Environmental Assessment of Geological and Seismological Characteristics for Siting and Design of Dry Cask Independent Spent Fuel Storage Installations and Monitored Retrievable Storage Installations

Draft Report

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Executive Summary

This document presents the Environmental Assessment of the U.S. Nuclear Regulatory Commission's (NRC or the Commission) proposal to amend its licensing requirements in 10 CFR Part 72 pertaining to the seismic siting and design criteria for dry cask modes of storage of (1) spent nuclear fuel in an independent spent fuel storage installation (ISFSI) and (2) spent nuclear fuel and solid high-level radioactive waste in a monitored retrievable storage installation (MRS). For purposes of this document, the term "ISFSI" is used to include both dry ISFSI and MRS facilities, as appropriate. The Commission does not intend to revise the 10 CFR Part 72 geological and seismological criteria as they apply to wet modes of storage because the risk associated with potential accident scenarios for wet modes of storage is greater than the risk for dry cask modes of storage. This is because wet modes of storage require active systems, such as systems to remove heat and maintain adequate water levels. These active systems have a higher probability of failure than the passive systems used in dry cask modes of storage, thus resulting in a greater seismic risk for wet modes of storage. The Commission also does not intend to revise the 10 CFR Part 72 geological and seismological criteria as they apply to dry modes of storage that do not use casks because of the lack of experience gained in licensing these facilities. The Commission considered a number of options to change the siting and design requirements in Part 72.

The rulemaking proposes the following changes:

1. Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a nuclear power plant, to address uncertainties in the seismic hazard analysis by using appropriate analyses, such as a probabilistic seismic hazard analysis (PSHA) or other suitable sensitivity analyses, for determining the design earthquake ground motion (DE). All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or other suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation.

2. Allow new ISFSI applicants to use a DE appropriate for and commensurate with the risk associated with an ISFSI (§ 72.103). A draft regulatory guide accompanying this proposed rule, recommends a DE with a mean annual probability of exceedance of 5.0E-04, which is lower than the current level for the safe shutdown earthquake (SSE) of a NPP, for ISFSI applications.

3. Require general licensees to evaluate that the designs of cask storage pads and areas adequately account for dynamic loads, in addition to static loads (§ 72.212).

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

The proposed changes are consistent with the Commission's strategic goals in that

- The rulemaking effort would increase NRC's effectiveness and efficiency by reducing the number of exemption requests that would need to be submitted and reviewed.

- This rule would maintain safety by selecting the DE to be commensurate with the risk associated with an ISFSI.

- The changes to the DE 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 (PSHA or suitable sensitivity analyses) to more accurately characterize the seismicity of a site.

The Commission considered four options for this rulemaking:

Option 1.

No Action. The siting requirements for new dry cask ISFSIs would continue to conform to the existing requirements of §§ 72.102.

Option 1, the no-action alternative, would not result in any change to current seismic design criteria, nor would it affect the DE for ISFSI SSCs.

Option 2.

Require new Part 72 specific license applicants to conform to § 100.23 in lieu of Appendix A to Part 100.

No adverse environmental impacts are expected under Option 2. Under this option, certain applicants would be required to address uncertainties in seismic hazard analysis by using appropriate analyses, such as a PSHA or suitable sensitivity analyses, for developing the DE for ISFSIs. The use of PSHA or suitable sensitivity analyses for derivation of the DE would be more risk-informed than the deterministic approach. Under this option, all ISFSIs would still meet the radiological protection standards in §§ 72.104(a) and 72.106(b), and thus the degree of protection of the public health would not be compromised.

Option 3.

Require new Part 72 specific license applicants to conform to § 100.23 in lieu of Appendix A to Part 100, and also give them the option to use a graded approach to seismic design of the ISFSI SSCs.

No adverse environmental impacts are expected under Option 3. As under Option 2, derivation of DEs for ISFSIs using a risk-informed PSHA or suitable sensitivity analyses would be required for certain specific license applicants, and would be protective. Under the graded approach to developing design criteria for ISFSIs, the DE for SSCs important to safety designed for Category 2 events would still be the SSE for a NPP. For these SSCs, there is therefore no

change in risk of radiological exposure. SSCs could be designed to withstand less stringent criteria (Category 1 events) only if the applicant's analysis provides reasonable assurance that the failure of the SSC would not cause the facility to exceed the radiological protection requirements of § 72.104(a) under normal operations. If the specific license applicant's analysis cannot support this conclusion, the SSC would have to be designed such that the facility can withstand more stringent criteria without impairing the ISFSI's capability to perform safety functions and not exceed the radiological protection requirements of §§ 72.104(a) and 72.106(b). Thus, no additional risk to the public would be incurred.

Option 4.

(1) Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a nuclear power plant, to address uncertainties in the seismic hazard analysis by using appropriate analyses, such as a PSHA or other suitable sensitivity analyses, for determining the DE. All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or other suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation.

(2) Maintain the present Part 72 requirement of using a single-level DE, but allow for the use of a lower DE that is commensurate with the level of risk associated with an ISFSI. The draft regulatory guide, DG-3021 "Site Evaluations and Determination of Design Earthquake Ground Motion for Seismic Design of Independent Spent Fuel Storage Installations and Monitored Retrievable Storage Installations," accompanying this proposed rule, recommends a DE with a mean annual probability of exceedance of 5.0E-04 for ISFSI applications. This recommended level is lower than the present level of approximately 1.0E-04 (equivalent to the SSE for a NPP).

Option 4 is similar to Options 2 and 3 in that it requires certain specific license applicants to address uncertainties in seismic hazard analysis to use a risk-informed PSHA or suitable sensitivity analyses for deriving the DE for ISFSIs. Thus, there would be no adverse effect associated with that aspect of this option. Option 4 is different from and 3 in that specific licensees would not be required to design any SSCs to withstand a DE as high as the SSE of a NPP. 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 DE 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.

Options Summary.

Overall, no adverse environmental impacts will result from any of the options identified. Dry storage casks used at an ISFSI are passive systems with natural cooling sufficient to maintain safe temperatures and a robustness or structural integrity to withstand external forces. The cask walls provide adequate shielding and no radioactive products are released under any credible accident conditions. Other systems, structures, and components (SSCs) will also be designed to standards affording a high degree of environmental protection under normal operations and credible accident conditions. In addition, none of the proposed changes will significantly affect the construction or operation of an ISFSI facility.

Additional Change

The Commission is also proposing a change to § 72.212(b)(2)(i)(B) to require that general licensees evaluate dynamic loads (in addition to static loads) in the design of cask storage pads and areas. This proposed change is an additional modification, separate from the changes proposed in the options above.

NRC would change § 72.212(b)(2)(i)(B) to require written evaluations, prior to use, establishing that cask storage pads and areas have been evaluated for the static and dynamic loads of the stored casks. No adverse environmental impacts are expected to result from the proposed change to evaluate dynamic as well as static loads in the design of ISFSI storage pads and areas. The proposed changes are intended to require that general licensees perform appropriate analyses to ensure that the seismic design bases for the casks are met and that casks are not placed in an unanalyzed condition. Therefore, these proposed changes are necessary to assure adequate protection to occupational and public health and safety. The proposed changes to § 72.212 would not actually impose new burden on the general licensees because they currently need to consider dynamic loads to meet the requirements in § 72.212(b)(2)(i)(A). Since the general licensees currently evaluate dynamic loads for evaluating the cask pads and areas, the proposed changes to § 72.212(b)(2)(i)(B) would not actually require any present general licensees operating an ISFSI to re-perform any written evaluations previously undertaken.

1.0 Introduction

The Nuclear Regulatory Commission (NRC) is proposing to amend its siting and design requirements in 10 CFR Part 72 pertaining to the seismic siting and design criteria for dry cask modes of storage of (1) spent nuclear fuel in an ISFSI and (2) spent nuclear fuel in solid high-level radioactive waste in a U.S. Department of Energy (DOE) MRS. For this document, the term “ISFSI” is used to include both ISFSI and MRS facilities, as appropriate. The Commission does not intend to revise the 10 CFR Part 72 geological and seismological criteria as they apply to wet modes of storage because the risk associated with potential accident scenarios for wet modes of storage is greater than the risk for dry cask modes of storage. This is because wet modes of storage require active systems, such as systems to remove heat and maintain adequate water levels. These active systems have a higher probability of failure than the passive systems used in dry cask modes of storage, thus resulting in a greater seismic risk for wet modes of storage. The Commission also does not intend to revise the 10 CFR Part 72 geological and seismological criteria as they apply to dry modes of storage that do not use casks because of the lack of experience gained in licensing these facilities.

The Commission considered four seismic evaluation options. This draft Environmental Assessment (EA) is a part of the Commission’s analysis of the options being considered and is a supporting document for the *Federal Register* Notice containing the proposed rule. The purpose of this draft EA is to evaluate the potential environmental impacts associated with the regulatory changes as required by the National Environmental Policy Act (NEPA). This document presents background material, describes the purpose and need for the proposed action, outlines the proposed action and alternatives being considered, and evaluates the environmental consequences of the proposed action and alternatives.

1.1 Background

In 1980, the Commission added 10 CFR Part 72 to its regulations to establish licensing requirements for the storage of spent fuel in an ISFSI (45 FR 74693, November 12, 1980). 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 regulations envisioned these facilities as spent fuel pools or single, massive dry storage structures. The regulations required seismic evaluations equivalent to those for a NPP when the ISFSI is located in the western U.S. (west of approximately 104^0 west longitude), or in areas of known seismic activity in the central and eastern U.S. A seismic design requirement, equivalent to the requirements for a NPP (Appendix A to 10 CFR Part 100) seemed appropriate for these types of facilities, given the potential accident scenarios. For those sites located in the central and eastern U.S., and not in areas of known seismic activity, the regulations allowed for less stringent alternatives.

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 for ISFSIs which do not involve massive structures, such as dry storage casks and canisters, the required DE 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).

For sites located in the western U.S., or in the eastern U.S. in areas of known seismic activity, the regulations in § 72.102 require the use of the procedures in Appendix A to Part 100 for determining the design basis vibratory ground motion at a site. Appendix A to Part 100 requires 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 the deterministic approach does not explicitly recognize uncertainties in geoscience parameters, PSHA methods and suitable sensitivity analyses were developed that allow explicit expressions for the uncertainty in ground motion estimates and provide a means for assessing sensitivity to various parameters.

Advances in the sciences of seismology and geology, along with the occurrence of some licensing issues not foreseen in the development of Appendix A to Part 100, have caused a number of difficulties in the application of this regulation to dry cask ISFSIs. Specific problematic areas include the following:

- The limitations in data and geologic and seismic analyses and the rapid accumulation of knowledge in the geosciences have required considerable latitude in judgment. The inclusion of detailed geoscience assessments in Appendix A has caused difficulties for applicants and the Commission by inhibiting the use of needed judgment and flexibility in applying basic principles to new situations. Requiring the use of Appendix A has also inhibited the use of evolving methods of analyses (for instance, probabilistic) in the licensing process.

- Various sections of Appendix A are subject to different interpretations. For ISFSI applications, some sections in the Appendix do not provide sufficient information for

implementation. As a result, the Appendix has been the source of licensing delays and debate.

In 1996, the Commission amended 10 CFR Parts 50 and 100 to update the criteria used in decisions regarding NPP siting, including geologic and seismic engineering considerations for future NPPs (61 FR 65157, December 11, 1996). The amendments placed a new § 100.23 in the regulations requiring that the uncertainties in seismic hazard analysis associated with the determination of the SSE be addressed through an appropriate analysis, such as a PSHA or suitable sensitivity analyses in lieu of Appendix A. 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. Further, regulatory guides have been used to address implementation issues. For example, the Commission provided guidance for nuclear power plant license applicants in Regulatory Guide 1.165, "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion," and Standard Review Plan-NUREG 0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Reactors." However, the Commission left Appendix A to Part 100 in place to preserve the licensing basis for existing plants and confined the applicability of § 100.23 to new NPPs.

With over 10 years of experience licensing dry cask storage the Commission is now proposing a conforming change to 10 CFR Part 72 to require some sites to address uncertainties in the seismic hazard analysis by using appropriate analyses, such as a PSHA or other suitable sensitivity analyses, for determining the DE. This approach parallels the change made to 10 CFR Part 100.

In comparison with a NPP, an operating ISFSI facility is a passive 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. Further, the robust cask design required for non-seismic considerations (e.g., drop event, shielding), assure low probabilities of failure from seismic events.

In the unlikely occurrence of a radiological release as a result of a seismic event, the radiological consequences to workers and the public are significantly lower in comparison to a NPP. This is because the conditions required for release and dispersal of significant quantities of radioactive material, such as high temperatures or pressures, are not present in an ISFSI. 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 environment. The long-lived nuclides present in spent fuel are tightly bound in the fuel materials and are not readily dispersible. 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 a fuel assembly rupture, the canister surrounding the fuel assemblies would confine these nuclides. Therefore, the Commission believes that the seismically induced radiological risk associated with an ISFSI is less than the risk associated with a NPP and the use of a lower DE is appropriate.

2.0 Purpose and Need for Proposed Action

Part 72 currently requires siting and design of ISFSI facilities in accordance with requirements that were established for the licensing of nuclear power plants (Appendix A to Part 100). The

purpose of the proposed changes to Part 72 is to (1) provide benefit from the experience gained in applying the existing regulation and from research, (2) incorporate state-of-the-art improvements in the geosciences and earthquake engineering, and (3) make the siting and design criteria risk-informed. These changes are needed because the current requirements are unnecessarily conservative for ISFSI applications, resulting in more costly facility designs, while not providing any measurable additional safety benefit.

The rulemaking proposes to:

1. Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a nuclear power plant, to address uncertainties in the seismic hazard analysis by using appropriate analyses, such as a PSHA or other suitable sensitivity analyses, for determining the DE. All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or other suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation.

2. Allow new ISFSI applicants to use a DE appropriate for and commensurate with the risk associated with an ISFSI (§ 72.103). A draft regulatory guide accompanying this proposed rule recommends a DE with a mean annual probability of exceedance of 5.0E-04, which is lower than the current level for the SSE of a NPP, for ISFSI applications.

3. Require general licensees to evaluate that the designs of cask storage pads and areas adequately account for dynamic loads, in addition to static loads (§ 72.212).

NRC is considering three changes to its seismological and geological siting and design regulations for ISFSI applications.

(1) The first change considers the plausibility of requiring new applicants for sites located in either the western U.S. or in the eastern U.S. in areas of known seismic activity, and not co-located with a NPP, to address uncertainties in determining the DE ground motion seismic hazard analysis by using appropriate analyses, such as a PSHA or other suitable sensitivity analyses. All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or other suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation (§ 72.103).

The existing approach for determining a DE for an ISFSI, embodied in Appendix A to Part 100, relies on a "deterministic" approach. Using this deterministic approach, an applicant develops a single set of earthquake sources, develops for each source a postulated earthquake to be used as the source of ground motion that can affect the site, locates the postulated earthquake according to prescribed rules, and then calculates ground motions at the site.

Although this approach has worked reasonably well for the past several decades, in the sense that safe shutdown earthquake ground motions for NPPs sited with this approach are judged to be suitably conservative, the approach has not explicitly recognized uncertainties in geosciences parameters. Because so little is known about earthquake phenomena (especially in the eastern U.S.), there have often been differences of opinion and differing interpretations

among experts as to the largest earthquakes to be considered and ground-motion models to be used.

Probabilistic methods that have been developed in the past 15 to 20 years for evaluation of seismic safety of nuclear facilities allow explicit incorporation of different models for zonation, earthquake size, ground motion, and other parameters. The advantage of using these probabilistic methods is their ability to incorporate different models and data sets, thereby providing an explicit expression for the uncertainty in the ground motion estimates and a means of assessing sensitivity to various input parameters. The western and eastern U.S. have fundamentally different tectonic environments and histories of tectonic deformation. Consequently, application of these probabilistic methodologies has revealed the need to vary the fundamental PSHA methodology depending on the tectonic environment of the site.

In 1996, when the Commission accepted the use of a PSHA methodology or suitable sensitivity analyses in §100.23, it recognized that the uncertainties in seismological and geological information must be formally evaluated and appropriately accommodated in the determination of the SSE for seismic design of NPPs. The Commission further recognized that the nature of uncertainty and the appropriate approach to account for it depends on the tectonic environment of the site and on properly characterizing parameters input to the PSHA or suitable sensitivity analyses. Consequently, methods other than probabilistic methods such as sensitivity analyses may be adequate for some sites to account for uncertainties. The Commission believes that certain new applicants for ISFSI specific licenses, as described in section 3.0, must also account for these uncertainties instead of using the Appendix A to Part 100.

NRC staff will review the application using all available data including insights and information from previous licensing experience. Thus, the proposed approach requires thorough regional and site-specific geoscience investigations. Results of the regional and site-specific investigations must be considered in application of the probabilistic method. Two current probabilistic methods are the NRC- sponsored study conducted by Lawrence Livermore National Laboratory and the Electric Power Research Institute's seismic hazard study. These are regional studies without detailed information on any specific location. The regional and site-specific investigations provide detailed information to update the database of the hazard methodology to make the probabilistic analysis site-specific.

Applicants also must incorporate local site geological factors such as stratigraphy and topography and account for site-specific geotechnical properties in establishing the DE. In order to incorporate local site factors and advances in ground motion attenuation models, ground motion estimates are determined using the procedures outlined in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Reactors", Section 2.5.2, "Vibratory Ground Motion."

(2) The second change would allow applicants to use a DE appropriate for and commensurate with the risk associated with an ISFSI.

The present DE for ISFSIs is based on the requirements contained in 10 CFR Part 100 for NPPs. In the Statement of Consideration accompanying the initial Part 72 rulemaking, the Commission recognized that the design peak horizontal acceleration for SSCs need not be as high as for a nuclear power reactor, and should be determined on a "case-by-case" basis until more experience is gained with licensing of these types of units (45 FR 74697). With over 10

years of experience licensing dry cask storage, and analyses demonstrating robust behavior of dry cask storage systems (DCSSs) in accident scenarios, the Commission now has a reasonable basis to consider lower and more appropriate DE parameters for dry cask ISFSIs.

The present ISFSI DE (equivalent to the SSE for a NPP) has a mean annual probability of exceedance of approximately 1.0E-04 (i.e., in any one year, the probability is one in ten thousand that the DE established for the site will be exceeded). In comparison with a nuclear power plant, an operating ISFSI is a passive facility in which the primary activities are waste receipt, handling, and storage. An ISFSI does not have the variety and complexity of active systems necessary to support an operating NPP. Further, the robust cask design required for non-seismic considerations (e.g., drop event, shielding), assure low probabilities of failure from seismic events.

In the unlikely occurrence of a radiological release as a result of a seismic event, the radiological consequences to workers and the public are significantly lower in comparison to a NPP. This is because the conditions required for release and dispersal of significant quantities of radioactive material, such as high temperatures or pressures, are not present in an ISFSI. 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 environment. The long-lived nuclides present in spent fuel are tightly bound in the fuel materials and are not readily dispersible. 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 a fuel assembly rupture, the canister surrounding the fuel assemblies would confine these nuclides. Therefore, the Commission believes that the seismically induced radiological risk associated with an ISFSI is less than the risk associated with a NPP and the use of a lower DE is appropriate.

Additional rationale supporting the Commission's proposal to reduce the DE is provided below.

- The critical element for protection against radiation release is the steel cask containing the spent fuel assemblies. The standards in Part 72 Subparts E - Siting Evaluation Factors and F - General Design Criteria, ensure that 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 DE.

- During a seismic event at an ISFSI, a cask may slide if lateral seismic forces are greater than the frictional 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 the thermal criteria in Part 72 Subpart F, are precluded from impacting other adjacent casks. Furthermore, the NRC staff guidance in reviewing cask designs is to show that casks are designed to prevent sliding or tip over during a seismic event. However, even if the casks slide or tip over and then impact other casks or the pad during a seismic event significantly greater than the proposed DE, there are adequate design margins to ensure that the casks maintain their structural integrity.

- Because the DE is a smooth broad-band spectrum, which envelops the controlling earthquake responses, the vibratory ground motion specified is conservative.

- The combined probability of the occurrence of a seismic event and operational failure that leads to a radiological release is much smaller than the individual probabilities of either of these events. This is because the handling building and crane are used for only a fraction of the licensed period of an ISFSI and for only a few casks at a time. Therefore, the risk of a potential release of radioactivity due to failure of the cask handling building and/or crane during a seismic event is small.

- The crane used for lifting the casks in the building is designed using the same industry codes as for a nuclear power plant (ACI 349, AISC N690, ANSI N14.6, and NUREG-0612), and has a safety factor of five (5) or greater for lifted loads using the ultimate strength of the materials. Therefore, the crane would perform satisfactorily for an earthquake ground motion much larger than the DE.

- The determination of a DE for ISFSIs 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.

(3) The third change would require that the design of cask storage pads and areas at ISFSIs adequately account for dynamic loads in addition to static loads.

The Commission is proposing a change to clarify that 10 CFR Part 72 general licensees must perform both static and dynamic loads for new ISFSIs after the effective date of the rule to ensure that casks are not placed in an unanalyzed condition. 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 DE acceleration, or soil liquefaction could cause unacceptable pad and foundation settlement. Accounting for dynamic loads in the analysis of ISFSI pads and areas would ensure that the pad continues to support the casks during seismic events.

3.0 Proposed Action and Alternatives

The options (alternatives) under consideration are:

Option 1. No Action. The siting requirements for new dry casks ISFSIs would continue to conform to the existing requirements of § 72.102.

Option 2. Require new Part 72 specific license applicants to conform to § 100.23 in lieu of Appendix A to Part 100.

Option 3. Require new Part 72 specific license applicants to conform to § 100.23 in lieu of Appendix A to Part 100, and also give them the option to use a graded approach to seismic design of the ISFSI SSCs.

Option 4. (1) Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a nuclear power plant, to address uncertainties in the seismic hazard analysis by using appropriate analyses, such as a PSHA or other suitable sensitivity analyses, for

determining the DE. All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or other suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation.

(2) Maintain the present Part 72 requirement of using a single-level DE, but with a lower DE that is commensurate with the level of risk associated with an ISFSI. Draft regulatory guide, DG-3021, accompanying this proposed rule, recommends a DE with a mean annual probability of exceedance of 5.0E-04, which is lower than the current level for the SSE of a NPP, for ISFSI applications.

Option 4 is the only option that considers whether a site is located with a NPP in determining applicability of the proposed requirements (see Table 3-1 below). Options 2 and 3 do not make this distinction.

Table 3-1. Summary of Applicability

DE for ISFSI or MRS Specific License Applicants for Dry Cask Modes of Storage on or after the Effective Date of the Final Rule	
Site Condition	Specific License[1]
Western U.S., or areas of known seismic activity in the eastern U.S., **not** co-located with NPP	Must use PSHA or suitable sensitivity analyses to account for uncertainties in seismic hazards evaluations[2]
Western U.S., or areas of known seismic activity in the eastern U.S., **and** co-located with NPP	PSHA or suitable sensitivity analyses to account for uncertainties in seismic hazards evaluations[2], **or** existing NPP design criteria (multi-unit sites - use the most recent criteria)
Eastern U.S., and not in areas of known seismic activity	PSHA or suitable sensitivity analyses to account for uncertainties in seismic hazards evaluations[2], **or** existing NPP design criteria, if applicable (multi-unit sites - use the most recent criteria), **or** an appropriate response spectrum anchored at 0.25g (subject to the conditions in proposed § 72.103(a)(1)).

1. Proposed § 72.103 does not apply to general licensees. General licensees must satisfy the conditions given in 10 CFR 72.212.
2. Regardless of the results of the investigations, anywhere in the continental U.S., the DE must have a value for the horizontal ground motion of no less than 0.10 g with the appropriate response spectrum.

Additional Change

The Commission is also proposing a change to § 72.212(b)(2)(i)(B) to require that general licensees evaluate dynamic loads (in addition to static loads) in the design of cask storage pads and areas. This proposed change is an additional modification, separate from the changes proposed in the options above.

NRC would change § 72.212(b)(2)(i)(B) to require written evaluations, prior to use, establishing that cask storage pads and areas have been evaluated for the static and dynamic loads of the stored casks.

3.1 Comparison of Proposed Options

This section compares the requirements of the proposed options. These options differ with regard to seismological and geological siting criteria and estimation of the DE for ISFSIs, and whether single-level DEs will be used in evaluating the design of ISFSI SSCs. As noted above, requirements for consideration of dynamic loads in the design of cask storage pads and areas may be promulgated along with any option. A summary of the requirements of the proposed options is provided in Table 3-2.

Table 3-2. Comparison of Requirements Under Proposed Options

Option	Seismic Siting Criteria, DE Definition	DE for Systems, Structures, and Components (SSCs)
1. (No Action)	Current § 72.102. Sites in the western U.S. do seismic analysis as required by Appendix A to Part 100. In the eastern U.S., use Appendix A analysis or DE with response spectrum anchored at 0.25g ground motion. If Appendix A is used at any site, DE is defined as the SSE for a NPP.	Current § 72.102.
2	Applicant must conform to § 100.23, requiring PSHA or suitable sensitivity analyses in lieu of Appendix A to Part 100, or other options compatible with the existing regulation.	Current § 72.102.
3	Applicant must conform to § 100.23, requiring PSHA or suitable sensitivity analyses in lieu of Appendix A to Part 100, or other options compatible with the existing regulation.	Require applicants to use graded approach to seismic design of SSCs. Similar to Parts 60 and 63; Category 1 event annual probability = 1.0E-03, Category 2 event annual probability = 1.0E-04.
4	Applicant must comply with new § 72.103 requiring use of PSHA or suitable sensitivity analyses in lieu of Appendix A to Part 100, or other options compatible with the existing regulation.	Single level DE for SSCs or other options compatible with the existing regulation.

3.1.1 Option 1: No-Action Alternative

Under Option 1, new specific license applicants for dry cask ISFSIs would continue to meet the existing requirements of 10 CFR 72.102. As noted in section 1, currently, ISFSI applicants at sites located in either the western U.S. or in the eastern U.S. in areas of known seismic activity must currently perform deterministic site seismic evaluations as prescribed in Appendix A to Part 100. ISFSIs located in the eastern U.S. and not in areas of known seismic activity may use a standardized design earthquake (peak ground acceleration of 0.25g) if justified by sufficient geological investigations and literature review. For any application in which the methods in Appendix A are used, the DE for the ISFSI must be no less than the SSE for a NPP.

As noted in the previous sections, the current requirements may result in more costly designs, are deterministic, and employ outdated criteria developed for power reactors, to define siting criteria for the much less complex and hazardous ISFSIs. Therefore, this approach does not consider uncertainties in the seismic hazard assessment, is not risk-informed, and may not be cost effective.

3.1.2 Option 2: Require New Part 72 Specific License Applicants to Conform to § 100.23 in lieu of Appendix A to Part 100

This option would require certain specific license applicants to address uncertainties in seismic hazard analysis by using a PSHA or suitable sensitivity analyses for determining the DE, as described in §§ 72.103 and 100.23. This would bring the seismic site evaluation requirements for ISFSIs into conformance with the updated requirements for NPPs. By accepting the use of

a PSHA methodology or suitable sensitivity analyses in § 100.23, the Commission has recognized that the uncertainties in seismological and geological information must be formally evaluated and appropriately accommodated in the determination of the SSE for seismic design of NPPs. The Commission, in promulgating § 100.23 further recognized that the nature of uncertainty and the appropriate approach to account for it depends on the tectonic environment of the site and on properly characterizing parameters input to the PSHA or suitable sensitivity analyses such as seismic sources, the recurrence of earthquakes within a seismic source, the maximum magnitude of earthquakes within a seismic source, and engineering estimation of earthquake ground motion.

The Commission notes that while strict adherence to the requirements in Appendix A for determining the DE for the ISFSI (equivalent to a 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 § 100.23 for NPPs. This guidance would be considered acceptable for ISFSIs.

This option retains the § 72.102(f)(1) requirement that the DE for ISFSIs be equivalent to the SSE for a NPP. Thus, while improving the technical requirements for site seismic analysis, this option is still not risk-informed, in that the same DEs are defined for the much less hazardous ISFSIs as for NPPs.

3.1.3. Option 3:

(1) Require New Part 72 Specific License Applicants to Conform to § 100.23 in lieu of Appendix A to Part 100

(2) Provide new Part 72 applicants the option to use a graded approach to seismic design for ISFSI SSCs.

This option is the same as Option 2, except that it would require applicants to use a graded approach to developing seismic design criteria for SSCs. The specific approach proposed for dry cask ISFSIs would be comparable to the Parts 60 and 63 graded approach to design ground motion for SSCs of pre-closure facilities (§ 60.2). 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 (Category 2 event). Similarly, those SSCs whose failure would result in lesser accident consequences would be designed to less stringent requirements (Category 1 event). For seismic events, the Commission 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 Part 63. In this approach Category 1 design basis ground motion refers to a mean

annual probability of exceedance of 1.0E-03. 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 earthquake. Other SSCs needed to be functional to prevent the dose limit of 5 rem from being exceeded at the controlled area boundary due to a seismic event, would be designed to a Category 2 design earthquake. Thus, the seismic design of the SSCs would be commensurate with their importance to safety.
By requiring uncertainties in seismic hazard analysis to be addressed using a PSHA or suitable sensitivity analyses to define the DE for ISFSIs, and the use of a graded approach to defining seismic criteria for SSCs, Option 3 sets siting and design criteria that are much more risk-informed than Options 1 and 2, and are more flexible than the proposed requirements in Option 2. It would, however, be more complex to implement than Option 2 and, as discussed in Section 4, would not achieve a meaningful risk reduction compared to the approach defined in Option 4.

3.1.4 Option 4:

(1) Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a nuclear power plant, to address uncertainties in seismic hazard analysis by using appropriate analyses, such as a PSHA or other suitable sensitivity analyses, for determining the DE. All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or other suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation.

(2) Maintain the present Part 72 requirement of using a single-level DE, but with a lower DE that is commensurate with the level of risk associated with an ISFSI. The draft regulatory guide, DG-3021, accompanying this proposed rule, recommends a DE with a mean annual probability of exceedance of 5.0E-04, which is lower than the current level of an SSE for a NPP, for ISFSI applications.

Option 4 would require that:

(1) Applicants who apply on or after the effective date of the final rule, for a Part 72 specific license for a dry cask storage ISFSI or MRS, located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a NPP, would be required to address uncertainties in seismic hazard analysis by using a PSHA or suitable sensitivity analyses, for determining the DE;

(2) Applicants who apply on or after the effective date of the final rule, for a Part 72 specific license for a dry cask storage ISFSI or MRS, located in either the western U.S. or in areas of known seismic activity in eastern U.S., and co-located with a NPP, would have the option of using a PSHA methodology or suitable sensitivity analyses for addressing uncertainties in seismic hazard analysis in determining the DE, or using the

existing design criteria for the NPP. When the existing design criteria for the NPP are used for an ISFSI at a site with multiple NPPs, the criteria for the most recent NPP must be used;

(3) Applicants who apply on or after the effective date of the final rule, for a Part 72 specific license for a dry cask storage ISFSI or MRS, located in eastern U.S., except in areas of known seismic activity, would have the option of using a PSHA methodology or suitable sensitivity analyses for addressing uncertainties in seismic hazard analysis in determining the DE, or using the standardized DE described by an appropriate response spectrum anchored at 0.25 g (subject to the conditions in proposed § 72.103(a)(1)), or using the existing design criteria for the most recent NPP (if applicable); and

(4) The proposed changes regarding the use of a PSHA methodology or suitable sensitivity analyses for addressing uncertainties in seismic hazard analysis in determining the DE are not applicable to a general licensee at an existing NPP operating an ISFSI under a Part 72 general license anywhere in the U.S.

Option 4 would also maintain the present Part 72 requirement of using a single DE for defining ISFSI SSC seismic design criteria, but with a lower ground motion that is commensurate with the level of risk associated with ISFSIs. The draft regulatory guide, DG-3021, accompanying this proposed rule, recommends a DE with a mean annual probability of exceedance of 5.0E-04, which is lower than the current level for the SSE of a NPP, for ISFSI applications. Seismic design criteria for Part 72, when originally issued in 1980, were based on the nuclear plant requirements, and require a DE with a mean annual probability of exceedance of approximately 1.0E-04. Part 72 regulations classify ISFSI facility systems, structures, and components (SSCs) based on their importance to safety. SSCs, whose function is to protect the public health and safety from undue risk, and prevent damage to the spent fuel during handling and storage, are classified as important to safety. These SSCs are evaluated for a single level of DE as an accident condition event only (§ 72.106). For normal operations and anticipated occurrences (§ 72.104), earthquake events are not included.

In the Statements of Consideration accompanying the initial Part 72 Rulemaking, the Commission recognized that the design peak horizontal acceleration for SSCs need not be as high as for a nuclear power reactor, and should be determined on a “case-by-case” basis until “more experience is gained with licensing of these types of units.” With over 10 years of experience licensing dry cask storage, and analyses demonstrating robust behavior of DCSSs in accident scenarios, NRC staff now have a reasonable basis to consider a different design value that is adequate for licensing dry cask storage ISFSIs.

The DCSSs for ISFSI applications are typically self-contained massive concrete or steel structures, weighing approximately 40 to 100 tons when fully loaded. There are very few, if any, moving parts. They are set on a concrete support pad. Several limitations have been set on the maximum height to which the casks can be lifted, based on the drop accident analysis. There is a minimum center-to-center spacing requirement for casks stored in an array on a common support pad. The most conservative estimates of structural thresholds of seismic inertia deceleration due to a drop accident event, before the confinement is breached so as to exceed the permissible radiation levels, is in the range of 30 g to 40 g.

3.2 Dynamic Loads and Soil Stability

Changes to § 72.212(b)(2)(i)(B) are also needed to communicate that general licensees must evaluate both static and dynamic loads for designing new ISFSIs after the effective date of the rule to ensure that casks are not placed in an unanalyzed condition. 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. Evaluation of dynamic loads for cask 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.

4.0 Environmental Consequences

Overall, no adverse environmental impacts will result from any of the options identified. Dry storage casks used at ISFSI's are passive systems with natural cooling sufficient to maintain safe temperatures and a robustness or structural integrity to withstand external forces. The cask walls provide adequate shielding and no radioactive products are released under normal and credible conditions. Other systems, structures, and components would also be designed to standards affording a high degree of environmental protection under normal and credible conditions.

4.1 Environmental Consequences of Option 1: No-Action

The no-action alternative would not result in any change to current seismic design criteria, nor would it affect the DE definition for ISFSI SSCs. No environmental impacts are expected under the current regulation. This conclusion is based on the finding of no significant impact prepared for the previous Part 72 rulemaking (45 FR 74693, November 12, 1980) and NRC's years of experience with licensing ISFSIs.

4.2 Environmental Consequences of Option 2: Require New Part 72 Specific License Applicants to Conform to § 100.23 in lieu of Appendix A to Part 100

No adverse environmental impacts are expected under Option 2. Under this option, certain specific license applicants would be required to address uncertainties in seismic hazard analysis by using a PSHA or suitable sensitivity analyses in determining the DE for ISFSIs. This option would require the same site investigation and characterization as under current rules, and would retain the requirement that the DE for the ISFSI be at least as stringent as the SSE for a NPP. The use of a PSHA or suitable sensitivity analyses for addressing uncertainties in seismic hazard analysis for determining the DE for ISFSIs would be more risk-informed than the deterministic approach. Under this option, all ISFSIs would still meet the radiological protections standards in 10 CFR 72.104(a) and 72.106(b), and thus the degree of protection of the environment and public health is maintained.

4.3 Environmental Consequences of Option 3:

(1) Require New Part 72 Specific License Applicants to Conform to § 100.23 in lieu of Appendix A to Part 100

(2) Provide new Part 72 applicants the option to use a graded approach to seismic design for ISFSI SSCs.

No adverse environmental impacts are expected under Option 3. As under Option 2, use of a PSHA or suitable sensitivity analyses to address uncertainties in seismic hazard analysis for determining the DE for an ISFSI would be protective. Under the graded approach to developing design criteria for ISFSIs, the DE for SSCs important to safety would still be the SSE for a NPP. For these SSCs, there is therefore no change in risk of radiological exposure. SSCs could be designed to withstand Frequency Category 1 events (the less stringent criteria) only if the applicant's analysis provides reasonable assurance that the failure of the SSC would not cause the facility to exceed the radiological protection requirements of § 72.104(a) under normal operations. If the specific license applicant's analysis cannot support this conclusion, the SSC would have to be designed such that the facility can withstand Frequency Category 2 events without impairing the ISFSI's capability to perform safety functions and not exceed the radiological protection requirements of § 72.106(b). Thus, no additional risk to the environment and public would be incurred.

4.4 Environmental Consequences of Option 4:

(1) Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a nuclear power plant, to address uncertainties in the seismic hazard analysis by using appropriate analyses, such as a PSHA or other suitable sensitivity analyses, for determining the DE. All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or other suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation.

(2) Maintain the present Part 72 requirement of using a single-level DE, but with a lower DE that is commensurate with the level of risk associated with an ISFSI. The draft regulatory guide, DG-3021, accompanying this proposed rule, recommends a DE with a mean annual probability of exceedance of 5.0E-04, which is lower than the current level for the SSE of a NPP, for ISFSI applications.

This option is similar to Options 2 and 3 in that it requires certain specific license applicants to address uncertainties in the seismic hazard analysis by using appropriate analyses, such as a PSHA or other suitable sensitivity analyses, for determining the DE. Thus, there would be no adverse effect associated with that aspect of this option. Option 4 also maintains the current single design event for ISFSI SSCs, however, specific licensees would not be required to design any SSCs to withstand a DE as high as the SSE of a NPP. The draft regulatory guide accompanying this proposed rule recommends a DE with a mean annual probability of exceedance of 5.0E-04, for ISFSI applications. NRC staff believe that the use of the less severe design event for all SSCs provides an adequate level of protection from adverse environmental consequences. The general rationale for this finding includes the following considerations:

The present DE (equivalent to the SSE for a NPP) has a mean annual probability of exceedance of approximately 1.0E-04. In comparison with a nuclear power plant, an operating ISFSI is a passive facility in which the primary activities are waste receipt, handling, and storage. An ISFSI does not have the variety and complexity of active systems necessary to support an operating NPP. Further, the robust cask design required for non-seismic considerations (e.g., drop event, shielding), assure low probabilities of failure from seismic events.

In the unlikely occurrence of a radiological release as a result of a seismic event, the radiological consequences to workers and the public are significantly lower in comparison to a NPP. This is because the conditions required for release and dispersal of significant quantities of radioactive material, such as high temperatures or pressures, are not present in an ISFSI. 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 environment. The long-lived nuclides present in spent fuel are tightly bound in the fuel materials and are not readily dispersible. 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 a fuel assembly rupture, the canister surrounding the fuel assemblies would confine these nuclides. Therefore, the Commission believes that the seismically induced radiological risk associated with an ISFSI is less than the risk associated with a NPP and the use of a lower DE is appropriate.

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 DE 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 DE 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 NRC staff's findings with regard to protectiveness include:

- The critical element for protection against radiation release is the sealed cask containing the spent fuel assemblies. The standards in Part 72 Subparts E - Siting Evaluation Factors and F - General Design Criteria, ensure that 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 DE.

- During a seismic event at an ISFSI, a cask may slide if lateral seismic forces are greater than the frictional 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 the thermal criteria in Part 72 Subpart F, are precluded from impacting other adjacent casks. Furthermore, the NRC staff guidance in reviewing cask designs is to show that casks are designed to prevent sliding or tip over during a seismic event. However, even if the casks slide or tip over and then impact other casks or the pad during a seismic event significantly greater than the proposed DE, analyses have

shown that there are adequate design margins to ensure that the casks maintain their structural integrity.

- Because the DE is a smooth broad-band spectrum, which envelops the controlling earthquake responses, the vibratory ground motion specified is conservative.

- The combined probability of the occurrence of a seismic event and operational failure that leads to a radiological release is much smaller than the individual probabilities of either of these events. This is because the handling building and crane are used for only a fraction of the licensed period of an ISFSI and for only a few casks at a time. Therefore, the risk of a potential release of radioactivity due to failure of the cask handling building and/or crane during a seismic event is small.

- The crane used for lifting the casks in the building is designed using the same industry codes as for a nuclear power plant (ACI 349, AISC N690, ANSI N14.6, and NUREG-0612), and has a safety factor of five (5) or greater for lifted loads using the ultimate strength of the materials. Therefore, the crane would perform satisfactorily for an earthquake much larger than the DE.

- The determination of a DE for ISFSIs 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.

In addition, none of the proposed changes will significantly affect the construction or operation of an ISFSI facility and therefore, there is no increased risk to the environment associated with this option.

4.5 Environmental Consequences of Considering Dynamic Loads

NRC would change § 72.212(b)(2)(i)(B) to require written evaluations, prior to use, establishing that cask storage pads and areas have been evaluated for the static and dynamic loads of the stored casks. No adverse environmental impacts are expected to result from the proposed change to evaluate dynamic as well as static loads in the design of ISFSI storage pads and areas. The proposed changes are intended to require that general licensees perform appropriate analyses to ensure that the seismic design bases for the casks are met and that casks are not placed in an unanalyzed condition. Therefore, these proposed changes are necessary to assure adequate protection to occupational and public health and safety. The proposed changes to § 72.212 would not actually impose new burden on the general licensees because they currently need to consider dynamic loads to meet the requirements in § 72.212(b)(2)(i)(A). Since the general licensees currently evaluate dynamic loads for evaluating the cask pads and areas, the proposed changes to § 72.212(b)(2)(i)(B) would not actually require any present general licensees operating an ISFSI to re-perform any written evaluations previously undertaken.

4.6 Summary

The purpose of the options under consideration is to enable ISFSI applicants to incorporate state-of-the-art improvements in the geosciences and engineering and require a risk-informed

regulation, while maintaining protection against radiological risks. As discussed in sections 3 and 4, NRC staff has concluded that neither the options to use a PSHA or suitable sensitivity analyses to address uncertainties in seismic hazard analysis for determining the DE for ISFSIs, nor the recommendation to reduce the mean annual probability of exceedance for the DE will adversely affect the safety of ISFSI designs. Dry storage casks used at an ISFSI are passive systems with natural cooling sufficient to maintain safe temperatures and a robustness or structural integrity to withstand external forces. The cask walls provide adequate shielding and no radioactive products are released under any credible accident conditions. Other SSCs will also be designed to standards affording a high degree of environmental protection under normal operations and credible accident conditions. In addition, none of the proposed changes will significantly affect the construction or operation of an ISFSI facility.

Under all the options under consideration, ISFSIs will still be able to meet the radiological protection standards of §§72.104(a) and 106(b). Thus, there will be no adverse environmental impacts from the proposed rule changes, no matter which option is chosen.

5.0 Finding of No Significant Impact

Based on the foregoing draft environmental assessment, the Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in Subpart A of 10 CFR Part 51, not to prepare an environmental impact statement for this proposed rule because the Commission has concluded, based on an Environmental Assessment, that this proposed rule, if adopted, would not be a major Federal action significantly affecting the quality of the human environment.

The Commission concluded that no significant environmental impact would result from this rulemaking. In comparison with a NPP, an operating ISFSI or MRS is a passive facility in which the primary activities are waste receipt, handling, and storage. An ISFSI or MRS does not have the variety and complexity of active systems necessary to support an operating NPP. Once the spent fuel is in place, an ISFSI or MRS is essentially a static operation and, 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 after it has decayed for more than one year before storage in an ISFSI or MRS and the low inventory of volatile radioactive materials readily available for release to the environs. The long-lived nuclides present in spent fuel are tightly bound 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 stored at an ISFSI or MRS. 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 seismically induced radiological risk associated with an ISFSI or MRS is less than the risk associated with a NPP.

The determination of this environmental assessment is that there will be no significant environmental impact due to the proposed changes because the same level of safety would be maintained by the new requirements, taking into account the lesser risk from an ISFSI or MRS. However, the general public should note that the NRC welcomes public participation. Comments on any aspect of the Environmental Assessment may be submitted to: Secretary,

U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Rulemaking and Adjudications Staff.

Deliver comments to 11555 Rockville Pike, Rockville, Maryland, between 7:30 a.m. and 4:15 p.m. on Federal workdays.

You may also provide electronic comments via the NRC's interactive rulemaking website at (http://ruleforum.llnl.gov). This site provides the capability to upload comments as files (any format), if your web browser supports that function. For information about the interactive rulemaking website, contact Ms. Carol Gallagher at (301) 415-5905, or e-mail cag@nrc.gov.

The NRC has sent a copy of the Environmental Assessment and this proposed rule to every State Liaison Officer and requested their comments on the Environmental Assessment. The Environmental Assessment may be examined at the NRC Public Document Room, O-1F21,11555 Rockville Pike, Rockville, MD. Single copies of the Environmental Assessment are available from Keith K. McDaniel, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, telephone: (301) 415-5252, e-mail: kkm@nrc.gov.

6.0 Agencies and Persons Consulted

No other agencies or persons were consulted in the preparation of this draft environmental assessment.

Note: State regulatory agencies and members of the public will have an opportunity to comment on the draft EA when it is published in the *Federal Register*.