

## **POLICY ISSUE NOTATION VOTE**

October 22, 2007

SECY-07-0185

FOR: The Commissioners

FROM: Luis A. Reyes  
Executive Director for Operations

SUBJECT: MODERATOR EXCLUSION IN TRANSPORTATION PACKAGES

PURPOSE:

To request that the Commission approve Option 3 of staff recommendations on its approach for considering the use of moderator exclusion for spent fuel transportation packages.

SUMMARY:

Fissile-material transportation packages are required, by regulation, to be subcritical with fresh (i.e., unborated) water inside the containment system. Packages based on "moderator exclusion" would not meet this requirement, because the criticality safety of the package relies on fresh water not getting into the containment system. Moderator exclusion is allowed only as an exception to the regulations, and has not previously been used as a basis for approval of a spent fuel transportation package design. Applicants have indicated that they wish to submit applications for spent fuel transportation package designs based on moderator exclusion. This paper describes: (1) the issues surrounding the use of moderator exclusion as a basis for design approval for spent fuel transportation packages, including a discussion of the current staff practice; (2) three regulatory options for addressing moderator exclusion; and (3) a recommendation regarding these options, that includes rulemaking to incorporate regulatory provisions addressing moderator exclusion. Because a change in staff practice would represent a departure with safety significance, the staff is requesting Commission direction on the moderator-exclusion issue.

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BACKGROUND:

The Nuclear Regulatory Commission (NRC) approves designs for transportation packages for large (Type B) quantities of radioactive material and fissile material. NRC transportation regulations, including performance standards for these packages, are in 10 CFR 71, "Packaging and Transportation of Radioactive Material." Regulations that specify criticality safety requirements for fissile-material packages are 10 CFR 71.55, "General Requirements for Fissile Material Packages," and 10 CFR 71.59, "Standards for Arrays of Fissile Material Packages." In certain instances, these provisions specifically address the presence and degree of water moderation that must be assumed when showing subcriticality of the fissile contents under normal conditions of transport and hypothetical-accident conditions. For a single package, 10 CFR 71.55(b) requires that a package must be designed and the contents limited such that a single package "would be subcritical if water were to leak into the containment system." Paragraph 71.55(c) allows the Commission to approve exceptions to this requirement, such as the approval of a package that relies on moderator exclusion. The regulations in 10 CFR 71.55 and 71.59 are consistent with, but not identical to, regulations promulgated by the International Atomic Energy Agency (IAEA). Enclosure 1 provides the applicable NRC and IAEA regulatory references.

DISCUSSION:

Transportation packages are required to be designed and the fissile contents limited, so that the package is subcritical, with fresh water in the containment system. This requirement (codified in 10 CFR 71.55(b)) provides a significant margin of safety and a defense-in-depth against accidental criticality in transport, such that a criticality accident is considered impossible. In fact, environmental impact statements and risk assessments for transportation are based on this premise. Such a robust defense-in-depth is consistent with NRC's strategic outcome of prevention of inadvertent criticality events. This is particularly important for transportation, because effects of an inadvertent criticality could adversely impact the public and not be limited to a nuclear facility site. Because most industry interest in moderator exclusion centers on spent fuel transport, this paper emphasizes this type of fissile material.

*Staff Practice to Date*

To date, NRC has not approved any spent fuel transportation package design that could be critical with fresh water in the containment system (i.e., no spent fuel transportation package design has been approved based on moderator exclusion). Practical design methods and features have been used to ensure subcriticality of transportation casks for all types of commercial- and research-reactor spent fuel. Such design features include geometry control and neutron-absorber plates incorporated into the basket structure that supports the fuel elements.

The requirement that water be assumed within the containment system is not explicitly tied to the ability of the package to limit water in-leakage under the regulatory tests and conditions that simulate normal conditions of transport and accident conditions. Instead, it is a general design requirement that is intended to ensure that no criticality accident could occur in transportation,

considering analytical uncertainties and uncertainties in the transportation environment. For example, although transportation risk studies to date show that the regulatory accident tests bound the conditions in most credible accidents, uncertainties still exist, particularly with respect to future transportation systems and practices. For spent fuel casks, this requirement also ensures safety during underwater loading and unloading operations.

The provisions of 10 CFR 71.55(c) allow the Commission to approve an exception to the requirement that the package must be subcritical with water in the containment system. The staff's long-term practice has been to consider this exception to be appropriate only for limited shipments and not for general approval of a design. Approval of a moderator exclusion exception under 10 CFR 71.55(c) should include risk information appropriate for the conditions of the particular shipments, including consideration of transportation operations, mode, route, and number of shipments. Using the moderator-exclusion provision of 10 CFR 71.55(c) for the general approval of a spent fuel cask design has not been considered appropriate in the past, because it would lead to the routine use of an exception that has important safety implications. In this regard, a Part 71 general design approval would allow an unlimited number of casks to be fabricated to that design, with essentially no restriction on transportation mode, route, or number of shipments.

#### *Limited Use of Moderator Exclusion and the Transport of Commercial High-burnup Spent Fuel*

Staff has issued guidance, regarding criticality assessments for transportation package designs for commercial spent fuel, that considers the ability of the cask to prevent water in-leakage under the regulatory hypothetical-accident conditions (10 CFR 71.55(e)). The guidance was issued as Interim Staff Guidance No. 19 (ISG-19). The guidance allows applicants to take credit for moderator exclusion under 10 CFR 71.55(e), provided that physical testing demonstrates the performance of the water-tight boundary under the regulatory-accident tests. The guidance was developed to address the possibility of fuel reconfiguration to a more reactive geometry under accident conditions, particularly in the case of high-burnup fuel that has unknown cladding strength and ductility.

#### *Practical Implications of Moderator Exclusion*

Applicants have claimed that using moderator exclusion as a basis for package-design approval could result in fewer future spent fuel shipments, because the number of fuel assemblies within a cask could be increased. The staff believes that there are reasonable and practical alternatives, that do not rely upon the moderator exclusion exception, and that these alternatives allow casks to retain defense-in-depth against accidental criticality in transport. It is primarily casks designed for an exceptionally large capacity (e.g., 32 pressurized water reactor (PWR) fuel assemblies) or without neutron-absorber plates, that may need to rely upon the moderator exclusion exception of 10 CFR 71.55(c). In contrast, the U.S. Department of Energy's (DOE) transport, aging, and disposal canister being developed for Yucca Mountain has a limited payload of commercial spent fuel (e.g., 21 PWR fuel assemblies) and is being designed so that it is critically safe with fresh water within the canister. Although NRC does not, in general, regulate DOE transportation activities, the Nuclear Waste Policy Act requires that shipments to the repository be made in NRC-certified packages.

Besides limiting the fuel payload, using burnup credit in criticality evaluations is an alternative method that can be used to achieve the same high capacity as would be possible with moderator exclusion. Burnup credit involves quantifying the decrease in nuclear reactivity of the fuel, due to fissile material depletion and the buildup of actinide and fission-product poisons during irradiation. The primary difference would be that designs using burnup credit would still incorporate neutron absorbers in the fuel basket. The use of burnup credit, with neutron absorbers, retains a margin of safety and defense-in-depth that ensures subcriticality in the unlikely event of fresh water entering into the containment system. NRC has recently approved a large-capacity spent fuel transport cask that takes limited credit for fuel burnup, to ensure criticality safety with fresh water in the containment system. Staff continues to interface with industry on the use of burnup credit in criticality safety evaluations for spent fuel transportation casks.

#### *Possibility of Requests for Design Approval Using Moderator Exclusion*

Some cask designers have stated that they intend to submit applications for spent fuel cask-design approvals based on moderator exclusion. For example, staff has held public meetings, with Holtec International, on its new design for a dual-purpose (storage and transport) cask that may rely on moderator exclusion. Other vendors for large-capacity, dual-purpose casks (e.g., Transnuclear and NAC International) have also said that they intend to submit designs that would need approval under 10 CFR 71.55(c). In addition, the staff has received a written query, from DOE, about the acceptability of using moderator exclusion as part of the design basis for a standardized canister being developed, by Idaho National Laboratory (INL), for shipments of non-commercial spent fuel from research and weapons-production reactors. DOE has indicated that it has near-term plans to submit a topical report for the INL canister design for NRC staff review.

#### *Regulatory Options for Moderator Exclusion for Spent Fuel Casks*

Prevention of an accidental criticality is a fundamental safety principle in the transport of fissile material. The regulatory approach currently in place, including regulations and staff practice, assures that there will be no inadvertent criticality events in spent fuel transportation activities. However, addressing moderator exclusion provisions in rulemaking may be an effective way of retaining appropriate margins of safety while recognizing the robust nature of spent fuel casks and the very small likelihood of fresh water inadvertently getting into the containment system during actual transport. A rulemaking process will also provide an opportunity for stakeholder comment and engagement with the staff in discussing views on moderator exclusion.

On February 15 and March 20, 2007, Spent Fuel Storage and Transportation staff made presentations to the Advisory Committee on Nuclear Waste and Materials (ACNW&M) on moderator exclusion in spent fuel transportation packages. In a letter to Chairman Klein (ADAMS Accession Number ML071150483), dated April 23, 2007, the ACNW&M recommended deferring the rulemaking decision and gaining experience through processing of applicants' requests for moderator exclusion. Staff stated, in its response dated June 1, 2007 (ADAMS Accession Number ML071380463), that it is actively engaged with potential applicants to gain this experience, although ACNW&M noted in its summary report dated July 27, 2007 (ADAMS

Accession Number ML072110537), that this experience would address moderator exclusion only under accident conditions, and was not consistent with its recommendation. The staff believes that rulemaking ultimately provides the best approach to assure adequate stakeholder input in this matter.

Approval of spent fuel package designs based on moderator exclusion would represent a major departure from current practice, and may preclude NRC from making categorical statements about the impossibility of criticality accidents during transportation. Because of the likelihood that applicants may, in the future, submit spent fuel package applications, requesting approval under 10 CFR 71.55(c), and because of the safety implications, staff is proposing three options to address the moderator exclusion issue. The options, including the pros and cons and resource estimates for each, are described in Enclosure 2. The three options are: (1) consider moderator exclusion only on a limited-shipment basis, as a 10 CFR 71.55(c) exception to the subcriticality requirement of 10 CFR 71.55(b); (2) consider moderator exclusion in spent fuel cask-design approvals under the provisions of 10 CFR 71.55(c), with additional risk information; and (3) initiate rulemaking to codify the acceptable uses of moderator exclusion for spent fuel transportation packages (recommended option). Enclosure 3 provides a discussion of security-related issues associated with moderator exclusion.

#### RECOMMENDATION:

The staff recommends that the Commission approve Option 3, to codify the acceptable uses of moderator exclusion for spent fuel transportation packages, using the rulemaking process, which assures appropriate stakeholder participation. The activities associated with this option are described in Enclosure 2. As the initial steps, the staff would: (1) evaluate existing environmental, risk, and security assessments; (2) develop the risk information needed for a technical basis for the rulemaking; and (3) develop a proposed rule and guidance. It is estimated that these initial steps would take approximately 2 years.

#### RESOURCES:

Because resources for Fiscal Year (FY) 2008 are already budgeted, any needed resources for moderator exclusion would have to be reprogrammed from existing budgeted efforts. For FY 2008 activities, if resources are reprogrammed to support moderator exclusion tasks, Office of Nuclear Material Safety and Safeguards (NMSS) work that may be deferred, delayed, or canceled includes the Division of Spent Fuel Storage and Transportation's (SFST's) efforts on risk-informing guidance, multi-lateral cooperation and assistance, inspection, and lower-priority licensing casework. The budgeting process for FY 2009 would be handled in a similar manner, although staff may have somewhat more latitude in reallocating workload resources in FY 2009, given the additional time for planning.

Resource estimates for the three regulatory options are described in Enclosure 2. For the recommended option (Option 3), the Fiscal Year (FY) 2008 resources are estimated as 2.0 full-time equivalents (FTEs) and \$300,000 contract cost for technical assistance. Resources needed for FY 2009 and FY 2010 are estimated as 2.7 FTEs and 1.0 FTE, respectively. Enclosure 3 addresses security-related resources.

The Commissioners

-6-

The Office of the General Counsel has reviewed this package and has no legal objection. The Office of the Chief Financial Officer has reviewed this package for resource implications and concurs.

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Executive Director  
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Enclosures:

1. Regulatory References
2. Regulatory Options
3. Security-Related Issues

## REGULATORY REFERENCES

### *Domestic Regulations*

U.S. Nuclear Regulatory Commission (NRC) transportation regulations, including performance standards for packages, are in 10 CFR Part 71. Regulations that specify criticality safety requirements for fissile material packages are 10 CFR 71.55 and 71.59. In general, 10 CFR 71.55 addresses subcriticality of a single package in isolation, whereas 10 CFR 71.59 addresses criticality safety for arrays of packages that may be transported in a single conveyance. The following paragraphs in Part 71 contain, in part, the regulatory basis for criticality safety of a single package of fissile material, and are the important regulatory provisions in considering moderator exclusion:

Paragraph 71.55 (b) states:

Except as provided in paragraph (c) ... of this section, a package used for the shipment of fissile material must be so designed and constructed and its contents so limited that it would be subcritical if water were to leak into the containment system, or liquid contents were to leak out of the containment system so that, under the following conditions, maximum reactivity of the fissile material would be attained:

- (1) The most reactive credible configuration consistent with the chemical and physical form of the material;
- (2) Moderation by water to the most reactive credible extent; and
- (3) Close full reflection of the containment system by water on all sides, or such greater reflection of the containment system as may additionally be provided by the surrounding material of the packaging.

Paragraph 71.55(c) states:

“The Commission may approve exceptions to the requirements of paragraph (b) of this section if the package incorporates special design features that ensure that no single packaging error would permit leakage, and if appropriate measures are taken before each shipment to ensure that the containment system does not leak.”

Additionally, portions of 10 CFR 71.55 (d) and (e) address water moderation, within the containment system, under normal conditions of transport and hypothetical-accident conditions, respectively. These are:

Paragraph 71.55(d) states, in part, that a fissile material package must be designed and its contents limited such that, under normal conditions of transport, the contents would be subcritical, and that:

“... There would be no leakage of water into the containment system unless, in the evaluation of undamaged packages under §71.59(a)(1) [criticality safety standards for arrays of fissile material packages under normal conditions of transport], it has been assumed that moderation is present to such an extent as to cause maximum reactivity consistent with the chemical and physical form of the material; ....”

Paragraph 71.55(e) states, in part, that a fissile material package must be designed and its contents limited such that, under hypothetical-accident conditions, the package would be subcritical, assuming that:

“Water moderation occurs to the most reactive credible extent consistent with the damaged condition of the package and the chemical and physical form of the contents; ....”

### *International Regulations*

The International Atomic Energy Agency (IAEA) develops and publishes safety regulations, for transportation of radioactive materials, that Member States may adopt. The IAEA regulations are contained in TS-R-1, “Regulations for the Safe Transport of Radioactive Material.” TS-R-1 includes provisions for fissile-material packages that are similar, but not identical to, those in Part 71.

For the criticality safety of a single package, TS-R-1 (2005 Edition), Paragraph 677, states, in part:

For a *package* in isolation it shall be assumed that water can leak into or out of all void spaces of the *package*, including those within the *containment system*. However, if the *design* incorporates special features to prevent such leakage of water into or out of certain void spaces, even as a result of error, absence of leakage may be assumed in respect of those void spaces. Special features shall include the following:

(a) Multiple high standard water barriers, each of which would remain watertight if the package were subject to the tests prescribed in para. 682 (b) [normal and accident conditions], a high degree of quality control in the manufacture, maintenance and repair of packagings, and tests to demonstrate the closure of each package before each shipment; ....

## **REGULATORY OPTIONS FOR CONSIDERING MODERATOR EXCLUSION**

The staff proposes three options to address the moderator exclusion issue for Commission consideration:

- Option 1. Consider moderator exclusion for transport of commercial spent fuel under 10 CFR 71.55(e) for hypothetical accident conditions, and on a limited-shipment basis, as a 10 CFR 71.55(c) exception to the subcriticality requirement of 10 CFR 71.55(b)

Description of Option: This option represents maintenance of the status quo. Under this option, applications for design approval would be assessed consistent with Interim Staff Guidance No.19, [i.e., transportation packages for commercial spent fuel may rely on moderator exclusion to meet 10 CFR 71.55(e)]. The staff would review requests for moderator exclusion under 10 CFR 71.55(c) for specific shipments or specific shipping campaigns based on appropriate risk information. Applications for specific shipments or shipping campaigns could be accepted under the provisions of 10 CFR 71.55(c). The applicant would provide information about the special design features of the package, and measures taken before each shipment, to ensure that the containment system does not leak. In addition, the applicant would provide appropriate risk information to demonstrate an adequate margin of safety against accidental criticality. Appropriate risk information would provide justification for approval of the shipments as an exception to the requirements of 10 CFR 71.55(b). Such risk information may include shipment-specific details such as: (1) nuclear reactivity of the cask system, and a quantified assessment of margins against accidental criticality; (2) modal or carrier restrictions; (3) identification of routes, including route characteristics and accident frequency information; (4) special loading and unloading controls; and (5) other operational controls exercised during transport.

### Pros:

- Maintains the current defense-in-depth against inadvertent criticality. This defense-in-depth provides margins of safety that are particularly important when considering potential misloading events, loading and unloading operations, and possible future reliance on burnup credit in cask designs.
- Clearly supports NRC's strategic outcome of preventing inadvertent criticality events.
- Does not require new guidance or rulemaking, and does not significantly impact NRC resources.

### Cons:

- May limit the number of commercial spent fuel elements that can be shipped in a single cask, and may increase the number of shipments.
- Increases the cost of cask fabrication for commercial spent fuel, because neutron absorbers are typically needed.
- Increases the U.S. Department of Energy's (DOE's) difficulties in demonstrating subcriticality for non-commercial spent fuel in the Idaho National Laboratory (INL) canister.

Option 2. Consider moderator exclusion in spent fuel cask-design approvals under the provisions of 10 CFR 71.55(c), as justified by additional risk information.

Description of option: Under this option, a spent fuel cask design that relies on moderator exclusion for criticality safety could be reviewed and approved under the provisions of 10 CFR 71.55(c). Significant risk information would be needed in reviewing such a request. In addition, before accepting such an application, the staff would: (1) evaluate the existing environmental impact statements (EIS) and risk assessments that support spent fuel transportation activities, to ensure that they would remain valid under the introduction of this type of accident, albeit with a low probability; and (2) develop formal guidance, giving the basis for accepting and approving such a request. This guidance would describe the type of risk information needed to support a design approval, under the provisions of 10 CFR 71.55(c). This risk information would include: (1) consideration of the nuclear reactivity of the cask system, including consideration of credit for fuel burnup; (2) identification of design-basis accidents; (3) probabilistic accident information; (4) evaluation of human factors; and (5) special considerations for loading and unloading operations.

Pros:

- May allow larger-capacity spent fuel cask-design approvals, which could reduce the number of shipments.
- Reduces costs of cask fabrication, because neutron absorbers would likely not be needed for subcriticality.
- Does not require rulemaking, and may be completed in a shorter time than rulemaking.
- May result in guidance development that could: (1) increase the body of knowledge regarding transportation risks associated with moderator exclusion; and (2) address moderator exclusion and burnup credit in a coherent risk-informed context.
- May provide an efficient mechanism to gain experience in evaluating applications for moderator exclusion, before any initiation of rulemaking.

Cons:

- May reduce margins of safety against NRC's strategic outcome of preventing inadvertent criticality events.
- Reduces margins of safety in spent fuel loading and unloading operations.
- May result in routine use of packages approved under a regulatory exception, with important safety significance.
- Results in a less open and transparent process because there is no public participation in the cask-design-approval process.
- Requires significant staff resources for reevaluation of environmental assessments, guidance development, and technical review of applications.

Option 3. Initiate rulemaking to codify the acceptable uses of moderator exclusion for spent fuel transportation packages, while continuing current staff practices, as described under Option 1, in the interim.

Description of Option: This option is recommended, and involves the development of a technical basis for rulemaking, to include a moderator-exclusion provision for spent fuel transportation casks. The approach would consist of developing a regulation specifically

addressing requirements for approving such package designs, and clarifying 10 CFR 71.55 with respect to moderator exclusion. Risk information would be developed to provide a technical basis for the rulemaking. The risk information would be derived from collating and supplementing existing risk assessments for spent fuel transportation, to consider accidental criticality risks. Activities identified above for Option 2 (e.g., guidance development) would also be needed for this option. The rulemaking process would provide an opportunity for stakeholder comment and engagement with the staff in discussing views on moderator exclusion. A place-holder for this rulemaking is included in the Common Prioritization of Rulemakings as an unfunded, low-priority rule.

Pros:

- Allows risk-informed approach to address moderator exclusion within the regulatory framework (i.e., may result in a rule that codifies alternative methods for retaining defense-in-depth while allowing large-capacity casks).
- Enhances openness to stakeholders because it allows involvement in the rulemaking process. This is particularly important in transportation package approval, because moderator exclusion has important safety implications and because there is no public participation in the cask-design-approval process under Part 71.
- Does not rely on use of a regulatory exception, with important safety implications for routine spent fuel shipments.

Cons:

- Involves longer lead time and significant staff resources to develop a technical basis and a final rule.

RESOURCES:

Because resources for Fiscal Year (FY) 2008 are already budgeted, any needed resources for moderator exclusion would have to be reprogrammed from existing budgeted efforts. For FY 2008 activities, if resources are reprogrammed to support moderator exclusion tasks, Office of Nuclear Material Safety and Safeguards (NMSS) work that may be deferred, delayed, or cancelled includes the Division of Spent Fuel Storage and Transportation's (SFST's) efforts on risk-informing guidance, multi-lateral cooperation and assistance, inspection, and lower-priority licensing casework. The budgeting process for FY 2009 would be handled in a similar manner, although staff may have somewhat more latitude in reallocating workload resources in FY 2009, given the additional time for planning.

- Option 1. No significant budget impact. In FY 2008, no resources are budgeted, and no resources are needed.
- Option 2. FY 2008 costs are estimated as 4.5 to 6.0 full-time equivalents (FTEs) in SFST/NMSS. FY2008 activities include: (1) evaluate the EIS and other documents supporting current spent fuel transportation activities; (2) initiate development of formal guidance; (3) review one to two applications for casks for commercial spent fuel transport; and (4) review DOE application for the INL canister design for non-commercial spent fuel transport. The estimate of costs assumes approximately 1.5 FTEs per design review, and 1.0 FTEs for

development of guidance. The average value for design review (1.5 FTEs) accounts for resources needed to review designs that would not otherwise be submitted, or the additional resources needed for the review of moderator exclusion for designs that would have been submitted anyway. This estimate assumes that no new environmental assessments are needed.

FY 2009 costs are estimated as 2.0 to 3.5 FTEs in SFST/NMSS. FY 2009 activities include: (1) complete guidance development; and (2) review one to two applications for casks for commercial spent fuel transport.

Option 3. FY 2008 costs are estimated as 2.0 FTEs in NMSS/SFST and an additional \$300,000 contract cost for technical assistance. The primary FY 2008 activities include: (1) evaluate the EIS and other documents supporting current spent fuel transportation activities; and (2) initiate development of technical basis, including any risk studies, to support rulemaking and development of associated guidance.

FY 2009 costs are estimated as 2.7 FTEs -- 0.5 FTE in the Division of Intergovernmental Liaison and Rulemaking, of the Office of Federal and State Materials and Environmental Management Programs (DILR/FSME), and 2.2 FTEs in SFST/NMSS. FY 2009 activities include: (1) complete development of technical basis; (2) develop a regulatory analysis and a proposed rule, including any needed revisions to 10 CFR 71.55(b); and (3) develop draft guidance.

FY 2010 costs are estimated as 1.0 FTE -- 0.5 FTE in DILR/FSME, and 0.5 FTE in SFST/NMSS. FY 2010 activities include: (1) resolve public comments on the proposed rule; (2) prepare final rule; and (3) develop final guidance.

The information on resources and schedule reflect the current environment. If a significant amount of time (greater than 30 days) passes, or the Commission provides the staff direction that differs from, or adds to, the staff's recommended action, this section of the paper would need to be revisited after issuance of the draft Staff Requirements Memorandum.

## **SECURITY-RELATED ISSUES CONNECTED WITH MODERATOR EXCLUSION**

Current spent fuel packages are designed and the contents limited so that the package will remain subcritical even if water enters the containment system.

Additionally, moderator exclusion may allow shipment of spent fuel casks with a larger capacity than currently certified designs.

The security

assessments would need to be evaluated when considering a change in policy regarding moderator exclusion to ensure that the orders continue to provide adequate protection.

Although 10 CFR 71.55(c) authorizes approval of transport with moderator exclusion as a regulatory exception, the basis is rooted in technical and safety considerations.

The following security-related issues should also be included in the regulatory options identified, the pros and cons of each option, and the resources associated with these options.

Option 1. Consider moderator exclusion for transport of commercial spent fuel under 10 CFR 71.55(e) for hypothetical accident conditions, as described in ISG-19; and on a shipment basis, as a 10 CFR 71.55(c) exception to the subcriticality requirement of 10 CFR 71.55(b).

Pros (no additional cons)

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No additional resources nor commitments are needed, based on security-related issues.

Enclosure 3

Option 2. Consider moderator exclusion in spent fuel cask-design approvals under the provisions of 10 CFR 71.55(c), with additional risk information.

Cons (no additional pros)

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RESOURCES:

This additional task could increase resources by approximately 0.1 full-time equivalent (FTE).

Option 3. Recommended option. Initiate rulemaking to codify the use of moderator exclusion for spent fuel transportation packages, while continuing current staff practices, as described under Option 1, in the interim.

Pros:

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Cons:

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RESOURCES:

increase resources by approximately 0.1 FTE.

This additional task could