

RULEMAKING ISSUE
(NEGATIVE CONSENT)

September 26, 2001

SECY-01-0178

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: MODIFIED RULEMAKING PLAN: 10 CFR Part 72 -- "GEOLOGICAL AND SEISMOLOGICAL CHARACTERISTICS FOR SITING AND DESIGN OF DRY CASK INDEPENDENT SPENT FUEL STORAGE INSTALLATIONS"

PURPOSE:

To request, by negative consent, Commission approval of the attached Modified Rulemaking Plan for amending certain sections in 10 CFR Part 72 dealing with seismic siting and design criteria for dry cask independent spent fuel storage installations (ISFSIs). The staff proposes modifications to the approved Rulemaking Plan, SECY-98-126, "Rulemaking Plan: Geological and Seismological Characteristics for the Siting and Design of Dry Cask Independent Spent Fuel Storage Installations, 10 CFR Part 72."

SUMMARY:

The Commission is amending certain sections in 10 CFR Part 72 dealing with seismic siting and design criteria for dry cask independent spent fuel storage installations (ISFSIs). The staff proposes modifications to the approved Rulemaking Plan, SECY-98-126, "Rulemaking Plan: Geological and Seismological Characteristics for the Siting and Design of Dry Cask Independent Spent Fuel Storage Installations, 10 CFR Part 72."

The Rulemaking Plan in SECY-98-126 provided three options. Option 3, recommended by the staff and approved by the Commission in its SRM to SECY-98-126, adopted the Probabilistic Seismic Hazard Analysis (PSHA) and also provided an option to use the risk-informed graded approach to seismic design for ISFSI SSCs. An additional change was recommended in SECY-98-126 to require that the design of cask storage pads and areas account for dynamic loads in addition to static loads for general licensees.

CONTACTS: Keith McDaniel, NMSS/IMNS
(301) 415-5252
Mahendra Shah, NMSS/SFPO
(301) 415-8537

After further consideration of the use of the graded approach in Option 3, the staff is recommending a fourth option that has been added to the attached Modified Rulemaking Plan. This new Option 4 retains the PSHA approach, described in Option 3, but provides for a single design earthquake ground motion rather than the graded approach in Option 3.

The Plan clarifies the applicability of the proposed changes to Part 72 general and specific licensees. Except as described above, the Modified Rulemaking Plan is consistent with all other aspects of the approved rulemaking plan in SECY-98-126.

BACKGROUND:

In a Staff Requirements Memorandum issued on June 24, 1998, in response to SECY-98-126, the Commission did not object to the staff's plan to develop a proposed rule for changing Part 72. The Rulemaking Plan, in SECY-98-126, would amend Part 72 to:

- (1) Require new Part 72 applicants to use a probabilistic seismic hazard analysis (PSHA) approach (10 CFR 100.23) instead of the current deterministic approach (10 CFR Part 100, Appendix A) in determining the design earthquake ground motion.
- (2) Allow for classification of systems, structures, and components (SSCs) that are important to safety into one of two different categories for earthquake designs, to account for the safety importance of the SSC and risk levels (risk-informed graded approach). SSCs whose failure would result in high accident consequences would be required to use a design earthquake equivalent to those used for SSCs of nuclear power plants (NPPs). SSCs whose failure would result in low accident consequences could be designed for a lower earthquake.
- (3) Require that the design of cask storage pads and areas account for dynamic loads in addition to static loads.

In SECY-99-036, "Proposed Rulemaking Activity Plan," the staff informed the Commission of its intent to put this rulemaking activity on hold for higher-priority rulemakings, but to continue development of the technical basis. During the subsequent development of the technical basis, the staff determined that some of the changes proposed in the approved Rulemaking Plan required modification. The Modified Rulemaking Plan includes a new option to address these modifications.

DISCUSSION:

The Rulemaking Plan in SECY-98-126 provided three options. Option 1 took no action (maintained the current Part 72 requirements). Option 2 required the use of the PSHA approach as described in 10 CFR 100.23, in lieu of 10 CFR Part 100 Appendix A, for determining seismic design ground motion. Option 3 adopted the PSHA and also provided an option to use the risk-informed graded approach to seismic design for ISFSI SSCs. Option 3 was recommended by the staff. An additional change was recommended in SECY-98-126 to require that the design of cask storage pads and areas account for dynamic loads in addition to static loads for general licensees. After further consideration of the use of the graded approach in Option 3, the staff is recommending a fourth option, that has been added to the attached Modified Rulemaking Plan. This new Option 4 provides an alternative to the graded approach for the seismic design of dry

cask ISFSI SSCs. Except for incorporating an Option 4 and several minor editorial changes and clarifications, the rulemaking plan in SECY-98-126 has not otherwise been modified.

The Modified Rulemaking Plan clarifies the applicability of the proposed changes to Part 72 general and specific licensees. Applicants for a Part 72 specific license after the effective date of the rule for an ISFSI site, located in the western U.S. and not co-located with an NPP, must comply with the proposed changes. A Part 72 specific license applicant for an ISFSI site located in the western U.S. and co-located with an NPP has the option of using the proposed PSHA methodology for determining the design earthquake ground motion, or using the existing design criteria for the NPP. Where the existing design criteria for the NPP are used at sites with multiple NPPs, the criteria for the most recent NPP would be used. For all specific-license applicants, whose sites are located in the central and eastern U.S., the proposed changes are also optional. The proposed changes regarding the use of the PSHA method are not applicable to general licensees at existing NPPs operating an ISFSI under a Part 72 general license anywhere in the U.S. The proposed additional change, requiring that the design of cask storage pads and areas account for dynamic loads in addition to static loads, is applicable to general licensees for new ISFSIs after the effective date of the rule. Current practice already provides that specific licensees demonstrate that static and dynamic loads are considered.

The proposed changes also apply to the design basis of both dry cask storage ISFSIs and U.S. DOE monitored retrievable storage installations (MRS) because these facilities are similar in design. The Modified Rulemaking Plan uses the term "ISFSI" to include both ISFSI and MRS facilities. The staff does not intend to revise the Part 72 geological and seismological criteria as they continue to apply to wet storage facilities because of the greater consequences associated with the potential accident scenarios for these facilities.

In summary, the proposed changes related to the PSHA methodology are mandatory after the effective date of the rule for specific-license applicants for ISFSIs, located in the western U.S., and not co-located with a NPP. For all other dry cask storage specific-license applicants, the proposed changes are voluntary. The proposed additional change related to dynamic loads, is applicable to general licensees for new ISFSIs designed after the effective date of the rule.

Option 4 proposes changing Part 72 as follows:

OPTION 4:

- (1) Require certain Part 72 applicants (as described above) to comply with a new 10 CFR 72.103 (use of PSHA based on 10 CFR 100.23, as described in Options 2 and 3), in lieu of 10 CFR 72.102(f), which requires the use of Part 100, Appendix A.
- (2) Maintain the present Part 72 requirement of using a single-level design earthquake, but with a lower design earthquake ground motion that is commensurate with the level of risk associated with an ISFSI.

Item 1 of Option 4 differs slightly from that previously approved by the Commission in the Rulemaking Plan (SECY-98-126). It adds a new section in Part 72 that is based on 10 CFR 100.23, instead of referencing 10 CFR 100.23. This will make Part 72 independent of Part 100.

The staff believes this is aligned with NRC's plain language initiative. Item 2 is a change to the approved Rulemaking Plan and is discussed further in the following sections. Detailed guidance for the use of Option 4 will be provided in a guidance document for ISFSI applicants that will be published as a draft document concurrently with the proposed rule.

The staff evaluated the recommendations related to the graded approach and concluded that the use of two earthquake levels for an ISFSI facility should be revised. A modified approach, using a single-level design earthquake with a ground motion that is commensurate with the level of risk associated with an ISFSI, has been added to the Modified Rulemaking Plan as Option 4. The current Part 72 regulations are based on the use of a single-level design earthquake. However, Option 4 uses a lower design earthquake ground motion than those used in the current Part 72 and in Option 3 for SSCs whose failure would result in greater accident consequences. The Modified Rulemaking Plan is consistent with all other aspects of the approved Rulemaking Plan. The basis for this change is summarized below and discussed in more detail in the Modified Rulemaking Plan.

The staff recognized that because SSCs important to safety in an ISFSI facility are few relative to those in an NPP, the use of a graded approach for classifying ISFSI SSCs into one of two different categories for earthquake designs would not benefit applicants and could unnecessarily increase the complexity in applications, without a commensurate improvement to safety.

In comparison to NPPs, an operating ISFSI facility is a relatively simple facility in which the primary activities are waste receipt, handling, and storage. An ISFSI facility does not have the variety and complexity of active systems necessary to support an operating NPP. After the spent fuel is in place, an ISFSI facility is a static operation. During normal operations, the conditions required for the release and dispersal of significant quantities of radioactive materials are not present. Temperatures and pressures are relatively low during normal operations or even under design basis accident conditions; therefore, the likelihood of release and dispersal of radioactive materials is low primarily due to low heat generation rates of spent fuel with greater than the required one year of decay before storage in an ISFSI, combined with low inventory of volatile radioactive materials readily available for release to the environs. The long-lived and potentially biologically hazardous materials present in spent fuel are tightly bound up in the fuel materials and are not readily dispersible. The short-lived volatile nuclides, such as I-131, are no longer present in aged spent fuel (e.g., cooled at least one year). Furthermore, even if the short-lived nuclides were present during an event of a fuel assembly rupture, the canister surrounding the fuel assemblies would confine these nuclides. The radiological risk associated with an ISFSI facility is significantly less than the risk associated with an NPP, and therefore, the use of a lower design earthquake ground motion is appropriate.

The Commission explained in the Statement of Considerations accompanying the initial Part 72 rulemaking that “[f]or ISFSI's which do not involve massive structures, such as dry storage casks and canisters, the required design earthquake will be determined on a case-by-case basis until more experience is gained with the licensing of these types of units.” [45 FR 74697 (1980)]. With more than 10 years of experience licensing dry cask storage systems, together with analyses demonstrating their robust behavior in accident scenarios involving earthquakes, the staff concludes that designing ISFSI SSCs using a single-level design earthquake with a

ground motion that is commensurate with the level of risk associated with an ISFSI, is sufficient to provide reasonable assurance in demonstrating protection of public health and safety.

The use of a lower design earthquake ground motion is consistent with the Commission's approval of the U.S. Department of Energy's (DOE's) request for an exemption from 10 CFR 72.102(f)(1) for a proposed ISFSI at the Idaho National Engineering and Environmental Laboratory (INEEL). In its evaluation of the request to lower the design earthquake ground motion, the NRC staff considered the relative risk posed by the ISFSI. Considering the minor radiological consequences expected from a cask failure resulting from a seismic event and the lack of a credible mechanism to cause such a failure, the staff believed that the design earthquake proposed by DOE for dry storage facilities at INEEL was conservative. The design earthquake level proposed in the Modified Rulemaking Plan is the same as the design earthquake level used as the basis for approving DOE's request for an exemption. Furthermore, the staff notes that the proposed Option 4, as it relates to the design basis earthquake level, is consistent with DOE Standard 1020, "Natural Phenomena Hazards Design Evaluation Criteria for Department of Energy Facilities" for similar type facilities.

As demonstrated in the Modified Rulemaking Plan, the probability of exceeding the lower design earthquake event at an ISFSI facility with an operational period of 20 years is the same as the probability of exceeding the higher design earthquake event at the pre-closure facility at Yucca Mountain with an operational period of 100 years. Therefore, the probability of failure of an SSC important to safety is the same for these two types of facilities over their respective operational periods. In this respect, the proposed changes to Part 72 are consistent with the requirements of 10 CFR Parts 60 and 63.

The approach in the Modified Rulemaking Plan and the graded approach in Parts 60 and 63, as recommended in SECY-98-126, are similar in that they are both risk-informed. However, for ISFSI applications, the staff determined that maintaining the current Part 72 approach of a single design basis event is more appropriate than the use of the graded approach because of the relative simplicity of the ISFSI design and operation.

APPLICATION OF THE SCREENING CRITERIA FOR RISK-INFORMING NMSS REGULATORY ACTIVITIES:

The Office of Nuclear Material Safety and Safeguards (NMSS) has developed a set of screening criteria to identify NMSS regulatory activities amenable to increased use of risk information. The staff applied the criteria to the proposed changes in the Modified Rulemaking Plan to determine if the risk-informed approach of lowering the design earthquake to a level that is commensurate with the lower risk associated with an ISFSI should be implemented. The proposed changes satisfy the screening criteria because they: (1) improve efficiency and effectiveness of the NRC regulatory process by eliminating the need for applicants to request exemptions from 10 CFR 72.102(a), 72.102(b), and 72.102(f)(1) (similar to DOE's request for the ISFSI at INEEL), and the need for NRC to review the exemption requests; (2) reduce unnecessary regulatory burden for the applicant or licensee by reducing the design earthquake level to account for the lower risk associated with ISFSI facilities; (3) can be supported by analytical models that evaluate the seismic behavior of a cask; (4) would not result in significant start-up or implementation costs to NRC and applicants, other than technical training and further development of analytical models; and (5) do not involve other factors, with the exception of potential adverse stakeholder reaction

as can be the case when using risk-informed approaches. Satisfying these criteria supports the implementation of the proposed risk-informed approach.

NRC STRATEGIC GOALS:

The staff considered the merits of the rulemaking within the context of the performance goals listed in the Agency's strategic plan. The rulemaking effort would increase NRC's effectiveness and efficiency and reduce unnecessary regulatory burden by reducing the number of exemption requests that would need to be submitted and reviewed. This rule would maintain safety by selecting the design earthquake level to be commensurate with the risk associated with an ISFSI. The changes to the design earthquake level are considered risk-informed, consistent with NRC policy to develop risk-informed regulations. This rule would increase realism by enabling ISFSI applicants to use the state-of-the-art approach to more accurately characterize the seismicity of a site. Public confidence may be adversely affected because the proposed risk-informed approach lowers the design earthquake level commensurate with the lower risk of an ISFSI facility.

COORDINATION:

The Office of the General Counsel has no legal objection to the modified rulemaking plan. The Office of the Chief Financial Officer has no objection to the resource estimates contained in this paper. However, the plan suggests changes in information collection requirements that must be submitted to the Office of Management and Budget before publication of the proposed rule.

SCHEDULE:

The staff believes that an expedited schedule for this rulemaking is appropriate. As a result of current activities being conducted by the NRC, the staff believes that expediting this rule would enhance the licensing process by potentially reducing exemption requests. It is anticipated that the need for new ISFSI facilities in the Western U.S. will continue to grow as the need for spent fuel storage increases. As a result, the staff expects to receive ISFSI licensing requests in the near future. In addition, the Commission has previously approved an exemption request for the storage of TMI-2 fuel at the Idaho National Engineering and Environmental Laboratory, based on an approach similar to that of the preferred option in the modified rulemaking plan. The staff has received a similar request for exemption by another ISFSI applicant (Private Fuel Storage, L.L.C.) which is currently the subject of an adjudicatory proceeding, referred to in CLI-01-12, 53 NRC ___ (June 14, 2001).

RESOURCES:

If the Commission directs the staff to go forward with Option 1, no additional resources would be required. Option 2 would cost 1.6 full-time equivalents (FTEs) and approximately \$65,000 for technical support spread out over 2 years. For Option 3 and recommended Option 4, which includes the development of regulatory guidance, 3.8 FTE and approximately \$200,000 for technical support would be required spread over fiscal years 2001 and 2002. Technical support will be used to assist in the development of the proposed and final rule and related guidance documents.

SECY-98-126 estimated 2.1 FTE and \$100,000 would be needed to complete the rulemaking. During the development of the Modified Rulemaking Plan, the staff determined that an increase in rulemaking complexity beyond what was anticipated in SECY-98-126, an expected increase in stakeholder involvement, and the expedited schedule, resulted in additional resources being necessary. These resources will be reallocated through the Planning Budgeting Performance Management process for the office, pending Commission approval of the Modified Rulemaking Plan.

RECOMMENDATION:

Staff request action within 10 days. Action will not be taken until the SRM is received. We consider this action to be within the delegated authority of the EDO.

/RA/

William D. Travers
Executive Director
for Operations

Attachment:
Modified Rulemaking Plan-Geological and
Seismological Characteristics for the Siting
and Design of Dry Cask ISFSIs, Part 72

MODIFIED RULEMAKING PLAN
GEOLOGICAL AND SEISMOLOGICAL CHARACTERISTICS
FOR THE SITING AND DESIGN OF DRY CASK ISFSIs
10 CFR PART 72

REGULATORY PROBLEM

In 1980, the Commission added 10 CFR Part 72 to its regulations to establish licensing requirements for the storage of spent fuel in an independent spent fuel storage installation (ISFSI), (45 FR 74693). Subpart E of Part 72 contains siting evaluation factors that must be investigated and assessed with respect to the siting of an ISFSI, including a requirement for evaluation of geological and seismological characteristics. The original provision (10 CFR 72.66) (45 FR 74708) distinguished between massive water basin and air-cooled canyon types of ISFSI structures and other types of ISFSI designs. For the former, section 72.66 (now section 72.102) required seismic evaluations equivalent to those required for nuclear power plants (NPPs) when the ISFSI was located west of the Rocky Mountain Front (approximately 104⁰ west longitude) or in areas of known potential seismic activity. At that time, ISFSIs were largely envisioned to be spent fuel pools or single, massive dry storage structures. A seismic design requirement, equivalent to the requirements for an NPP (Appendix A of 10 CFR Part 100) seemed appropriate for these types of facilities, given the potential accident scenarios. For other types of ISFSI designs, the regulation required a site-specific investigation to establish site suitability commensurate with the specific requirements of the proposed ISFSI. The Commission explained that “[f]or ISFSI’s which do not involve massive structures, such as dry storage casks and canisters, the required design earthquake will be determined on a case-by-case basis until more experience is gained with the licensing of these types of units.” [45 FR 74697 (1980)]. The NRC staff believed that a major seismic event at an ISFSI storing spent fuel in dry casks or canisters would most likely have minor radiological consequences compared with a major seismic event at an NPP, spent fuel pool, or single massive storage structure.

Part 72 was amended in 1988 to include the U.S. DOE Monitored Retrievable Storage Installation (MRS), (53 FR 31651). The 1988 amendment also relocated the provision governing evaluation of geological and seismological characteristics to section 72.102. It also eliminated the distinction formerly made between criteria for massive water basin and air-cooled canyon types of ISFSI structures and other types of ISFSI designs such that the criteria designed for massive structures now applied to all ISFSI and MRS facilities. Thus, section 72.102 requires that, for any site located west of the Rocky Mountain Front or in any areas of known potential seismic activity, seismicity be evaluated by the techniques of Appendix A of Part 100 and that, for sites evaluated under the Appendix A criteria, the design earthquake be equivalent to the safe shutdown earthquake (SSE) for an NPP. For sites located east of the Rocky Mountain Front and not in areas of known seismic activity, the Appendix A criteria may be used to determine a site-specific design earthquake or, alternatively, a standardized design earthquake described by an appropriate response spectrum anchored at a peak ground acceleration of 0.25 g may be used.

The procedures in Appendix A of Part 100 for determining the design basis vibratory ground motion at a site require the use of “deterministic” approaches in the development of a single set of earthquake sources. The applicant develops for each source a postulated earthquake to be used to determine the ground motion that can affect the site, locates the postulated earthquake

according to prescribed rules, and then calculates ground motions at the site. Because this approach has not explicitly recognized uncertainties in geoscience parameters, probabilistic seismic hazard analysis (PSHA) methods have been developed that allow explicit expressions for the uncertainty in ground motion estimates and provide a means for assessing sensitivity to various parameters.

In 1997, the Commission amended Parts 50 and 100 of its regulations to update the criteria used in decisions regarding NPP siting, including geologic and seismic engineering considerations for future NPPs (61 FR 65157). The 1997 Part 100 amendments placed a new section 100.23 in the regulations (guidance provided in Regulatory Guide 1.165 and Standard Review Plan-NUREG 0800) requiring that the uncertainties associated with the determination of the safe shutdown earthquake ground motion be addressed through an appropriate analysis, such as a probabilistic seismic hazard analysis or suitable sensitivity analyses. This approach takes into account the shortcomings in the earlier siting requirements and is based on developments in the field over the past two decades. The Commission left Appendix A of Part 100 in place to preserve the licensing basis for existing plants and confined the applicability of section 100.23 to new NPPs. Because section 72.102 requires that seismicity be evaluated by the techniques of Appendix A of Part 100, new applicants for ISFSI licenses must follow the rules that applied to NPPs before the 1997 Part 100 amendments.

In the past several years, dry cask designs for ISFSIs have become a dominant option to store spent fuel. This trend is expected to continue for the foreseeable future. The purpose of this rulemaking is to require the applicants to use state-of-the-art seismic hazard methodologies for site characterization. This will result in alleviating the need for applicants to request exemptions from 10 CFR 72.102(f)(1). For example, the U.S. Department of Energy (DOE) requested an exemption from 10 CFR 72.102(f)(1) for an ISFSI at the Idaho National Engineering and Environmental Laboratory (INEEL) to store fuel generated at the Three Mile Island-Unit 2 nuclear power plant.

EXISTING REGULATORY FRAMEWORK

Section 72.102 describes the geological and seismological criteria for siting of ISFSI and MRS facilities. Separate siting criteria are specified in 10 CFR 72.102 for: (1) sites east of the Rocky Mountain Front, if not located in areas of known seismic activity; and (2) sites west of the Rocky Mountain Front and in other areas of known potential seismic activity. Section 72.102(a)(2) allows sites east of the Rocky Mountain Front, if not located in areas of known seismic activity, to use a standardized design earthquake described by an appropriate response spectrum (RS) anchored at a peak ground acceleration of 0.25 g, provided the results from foundation and geological investigations, literature review, and regional geological reconnaissance show no unstable geological characteristics, soil stability problems, or potential for vibratory ground motion at the site in excess of an appropriate RS anchored at a peak ground acceleration of 0.2 g. Alternatively, a site-specific design earthquake may be determined by using the criteria and level of investigations required by Appendix A of 10 CFR Part 100. Appendix A describes the principal seismological and geological criteria for assessing the suitability of sites for nuclear power plants and the suitability of the reactor plant design basis. These criteria describe the nature of the investigations required to obtain the geologic and seismic data necessary to determine site suitability. Appendix A describes procedures for determining the design basis vibratory ground motion from an earthquake at a site and describes information needed to

determine whether and to what extent a nuclear power plant needs to be designed to withstand the effects of surface faulting.

For sites west of the Rocky Mountain Front, and in other areas of known potential seismic activity, seismicity is evaluated by the techniques of Appendix A of Part 100 with the design earthquake for an ISFSI of no less than the SSE ground motion for an NPP (as defined in Appendix A of Part 100).

The rule also states that:

- Sites other than those on bedrock must be evaluated for their liquefaction potential or other soil instability caused by vibratory ground motion (10 CFR 72.102(c)).
- Site-specific investigations and laboratory analyses must show that soil conditions are adequate for the proposed foundation loading (10 CFR 72.102(d)).
- Sites with unstable geologic characteristics should be avoided (10 CFR 72.102(e)).
- For sites evaluated under the criteria of Appendix A of Part 100, the design earthquake must be equivalent to the SSE of the nuclear power plant, with a value of no less than 0.1g with the appropriate RS (10 CFR 72.102(f)(1) and (2)).

HOW THE REGULATORY PROBLEM WILL BE ADDRESSED BY RULEMAKING

This rulemaking will clarify the applicability of the proposed changes to Part 72 general and specific licensees. Applicants for a Part 72 specific license after the effective date of the rule for an ISFSI site, located in the western U.S. and not co-located with an NPP, must comply with the proposed changes. A Part 72 specific license applicant for an ISFSI site located in the western U.S. and co-located with an NPP has the option of using the proposed PSHA methodology for determining the design earthquake ground motion, or using the existing design criteria for the NPP. Where the existing design criteria for the NPP is used at sites with multiple NPPs, the criteria for the most recent NPP should be used. For all dry cask storage specific-license applicants, whose sites are located in the central and eastern U.S., the proposed changes are also optional. The proposed changes regarding the use of the PSHA method are not applicable to general licensees at existing NPPs operating an ISFSI under a Part 72 general license anywhere in the U.S.

The proposed changes also apply to the design basis of both dry cask storage ISFSIs and U.S. DOE monitored retrievable storage installations (MRS), because these facilities are similar in design. The Modified Rulemaking Plan uses the term "ISFSI" to include both ISFSI and MRS facilities. The NRC staff does not intend to revise the Part 72 geological and seismological criteria as they apply to wet storage because of the greater consequences associated with the potential accident scenarios for these facilities.

The NRC staff intends to leave present section 72.102 in place to preserve the licensing basis of present ISFSIs. The proposed provisions would be added as a new section 72.103, which would provide the requirements that would be utilized by new license applicants.

The rulemaking options are discussed below. It should be noted that all options for rulemaking changes (Options 2-4) will necessitate a revision to NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems," and NUREG-1567, "Standard Review Plan for Spent Fuel Dry Storage Facilities," and development of a new regulatory guide to provide guidance in meeting the changes in regulation.

OPTION 1: No action. The siting requirements for new dry cask ISFSIs would conform to the existing requirements of 10 CFR 72.102.

The benefit of this option is that no additional NRC resources would be expended in conducting a rulemaking. However, new licensees would need to conform to outdated criteria developed for power reactors, which are very conservative, not risk-informed, and may not be cost-effective for dry cask ISFSIs, especially when not co-located with an NPP site. Hence, this option is not recommended.

OPTION 2: Require new Part 72 license applicants to conform to 10 CFR 100.23 in lieu of 10 CFR Part 100 Appendix A.

The NRC staff notes that while strict adherence to the requirements in Appendix A for determining the design earthquake for the ISFSI (equivalent to an NPP SSE) will be removed, those applicants for ISFSIs, co-located with existing nuclear power plant sites, would be allowed to use all of the geophysical investigation information obtained from the original licensing process (which used the Appendix A requirements), in verifying that all applicable seismic data are considered in determining the design basis. The benefit of this option is that it would be a conforming change to Part 100 for evaluating geological and seismological criteria. It should be noted that under this option, the extent of site investigations and characterization remains the same as required in Part 100. Regulatory Guide 1.165, "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion," was developed to provide general guidance on procedures acceptable to the staff for satisfying the requirements of 10 CFR 100.23 for NPPs. This guidance would be considered acceptable for ISFSIs.

Section 100.23 stipulates evaluations that must be performed to arrive at estimates of the SSE. The SSE is the vibratory ground motion for which certain structures, systems, and components (SSCs) of an NPP are required to remain functional. However, the criteria for determining which SSCs of an NPP should remain functional during a SSE do not directly relate to ISFSI SSCs. In contrast, a dry cask ISFSI does not contain active SSCs that must perform a safety-related function after an earthquake. Section 72.102(f)(1), which requires ISFSI structures to be designed to the SSE, is not risk-informed and does not consider the lower risk of an ISFSI consistent with protection of public health and safety. Hence, this option is not recommended.

OPTION 3: Require new Part 72 applicants to conform to 10 CFR 100.23 in lieu of 10 CFR Part 100 Appendix A (Option 2) and also give them the option to use a graded approach to seismic design for ISFSI SSCs in conjunction with Option 2. In general, a graded approach to design requires those SSCs whose failure would result in greater accident consequences to use higher design requirements for phenomena such as earthquakes and tornadoes. Similarly, those SSCs whose failure would result in lesser accident consequences would be designed to less stringent requirements. This graded approach would be in lieu of section 72.102(f)(1),

which requires sites that have been evaluated under the criteria of Appendix A of Part 100 to design structures to a design earthquake that is equivalent to the SSE for an NPP. It should be noted that under this option, the extent of site investigations and characterization remains the same as required in Part 100.

The specific approach proposed for dry cask ISFSIs would be comparable to the 10 CFR Part 60/63 graded approach to design ground motion for SSCs of pre-closure facilities. This graded approach would allow the SSCs of dry cask ISFSIs to be designed to either Category 1 design basis events or Category 2 design basis events, depending upon their importance to safety. For seismic events, the NRC staff has accepted the approach described in DOE Topical Report YMP/TR-003-NP, Rev. 2, Preclosure Seismic Design Methodology for a Geologic Repository at Yucca Mountain, pertaining to 10 CFR Part 63. In this approach Category 1 design basis ground motion refers to a mean annual probability of exceedance of $1.0E-03$.¹ Category 2 design basis ground motion refers to a mean annual probability of exceedance of $1.0E-04$.

Individual SSCs that are required to maintain the annual dose within the regulatory limits of 10 CFR Part 20 would be designed to a Category 1 design basis earthquake. Other SSCs needed to be functional to prevent the dose limit of 5 rem from being exceeded at the controlled area boundary would be designed to a Category 2 design basis earthquake. Thus, the seismic design of the SSCs would be commensurate with their importance to safety. Therefore, this design approach follows the Commission policy of using a risk-informed approach.

The advantages of this option for rulemaking are that: (1) it would enable applicants to take advantage of state-of-the-art methodology for evaluating geological and seismological criteria contained in section 100.23 (revised power reactor regulations); (2) it would allow the industry the flexibility to design ISFSI SSCs so that the costs would be more commensurate with the probability of radiological consequences from an earthquake at an ISFSI (i.e., more cost-effective); and (3) it would be comparable to the graded approach to design requirements for systems, structures, and components for pre-closure facilities in 10 CFR Part 60 (Disposal of High-Level Wastes in Geologic Repositories).

The disadvantages of this option are that it may unnecessarily increase the complexity in applications without any risk reduction and would be inconsistent with the previous NRC licensing action in response to an exemption request for an ISFSI. Hence, this option is not recommended.

OPTION 4:

- (1) Require new Part 72 specific licensees for sites located in the western U.S. and not co-located with NPPs, to comply with a new 10 CFR 72.103 (based on 10 CFR 100.23 as described in Options 2 and 3), in lieu of 10 CFR 72.102(f), which requires the use of Appendix A of Part 100. A Part 72 specific license applicant for an ISFSI site located in the western U.S. and co-located with an NPP has the option of using the PSHA method for determining seismological and geological design criteria, or using the existing design criteria

¹The mean annual probability of exceedance, p , of an event is the reciprocal of the return period of that event (i.e., $p = 1/T$). As an example, consider a site at which the return period for an earthquake is 2,000 years. In this case, the mean annual probability of exceedance is $5.0E-04$ ($1/2,000$) or 0.05 percent.

for the NPP. Where the existing design criteria for the NPP is used at sites with multiple NPPs, the criteria for the most recent NPP would be used. For all dry cask storage specific-license applicants whose sites are located in the central and eastern U.S., the proposed changes are also optional. The proposed changes regarding the use of the PSHA method are not applicable to general licensees anywhere in the U.S. The appendix to this modified rulemaking plan contains a table summarizing the information in this paragraph.

The proposed changes also apply to the design basis of both the dry cask storage ISFSI and MRS. The remainder of this plan uses the term "ISFSI" to include both ISFSI and MRS facilities because the facilities are similar in design. The NRC staff does not intend to revise the Part 72 geological and seismological criteria as they apply to wet storage because of the greater consequences associated with the potential accident scenarios for these facilities.

- (2) Maintain the present Part 72 requirement of using a single-level design earthquake, but with a lower design earthquake ground motion that is commensurate with the level of risk associated with an ISFSI. This single-level design earthquake will have a mean annual probability of exceedance of $5.0E-04$, which is lower than the current level for the SSE of an NPP.

Detailed guidance for the use of Option 4 will be provided in a guidance document for ISFSI licensees.

The NRC staff has determined that for new ISFSI facilities, a design earthquake with a mean annual probability of exceedance of $5.0E-04$ is appropriate. The present design earthquake (equivalent to the SSE for an NPP) has a mean annual probability of exceedance of approximately $1.0E-04$. In comparison with a nuclear power plant, an operating ISFSI facility is a relatively simple facility in which the primary activities are waste receipt, handling, and storage. An ISFSI facility does not have the variety and complexity of active systems necessary to support an operating nuclear power plant. After the spent fuel is in place, an ISFSI facility is a static operation. During normal operations, the conditions required for the release and dispersal of significant quantities of radioactive materials are not present. There are no high temperatures or pressures present during normal operations or under design basis accident conditions to cause the release and dispersal of radioactive materials. This is primarily due to the low heat-generation rate of spent fuel that has undergone more than one year of decay before storage in an ISFSI, and to the low inventory of volatile radioactive materials readily available for release to the environs. The long-lived and potentially biologically hazardous materials present in spent fuel are tightly bound up in the fuel materials and are not readily dispersible. The short-lived volatile nuclides, such as I-131, are no longer present in aged spent fuel. Furthermore, even if the short-lived nuclides were present during an event of a fuel assembly rupture, the canister surrounding the fuel assemblies would confine these nuclides. Therefore, the radiological risk associated with an ISFSI facility is significantly less than the risk associated with an NPP and the use of a lower design earthquake ground motion is justified.

The Commission indicated in the Statement of Considerations accompanying the initial Part 72 rulemaking that "[f]or ISFSI's which do not involve massive structures, such as dry storage casks and canisters, the required design earthquake will be determined on a case-by-case basis until more experience is gained with the licensing of these types of units." [45 FR 74697 (1980)]. With more than 10 years of experience licensing dry cask storage systems, together

with analyses demonstrating their robust behavior in accident scenarios involving earthquakes, the NRC staff concludes that designing ISFSI SSCs using a single-level design earthquake with a ground motion that is commensurate with the level of risk associated with an ISFSI, is sufficient to provide reasonable assurance in demonstrating public health and safety.

The rationale for the proposed mean annual probability of exceedance of $5.0E-04$ (return period of 2,000 years) for a design earthquake is based on several points:

- Use of a mean annual probability of exceedance of $5.0E-04$ (return period of 2,000 years) for the design earthquake is consistent with the Commission's approval of DOE's request for an exemption from section 72.102(f)(1) for a proposed ISFSI at the INEEL to store spent fuel generated at the Three Mile Island Unit-2 nuclear power plant. Section 72.102(f)(1) requires that for sites that have been evaluated under the criteria of Appendix A of Part 100, the design earthquake must be equivalent to the SSE for an NPP. In its evaluation of the request, NRC staff considered the relative risk posed by the ISFSI. The staff concluded that considering the minor radiological consequences expected from a cask failure resulting from a seismic event, and the lack of a credible mechanism to cause such a failure, the NRC staff believes that the design earthquake using a mean annual probability of exceedance of $5.0E-04$ for dry storage facilities at INEEL would be conservative.
- The total probability of exceedance for a design earthquake at an ISFSI facility with an operational period of 20 years ($20 \text{ years} \times 5.0E-04 = 1.0E-02$) is the same as the total probability of exceedance for an earthquake event at the proposed pre-closure facility at Yucca Mountain with an operational period of 100 years ($100 \text{ years} \times 1.0E-04 = 1.0E-02$).
- Because SSCs important to safety in an ISFSI are few, relative to those found in an NPP, the use of a graded approach for classifying ISFSI SSCs into one of two different categories for earthquake designs would unnecessarily increase the complexity in applications, without a commensurate improvement to safety. The SSCs important to safety in an ISFSI are associated with the storage cask, and include the canister, the canister handling systems, concrete pad supporting the cask, the transfer building supporting the handling systems, and the transfer cask. Since these SSCs are needed to be functional to prevent the dose limit of 5 rem being exceeded at the controlled area boundary, they would be required to be designed for a Category 2 design basis earthquake. Other SSCs important to safety may include the pressure monitoring system, protective cover, security lock and wire, etc. and can be designed for a lower Category 1 earthquake. However, it would be simpler to design all SSCs for a bounding Category 2 earthquake.
- The critical element for protection against radiation release is the confinement boundary for containing the spent fuel assemblies. Because the casks are rigid and have high natural frequencies, the damage from a drop or tip-over accident is expected to be far greater and more severe than the seismic inertial acceleration loads. Therefore, seismic inertia loads are bounded by other loads. The dry storage cask designs are very rugged and robust, and are expected to have substantial design margins to withstand forces from a seismic event greater than the design earthquake.

- During a seismic event, a cask may slide if lateral seismic forces are greater than friction resistance between the cask and the concrete pad. The sliding and resulting displacements are computed by the applicant to demonstrate that the casks, which are spaced to satisfy thermal requirements, are precluded from impacting other adjacent casks. Furthermore, the staff typically requests, as part of its approval process, that an applicant demonstrate that during a seismic event equal to the proposed design earthquake, the cask will not tip over. However, it follows from the discussion above that even if the casks slide or tip-over and then impact other casks or the pad during a seismic event greater than the proposed design earthquake, the casks have adequate design margins to ensure that they maintain their structural integrity to meet the Part 72 exposure limits for radiological protection.
- The mean annual probability of exceedance of $5.0E-04$ for ISFSI facilities is consistent with the design approach used in DOE Standard DOE-STD-1020, "Natural Phenomena Hazards Design Evaluation Criteria for Department of Energy Facilities," for similar type facilities.

Based on the preceding analysis, the NRC staff concludes that the rationale for designing ISFSI SSCs for a single design earthquake, using a mean annual probability of exceedance of $5.0E-04$, is sufficient to ensure the public health and safety.

PREFERRED OPTION

Option 4 is preferred over the other options because it (1) is consistent with a previous NRC licensing decision in response to an exemption request for an ISFSI facility and (2) results in the design of ISFSI SSCs to be commensurate with the risk level. Additionally, Option 4, like other options, enables new licensees to take advantage of state-of-the-art methodology for evaluating geological and seismological criteria contained in proposed section 72.103 and would not unnecessarily increase the complexity in applications by classifying SSCs into more than one category.

ADDITIONAL PROPOSED CHANGE

Changes to 10 CFR 72.212(b)(2)(ii) are also needed to communicate that general licensees must perform both static and dynamic analyses for new ISFSIs after the effective date of the rule to ensure that casks are not placed in an unanalyzed condition. This proposed change would be included with any of the options requiring rulemaking (Options 2-4). Current practice already provides that specific licensees demonstrate that static and dynamic loads are considered. The change would state that the design of cask storage pads and areas must adequately account for dynamic loads (in addition to static loads). For example, dynamic effects can cause soil-structure interactions that could amplify ground motion to the point that the acceleration on the casks is greater than the design earthquake acceleration, or that soil liquefaction could cause unacceptable pad and foundation settlement. A dynamic analysis of ISFSI pads and areas would ensure that the pad, which may be considered as failed in a seismic event, could continue to support the casks without placing them in an unanalyzed condition. In the past, this issue was addressed on a case-by-case basis. This is consistent with the Palisades Plant - NRC Final Safety Assessment of Independent Spent Fuel Storage Installation (ISFSI) Support Pad, September 20, 1994, the first ISFSI approved for a general licensee.

NRC STRATEGIC PLAN PERFORMANCE GOALS

The NRC staff considered the merits of the rulemaking within the context of the performance goals listed in the Agency's strategic plan. The rulemaking effort would increase NRC's effectiveness and efficiency and reduce unnecessary regulatory burden by reducing the number of exemption requests that would need to be submitted and reviewed. This rule would maintain safety by selecting the design earthquake level to be commensurate with the risk associated with an ISFSI. The changes to the design earthquake level are considered risk-informed, consistent with NRC policy to develop risk-informed regulations. This rule would increase realism by enabling ISFSI applicants to use the state-of-the-art approach to more accurately characterize the seismicity of a site. Public confidence may be adversely affected because the proposed risk-informed approach lowers the design earthquake level commensurate with the lower risk of an ISFSI facility.

OFFICE OF THE GENERAL COUNSEL LEGAL ANALYSIS

The Modified Rulemaking Plan proposes modifications to the approved Rulemaking Plan, SECY-98-126, "Rulemaking Plan: Geological and Seismological Characteristics for the Siting and Design of Dry Cask ISFSIs," dated June 4, 1998. During the development of the technical basis for the approved Rulemaking Plan, the staff determined that some of the changes proposed in the approved plan required modification. The Modified Rulemaking Plan includes a new option, Option 4, which reflects some of these proposed modifications.

The intent of this proposed Part 72 rulemaking is to reduce unnecessarily burdensome requirements with respect to evaluating the seismicity of potential ISFSI sites and determining a design earthquake for use in designing ISFSI structures, as those requirements appear in 10 CFR 72.102. The approved Rulemaking Plan (SECY-98-126) proposed to amend Part 72 to (1) require certain new Part 72 specific license applicants to use a probabilistic seismic hazard analysis (PSHA) approach (10 CFR 100.23), instead of the current deterministic approach (which is required by 10 CFR 72.102(f) and contained in Appendix A of 10 CFR Part 100), in determining design earthquake ground motion; (2) allow the use of a risk-informed graded approach to seismic design for ISFSI structures, systems, and components, in which SSCs are required to use one of two categories or levels of design earthquakes (for lower and higher accident consequences), depending on safety importance and risk levels, and (3) in the case of general licensees, require that the design of cask storage pads and areas account for dynamic loads and soil-structure interactions in addition to static loads by amending 10 CFR 72.212(b)(2)(ii).

Like Option 3, the newly added Option 4 would require that certain new Part 72 specific license applicants use the PSHA methodology based on 10 CFR Part 100.23 in lieu of the current deterministic approach. However, instead of simply referencing 10 CFR 100.23, Option 4 proposes the addition of a new section (10 CFR 72.103) based on section 100.23. In addition, Option 4 of the Modified Rulemaking Plan proposes an alternative to the risk-informed graded approach for seismic design of dry cask ISFSI SSCs that is contained in Option 3. Specifically, Option 4 proposes the use of a single-level design earthquake with a variable ground motion that is commensurate with the level of risk associated with an ISFSI. Finally, the Modified Rulemaking Plan retains the proposed amendment to 10 CFR 72.212(b)(2)(ii) requiring consideration of dynamic loads.

The Modified Rulemaking Plan clearly explains the rationale for designing ISFSI SSCs using a single-level design earthquake, concluding that use of this alternative will continue to meet the radiological criteria in Part 72 and therefore adequately protect public health and safety while reducing a regulatory burden. Given this, OGC does not foresee any basis for legal objection to this proposed rulemaking.

The proposed rule should emphasize that use of the PSHA methodology in conjunction with a single-level design earthquake with a lower ground motion would be mandatory only for specific ISFSI (and MRS) applicants who (1) apply for a specific license after the effective date of the rule; (2) are located in the Western U.S. or in any area of known potential seismic activity; and (3) are not co-located with a nuclear power plant. Specific license applicants who do not meet all of these criteria (such as applicants co-located with an NPP) would have the option of using the PSHA approach. Therefore, OGC believes that PSHA component of proposed rulemaking will not require a backfit analysis because it provides only a voluntary alternative for existing licensees.

However, in developing the wording of the proposed revision to 10 CFR 72.212(b)(2)(ii), which involves consideration of dynamic loads and soil-structure interactions by general licensees prior to use of an ISFSI, OGC cautions the staff to avoid potential backfit concerns. The proposed revision should be prospective in nature, applying to general licensees that have yet to commence use of new or future ISFSIs. Imposing new evaluation requirements on general licensees that are already using their ISFSIs could implicate the Backfit Rule in 10 CFR 72.62. OGC notes that an environmental assessment and a regulatory analysis will be required in conjunction with the proposed rulemaking. Moreover, because the options presented would reduce the burden on the licensee with respect to information collection requirements, an OMB clearance statement would be required to comply with the Paperwork Reduction Act.

The proposed rule will not result in a \$100 million impact upon nuclear power plant licensees. Therefore, it is not a "major rule."

Because the rule addresses only areas of exclusive NRC regulatory authority, it does not raise any Agreement State implementation issues.

In conclusion, OGC has determined that there are no known bases for legal objection to the contemplated rulemaking.

BACKFIT ANALYSIS

A backfit analysis is not required for the proposed rule because the provisions of the PSHA methodology are mandatory for new applicants for Part 72 specific licenses only. The backfit provisions of 10 CFR 72.62 only apply to existing licensees. Existing general and specific licensees are not required to use the PSHA methodology contained in the proposed rule; however, they may choose to use the PSHA methodology provisions on a voluntary basis. Therefore, a backfit analysis is not required.

Additionally, the proposed change to 10 CFR 72.212(b)(2), related to designing ISFSI pads for both static and dynamic loads of the stored casks due to earthquake events, will be prospective in nature, applicable only to general licensees for new ISFSIs after the effective date of the rule. Therefore, a backfit analysis is not required.

AGREEMENT STATE IMPLEMENTATION ISSUES

This rule is classified as compatibility category "NRC" and addresses only areas of exclusive NRC regulatory authority.

MAJOR RULE

This is not a major rule.

SUPPORTING DOCUMENTS NEEDED

This rulemaking would require a Regulatory Analysis that would estimate the costs and benefits to licensees for each of the proposed changes. The information provided in the Regulatory Analysis for each change concerning the impact on small entities would be sufficient to support a Regulatory Flexibility Analysis or a certification that the proposed rule would not have a significant economic impact on a substantial number of small entities. An OMB Clearance Package may be needed because the rulemaking is expected to reduce reporting or recordkeeping requirements. This would require that the clearance package be submitted to OMB no later than the date the proposed rule is submitted to the Office of the Federal Register for publication. An Environmental Assessment would be needed to show, as the NRC staff currently believes, that there is no significant impact to public health and safety.

In addition, this rulemaking will necessitate a revision to NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems," and NUREG-1567, "Standard Review Plan for Spent Fuel Dry Storage Facilities." The development of a new regulatory guide to provide guidance in meeting the changes in regulation will also be needed.

ISSUANCE BY EXECUTIVE DIRECTOR FOR OPERATIONS OR COMMISSION

It is recommended that the Commission issue this rulemaking because it involves additions to existing policy on the siting of new dry cask ISFSIs.

RESOURCES NEEDED TO COMPLETE RULEMAKING

The estimated resources to complete and implement Options 1 or 2 are included in the FY 2001-FY 2002 budgets. With Commission approval, the staff is prepared to redirect resources, using the Planning Budgeting Performance Management process, to support Options 3 or 4.

Option 1: No additional FTE required.

Option 2: Since Option 2 does not lower the design earthquake level, fewer public comments would be expected as compared to Options 3 and 4, which do provide for a lower design earthquake level. This would also reduce the need for an expedited rulemaking schedule.

NMSS	1.3 FTE	(develop proposed rule and draft guidance document, resolve public comments, develop final rule and guidance documents)
Other	0.3 FTE	(provide support to NMSS)
Contractor	\$50-65 K	(develop Environmental Assessment, Regulatory Analysis, Information Collection Burden Report, and assist in public comment analysis and guidance development)

Options 3 and 4:

NMSS	3.0 FTE	(develop proposed rule and draft guidance document, resolve public comments, develop final rule and guidance documents)
Other	0.8 FTE	(provide support to NMSS)
Contractor	\$200 K	(develop Environmental Assessment, Regulatory Analysis, Information Collection Burden Report, and assist in public comment analysis and guidance development)

STAFF LEVEL WORKING GROUP

Keith McDaniel, NMSS/IMNS Task Leader
 Mahendra Shah, NMSS/SFPO
 Mysore Nataraja, NMSS/DWM
 Goutam Bagchi, NRR
 Roger Kenneally, RES
 Martin O'Neill, OGC

Concurring Official

M. Virgilio, NMSS
 M. Virgilio, NMSS
 M. Virgilio, NMSS
 S. Collins, NRR
 A. Thadani, RES
 J. Gray, OGC

MANAGEMENT STEERING GROUP

A management steering group is not required for this rulemaking.

PUBLIC PARTICIPATION

There is no need for enhanced public participation for this rulemaking. The rulemaking documents will be placed on the NRC electronic rulemaking bulletin board in addition to publishing the documents for public comments.

SCHEDULE

Proposed rule to EDO

2.0 months after approval of rulemaking plan

Final rule to EDO

4.5 months following end of public comment period

The NRC has decided to conduct this rulemaking on an expedited basis to support current licensing activities.

APPENDIX

Applicability of Proposed Changes

Applicability of Proposed Section 72.103 to Specific License Applicants for ISFSI

Conditions	Western U. S.	Central and Eastern U. S.
Not co-located with NPP, and for applications received after the effective date	Mandatory	Voluntary
Not co-located with NPP, and for applications received prior to effective date but under review	Voluntary	Voluntary
Co-located with NPP, and for applications received after or prior to the effective date	Voluntary	Voluntary

Proposed change in section 72.103 regarding PSHA methodology does not apply to general licensees. General licensees must satisfy the conditions given in 10 CFR 72.212.

Applicability of Proposed Section 72.212(b)(2) to General License Applicants for ISFSI

Proposed changes in Section 72.212(b)(2) regarding dynamic loads apply to general licensees for new ISFSIs after the effective date of the rule, and not to specific licensees. Current practice already provides that specific licensees demonstrate that static and dynamic loads are considered.