE uses to prepare and transport the HLW package is acceptable. The proposed rule change would allow a more cost effective means of transporting this waste with no significant impact to public health and safety.

In addition, the NRC is proposing to make a minor correction to the usage of units in this section to be consistent with existing NRC policy. Metric units are reported first with English units in parenthesis.

## 5. Implementation

Unless significant safety concerns are raised during the public comment period, a final rule should be completed during FY97.

Draft Environmental Assessment and Finding of  
No Significant Environmental Impact

Proposed Rule: Requirements for Shipping Packages Used  
to Transport Vitrified High-Level Waste

BACKGROUND

In 10 CFR 71.63, the Commission imposed special requirements on licensees who ship plutonium in excess of 0.74 terabecquerels (20 curies). These requirements specify that plutonium must be in solid form and that packages used to ship plutonium must provide a separate inner containment (the "double containment" requirement). In adopting these requirements, the Commission specifically excluded plutonium in the form of reactor fuel elements, metal or metal alloys, and other plutonium-bearing solids that the Commission determines, on a case-by-case basis, do not require double containment.

On November 30, 1993, the DOE petitioned the Commission to amend § 71.63 to add a provision that would specifically remove canisters containing plutonium-bearing vitrified waste from the packaging requirement for double containment. DOE's main arguments were that the canistered vitrified waste provided a comparable level of protection to reactor fuel elements, that the plutonium concentrations in the vitrified waste will be lower than in spent nuclear fuel, and that the vitrified waste is in an essentially nonrespirable form. The Commission published a notice of receipt for the petition, docketed as PRM-71-11, in the Federal Register on February 18, 1994, requesting public comment by May 4, 1994. The public comment period was subsequently extended to June 3, 1994, at the request of the Idaho National Engineering Laboratory (INEL) Oversight Program of the State of Idaho.

Comments were received from three parties: the U.S. Environmental Protection Agency (EPA); Nye County, Nevada (the site for the proposed spent fuel and high-level waste (HLW) repository at Yucca Mountain); and the INEL Oversight Program of the State of Idaho. EPA reviewed the petition in accordance with its responsibilities under Section 309 of the Clean Air Act, and had no specific comments. Nye County agreed with the rationale and arguments advanced by the DOE, and had no objection to DOE's petition. The State of Idaho commented that the petition was premature because it did not specify the parameters or performance standards that HLW must meet.

On June 1, 1995, the NRC staff met with the DOE in a public meeting to discuss the petitioner's request and the possible

alternative of requesting an NRC determination under § 71.63(b)(3) to exempt vitrified HLW from the double containment requirement. The DOE informed the NRC in a letter dated January 25, 1996, of its intent to seek this exemption and the NRC received DOE's request on July 16, 1996. The original petition for rulemaking was requested to be held in abeyance until a decision was reached on the exemption request.

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The Commission further stated that:

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<sup>3</sup> Technical Justification to Support the PRM by the DOE to Exempt HLW Canisters from 10 CFR 71.63(b), dated September 30, 1993.

poured into the HLW canisters, normal handling and transport conditions, and accident conditions.

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The DOE also noted that evaluations show that the total concentration of plutonium in an individual fuel assembly is more than 100 times greater than that in a HLW canister from the Savannah River site. The DOE stated that the maximum concentration of plutonium projected for the Hanford and West Valley HLW canisters is much less than that of the Savannah River HLW canisters. The DOE also noted that canisters containing vitrified HLW will be enclosed within a shipping cask that has been certified by the NRC. The shipping casks would further reduce the potential for canister damage and for release of respirable particles.

#### ENVIRONMENTAL CONSIDERATIONS

The Commission has determined, under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in Subpart A of 10 CFR Part 51, that this rule is not a major Federal action significantly affecting the quality of the human environment and therefore, an environmental impact statement (EIS) is not required.

The Commission's "Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes," NUREG-0170 (December 1977), is the NRC's generic EIS, covering all types of radioactive material transportation by all modes (road, rail, air, and water). The environmental impact of radioactive material shipments (including plutonium) in all modes of transport under the regulations in effect as of June 30, 1975, is summarized by NUREG-0170 as follows:

Transportation accidents involving packages of radioactive material present potential for radiological exposure to transport worker and to members of the general public. The expected values of the annual radiological impact from such potential exposure are very small, estimated to be about one latent cancer fatality and one genetic effect for 200 hundred

years of shipping at 1975 rates.

The principal nonradiological impacts were found to be two injuries per year, and less than one accidental death per 4 years.

On the basis of the analysis and evaluation set forth in this statement, the staff concluded that:

Maximum radiation exposure of individuals from normal transportation is generally within recommended limits for members of the general public.

The average radiation dose to the population at risk from normal transportation is a small fraction of the limits recommended for members of the general public from all sources of radiation other than natural and medical sources and is a small fraction of the natural background dose.

The radiological risk from accidents in transportation is small, amounting to about one-half percent of the normal transportation risk on an annual basis.

The proposed exception to the requirements in 10 CFR 71.63(b) for a separate inner containment, for vitrified HLW forms, should not result in any additional shipments of radioactive material. Shipment of vitrified HLW to a repository is a necessary component of the national HLW disposal strategy, is permitted under current regulations (with double containment), and would need to occur regardless of the proposed change to 10 CFR Part 71. In concluding that the proposed rule would not increase the number of shipments, the NRC staff has presumed that, if the requirement for a separate inner containment is retained, the packaging for transport of the vitrified HLW would be changed, or alternatively, the canisters themselves would be evaluated as a separated inner containment; but that the primary factors which would increase the numbers of shipments (e.g., the number of canisters per package or the physical size and weight of each canister) are generally not related to 10 CFR Part 71 considerations.

However, it is noted that adopting the proposed rule could result in reducing the total number of shipments. This is because if additional packaging is required to include a separate inner containment, the payload of each package would need to be reduced due to conveyance size and/or weight limits. Because, as shown by NUREG-0170, the greatest contributor to the overall risk of transportation of radioactive material is related to the normal (non-accident) conditions of transport, this reduction potential in the total number of shipments could offset any additional risk

which might be incurred by not requiring double containment of the canistered, vitrified HLW.

Shipments of plutonium-bearing vitrified waste, as requested in the petition, are only expected to be made from three DOE facilities (i.e., West Valley, New York; Savannah River Site (SRS), South Carolina; and Hanford, Washington) to a federal HLW repository (although there is some possibility of intermediate shipments to an interim storage facility). The DOE has taken an inventory of HLW stored within the DOE complex and estimated the total number of vitrified HLW canisters that will be produced, requiring transport to a repository. The report, DOE/RW-0006, Rev. 11, September 1995, "Integrated Data Base Report - 1994, U.S. Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics," estimates the total number of HLW canisters, by site, to be: Hanford, 7,067 canisters; SRS, 5,717 canisters; and West Valley, 300 canisters -- approximately 13,000 canisters, to be processed and stored at these sites by 2030. This number of canisters may increase if plutonium production efforts were to resume. In addition, based on the above report, approximately 700 HLW canisters from INEL (Idaho) may also be generated. These canisters were not considered in the petition because the HLW treatment technology had not yet been selected.

Current repository conceptual designs place four or five vitrified HLW canisters per package. Conservatively assuming four canisters per transportation package, the number of shipments of plutonium-bearing vitrified HLW glass from the DOE complex to the repository would be about 3,500 total, to be spread out over several years. These shipments would not start until a HLW repository or an interim storage facility becomes available. The risk associated with this number of shipments is incidental to, and bounded by, the environmental impacts of all radioactive materials transportation, as described in NUREG-0170.

The only impact of this proposed rule is expected to be that shipments of vitrified HLW will not be required to be made in packages providing a separate inner containment. Every package for vitrified HLW will be required to meet the standards for accident resistant (i.e., Type B) packages as set forth in 10 CFR Part 71. The shipping casks for vitrified HLW are anticipated to be similar in design and robustness to shipping casks for spent nuclear fuel. Spent fuel elements are exempt from the requirement in 10 CFR 71.63 to provide a separate inner containment, and spent fuel contains much greater concentrations of plutonium than will the vitrified glass waste forms (the HLW was processed to remove plutonium).

In 1987, the NRC performed a modal study (NUREG/CR-4829), which examined the accident risks associated with transport of



spent nuclear fuel, by relating the thermal and mechanical forces that the NRC certified packages could withstand, to the frequencies of accidents that could result in such forces. The conclusion of this study was that the ability of spent nuclear fuel packages to withstand the hypothetical accident conditions in 10 CFR Part 71, as required during the NRC-certification, bounded the actual accidents which might occur during transport, such that the fraction of accidents resulting in any radiological hazard was less than 0.6%, and the annual risks of transporting spent nuclear fuel were estimated at less than one-third the NUREG-0170 estimates for all radioactive materials.

Because of: (1) the expected similarities between design and robustness of spent nuclear fuel packages and the vitrified HLW packages; (2) the greater number of shipments of spent fuel as compared to vitrified HLW; (3) the larger source term available for release as a result of an accident involving a spent fuel package as compared to a vitrified HLW package; and (4) the previous findings related to the impacts of radioactive materials shipments in NUREG-0170, and spent fuel shipments in NUREG/CR-4829); the NRC finds that there is no significant effect on the quality of the environment associated with the proposed rulemaking.

The Honorable Dan Schaefer, Chairman  
Subcommittee on Energy and Power  
Committee on Commerce  
United States House of Representatives  
Washington, DC 20515

Dear Mr. Chairman:

The NRC has sent to the Office of the Federal Register for publication and comment the enclosed proposed amendments to the Commission's rules in 10 CFR Part 71. The amendments, if adopted, would remove canisters containing vitrified high-level waste, which contain plutonium, from the packaging requirement for double containment. This amendment is being proposed in response to a petition for rulemaking submitted by the Department of Energy. The primary purpose for double containment is to ensure that any respirable plutonium will not be leaked into the atmosphere. The NRC agrees with the petitioner that vitrified high-level wastes are essentially nonrespirable, and therefore the packaging requirement for double containment is unnecessary. This proposed rule change would allow a more cost effective means of transporting this waste with no significant impact to public health and safety. This proposed rule would also make a minor correction to the usage of metric and English units to be consistent with existing NRC policy.

Sincerely,

Dennis K. Rathbun, Director  
Office of Congressional Affairs

Enclosure:  
Federal Register Notice

The Commissioners

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cc: Representataive Ralph Hall

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Enclosure:  
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cc: Ranking Member

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The Honorable James M. Inhofe, Chairman  
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Property and Nuclear Safety  
Committee on Environment and Public Works  
United States Senate  
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