[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 51

[NRC-2012-0246]

RIN: 3150-AJ20

Waste Confidence - Continued Storage of Spent Nuclear Fuel Beyond the Licensed Life for Operation of a Reactor

AGENCY: Nuclear Regulatory Commission.

ACTION: Proposed rule.

SUMMARY: The U. S. Nuclear Regulatory Commission (NRC) is proposing to revise its generic determination on the environmental impacts of the continued storage of spent nuclear fuel beyond a reactor's licensed life for operation and prior to ultimate disposal. The NRC has prepared a generic environmental impact statement to support this proposed rule. Based on the analysis in that document the Commission proposes to conclude that a mined geologic repository can be available within 60 years following the licensed life of operation for a reactor and that it is feasible that the spent nuclear fuel can be stored safely. The Commission also concludes that the analysis supports a generic conclusion on the environmental impacts of storage of spent fuel for 60 years beyond the licensed life for operation of a reactor. The proposed rule would also clarify that the generic determination applies to renewals of independent spent fuel storage installation licenses. The Commission is also proposing to

make conforming amendments to the Commission's 2013 findings on the environmental effects of renewing the operating license of a nuclear power plant to address Waste Confidence.

DATES: Submit comments on the rule by **[INSERT DATE 75 DAYS FROM DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. Comments received after the above date will be considered if it is practical to do so, but the NRC is able to assure consideration only for comments received on or before this date.

ADDRESSES: You may access information and comment submissions related to this proposed rule, which the NRC possesses and is publicly-available, by searching on http://www.regulations.gov under Docket ID NRC-2012-0246. You may submit comments related to this proposed rule by any of the following methods:

- **Federal rulemaking Web site:** Go to http://www.regulations.gov and search for Docket ID NRC-2012-0246. Address questions about NRC dockets to Carol Gallagher; telephone: 301-492-3668; e-mail: Carol.Gallagher@nrc.gov.

- **E-mail comments to**: Rulemaking.Comments@nrc.gov. If you do not receive an automatic e-mail reply confirming receipt, then contact us at 301-415-1677.

- **Fax comments to:** Secretary, U.S. Nuclear Regulatory Commission at 301-415-1101.

- **Mail comments to:** Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff.

- **Hand deliver comments to:** 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 a.m. and 4:15 p.m. (Eastern Time) Federal workdays; telephone: 301-415-1677.

For additional direction on accessing information and submitting comments, see "Accessing Information and Submitting Comments" in the SUPPLEMENTARY INFORMATION section of

this document.

FOR FURTHER INFORMATION CONTACT: Merri Horn, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-287-9167; e-mail: Merri.Horn@nrc.gov; or Timothy McCartin, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-287-3167; e-mail: Timothy.McCartin@nrc.gov;

EXECUTIVE SUMMARY:

Purpose of the Regulatory Action

The purpose of this proposed rule is to improve the efficiency of the NRC's licensing process by generically addressing the environmental impacts of the continued storage of spent nuclear fuel beyond the licensed life for operation of a reactor. The NRC has prepared a generic environmental impact statement of the environmental impacts of continued storage. This proposed rule would codify the results of the analyses from this document in Section 51.23 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Temporary storage of spent nuclear fuel after cessation of reactor operation-generic determination of no significant environmental impact." The NRC's licensing proceedings for nuclear reactors and ISFSIs have historically relied upon the generic determination in 10 CFR 51.23 to satisfy their obligations under the National Environmental Policy Act (NEPA) with respect to the narrow area of the environmental impacts of continued storage. If this proposed rule is adopted as a final rule, the NEPA analyses for future reactor and spent-fuel-storage facility licensing actions would not need to independently consider the environmental impacts of continued storage beyond the licensed life of a reactor.

Summary of the Major Rule Changes

The following bullets summarize the major proposed changes to the rule:

- The title of 10 CFR 51.23 would be revised to “Environmental effect of continued storage of spent nuclear fuel beyond the licensed life for operation of a reactor.”
- Paragraph (a) of 10 CFR 51.23 would be revised to provide the Commission’s generic determination on the continued storage of spent nuclear fuel. The proposed amendments would state that, based on the analysis in NUREG-2157, the Commission has concluded that a mined geologic repository can be available with 60 years following the licensed life of operation of a reactor; that the analysis is adequate to determine that it is feasible to safely store spent nuclear fuel; and that the analysis is adequate to reach a generic conclusion on the environmental impacts of continued storage for 60 years beyond the licensed life for operation of a reactor.
- Paragraph (b) of 10 CFR 51.23 would be revised to clarify that ISFSI renewals are included in the scope of the generic determination.
- The “Offsite radiological impacts of spent nuclear fuel and high-level waste disposal” issue would be reclassified as a Category 1 impact in Table B-1 of appendix B of 10 CFR part 51, “Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants,” and the finding column entry would be revised to address Waste Confidence.
- The finding column entry for the “Onsite storage of spent nuclear fuel” issue” in Table B-1 appendix B of subpart A of 10 CFR part 51 would be revised to include the period of continued storage beyond the licensed life for operation of a reactor.

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I. Accessing Information and Submitting Comments

A. Accessing Information

Please refer to Docket ID NRC-2012-0246 when contacting the NRC about the availability of information for this proposed rulemaking. You may access information related to this proposed rule, which the NRC possesses and is publicly-available, by any of the following methods:

- **Federal Rulemaking Web Site:** Go to http://www.regulations.gov and search for Docket ID NRC-2012-0246.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may access publicly-available documents online in the NRC Library at http://www.nrc.gov/reading-rm/adams.html**.** To begin the search, select "ADAMS Public Documents" and then select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this notice (if that document is available in ADAMS) is provided the first

time that a document is referenced. In addition, for the convenience of the reader, the ADAMS accession numbers are provided in a table in Section V, *Availability of Documents*, of this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

B. Submitting Comments

Please include Docket ID NRC-2012-0246 in the subject line of your comment submission, in order to ensure that the NRC is able to make your comment submission available to the public in this docket.

The NRC cautions you not to include identifying or contact information in your comment submission that you do not want to be publicly disclosed. The NRC will post all comment submissions at http://www.regulations.gov as well as enter the comment submissions into ADAMS and the NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submissions. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment into ADAMS.

II. Background

In the late 1970s, a number of environmental groups and States challenged the NRC regarding issues related to the storage and disposal of spent nuclear fuel beyond a reactor's licensed life for operation. In 1977, the Commission denied a petition for rulemaking (PRM), PRM-50-18, filed by the Natural Resources Defense Council (NRDC) that asked the NRC to determine whether radioactive wastes generated in nuclear power reactors can be disposed of without undue risk to public health and safety and to refrain from granting pending or future requests for reactor operating licenses until the NRC made such a determination. The Commission stated in its denial that, as a matter of policy, it "... would not continue to license reactors if it did not have reasonable confidence that the wastes can and will in due course be disposed of safely" (42 FR 34391, 34393; July 5, 1977, *pet. for rev. dismissed sub nom.*, *NRDC v. NRC*, 582 F.2d 166 (2d Cir. 1978)).

At about the same time, interested parties challenged license amendments that permitted expansion of the capacity of spent fuel pools at two nuclear power plants, Vermont Yankee and Prairie Island. In 1979, the U.S. Court of Appeals for the District of Columbia Circuit, in *Minnesota v. NRC*, 602 F.2d 41 (D.C. Cir. 1979), did not stay or vacate the license amendments, but did remand to the Commission the question of whether an offsite storage or disposal solution would be available for the spent nuclear fuel at the two facilities at the expiration of their licenses—in 2007 and 2009—and, if not, whether the spent nuclear fuel could be stored safely at those reactor sites until an offsite solution became available.

In 1979, the NRC initiated a generic rulemaking proceeding that stemmed from these challenges and the Court's remand in *Minnesota v. NRC*. The purpose of the Waste Confidence rulemaking was to generically assess whether the Commission could have reasonable assurance that radioactive wastes produced by nuclear power plants "can be safely disposed of, to determine when such disposal or offsite storage will be available, and to determine whether radioactive wastes can be safely stored onsite past the expiration of existing facility licenses until offsite disposal or storage is available" (44 FR 61372, 61373; October 25,

1979). On August 31, 1984, the Commission published the Waste Confidence Decision (Decision) (49 FR 34658) and a final rule (49 FR 34688), codified at 10 CFR 51.23. This Decision provided an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) to support the rule. In the Decision the Commission made five Findings:

1. The Commission finds reasonable assurance that safe disposal of radioactive waste and spent nuclear fuel in a mined geologic repository is technically feasible;

2. The Commission finds reasonable assurance that one or more mined geologic repositories for commercial high-level radioactive waste and spent nuclear fuel will be available by the years 2007 – 2009[1] and that sufficient repository capacity will be available within 30 years beyond the expiration of any reactor operating license to dispose of existing commercial high-level radioactive waste and spent nuclear fuel originating in such reactor and generated up to that time;

3. The Commission finds reasonable assurance that high-level radioactive waste and spent nuclear fuel will be managed in a safe manner until sufficient repository capacity is available to assure the safe disposal of all high-level radioactive waste and spent nuclear fuel;

4. The Commission finds reasonable assurance that, if necessary, spent nuclear fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the expiration of that reactor's operating license at that reactor's spent fuel storage basin, or at either onsite or offsite ISFSIs;

5. The Commission finds reasonable assurance that safe independent onsite or offsite spent fuel storage will be made available if such storage capacity is needed.

[1] Under the court remand that precipitated the initial waste confidence review, NRC was required to consider whether there was reasonable assurance that an offsite storage solution would be available by the years 2007-2009 and, if not, whether there was reasonable assurance that the spent fuel could be stored safely at those sites beyond those dates. *See State of Minnesota v. NRC,* 602 F.2d 412, 418 (D.C. Cir. 1979).

The rule, 10 CFR 51.23, codified the analysis in the Decision and found that for at least 30 years beyond the expiration of a reactor operating license, no significant environmental impacts will result from the storage of spent nuclear fuel, and expressed the Commission's reasonable assurance that a repository was likely to be available by 2007 – 2009. The rule also stated that, as a result of this generic determination, the agency did not need to assess the site-specific impacts of continuing to store the spent nuclear fuel in either an onsite or offsite storage facility in new reactor licensing environmental impact statements (EIS) or EAs beyond the expiration dates of reactor licenses (10 CFR 51.23(b)). The rule also amended 10 CFR part 50, "Domestic licensing of production and utilization facilities," to require operating nuclear power reactor licensees to submit their plans for managing spent nuclear fuel at their site until the fuel is transferred to the Department of Energy (DOE) for disposal. (See 50.54(bb)).

The Commission conducted its first review of the Decision and rule in 1989 – 1990. This review resulted in the revision of the second and fourth Findings to reflect revised expectations for the date of availability of the first repository, and to clarify that the expiration of a reactor's licensed life for operation referred to the full 40-year initial license for operation and any additional term of a revised or renewed license. On September 18, 1990, the Commission published the revised Decision (55 FR 38474) and the associated final rule (55 FR 38472). The revised Findings 2 and 4 in the 1990 revised Decision were:

2. The Commission finds reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of any reactor to dispose of the commercial high-level radioactive waste and spent nuclear fuel originating in such reactor and generated up until that time.

4. The Commission finds reasonable assurance that, if necessary, spent nuclear fuel generated at any reactor can be stored safely and without significant environmental impacts for

at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin, or at either onsite or offsite ISFSIs.

The Commission also amended 10 CFR 51.23(a) to reflect the revised timing of the availability of a geologic repository to the first quarter of the twenty-first century. The rule was also revised to reflect that the licensed life for operation may include the term of a revised or renewed license.

The Commission conducted its second review of the Decision and rule in 1999 and concluded that experience and developments after 1990 had confirmed the Findings and made a comprehensive reevaluation of the Decision unnecessary. The Commission also stated that it would consider undertaking a comprehensive reevaluation when the pending repository development and regulatory activities had run their course or if significant and pertinent unexpected events occurred that would raise substantial doubt about the continuing validity of the Waste Confidence Findings. (*See* 64 FR 68005; December 6, 1999).

In 2008, the Commission decided to conduct its third review of the Decision and rule as part of an effort to enhance the efficiency of upcoming combined operating license application proceedings. The Commission determined that it would be more efficient to resolve certain combined-license-proceeding issues generically, including those related to Waste Confidence. This review resulted in a revision of the second and fourth Findings to reflect revised expectations for the date of availability of the first repository and that spent nuclear fuel can be stored safely for at least 60 years beyond the licensed life for operation.

In December 2010, the Commission published its revised Decision (75 FR 81032; December 23, 2010) and associated final rule (75 FR 81037; December 23, 2010). The revised Findings 2 and 4 in the 2010 Decision were:

2. The Commission finds reasonable assurance that sufficient mined geologic repository capacity will be available to dispose of the commercial high-level radioactive waste and spent nuclear fuel generated by any reactor when necessary.

4. The Commission finds reasonable assurance that, if necessary, spent nuclear fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 60 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor in a combination of storage in its spent fuel storage basin and either onsite or offsite ISFSIs.

Section 51.23(a) of 10 CFR was amended to reflect revised Findings 2 and 4. The changes reflected that spent nuclear fuel could be safely stored for at least 60 years beyond the licensed life for operation of a reactor and that sufficient mined geologic repository capacity would be available when necessary.

In response to the 2010 Decision and rule, the States of New York, New Jersey, Connecticut, and Vermont; several public interest groups; and the Prairie Island Indian Community filed a lawsuit in the U.S. Court of Appeals for the D.C. Circuit that challenged the Commission's NEPA analysis. On June 8, 2012, the Court ruled that some aspects of the 2010 Decision did not satisfy the NRC's NEPA obligations and vacated the Decision and rule. (*New York v. NRC*, 681 F.3d 471 (D.C. Cir. 2012)). The Court's ruling is available at: http://www.cadc.uscourts.gov/internet/opinions.nsf/57ACA94A8FFAD8AF85257A1700502AA4/$file/11-1045-1377720.pdf.

The Court concluded that the Waste Confidence rulemaking is a major federal action necessitating either an EIS or an EA that results in a FONSI. In vacating the 2010 Decision and rule, the Court identified three specific deficiencies in the analysis:

1. Related to the Commission's conclusion that permanent disposal will be available "when necessary," the Court held that the Commission needed to include an evaluation of the

environmental effects of failing to secure permanent disposal since there was a degree of uncertainty regarding whether a repository would be built;

2. Related to the storage of spent nuclear fuel on site at nuclear plants for 60 years after the expiration of a plant's operating license, the Court concluded that the Commission had not adequately examined the risk of spent fuel pool leaks in a forward-looking fashion;

3. Also related to the post-licensed-life storage of spent nuclear fuel, the Court concluded that the Commission had not adequately examined the consequences of spent fuel pool fires.

In response to the Court's decision, on August 7, 2012, the Commission stated in Commission Order CLI-12-16 (ADAMS Accession No. ML12220A094) that it would not issue reactor or ISFSI licenses dependent upon the Waste Confidence Decision and rule until the Court's remand is appropriately addressed. The Commission stated, however, that this determination extends only to final license issuance, and that all licensing reviews and proceedings should continue to move forward.

In the Staff Requirements Memorandum on COMSECY-12-0016 (ADAMS Accession No. ML12250A032), the Commission directed the staff to develop a generic EIS to support an updated Waste Confidence Decision and rule. In response, the NRC formed the Waste Confidence Directorate in the Office of Nuclear Material Safety and Safeguards to oversee the development of the generic EIS, Decision, and rule. The NRC began the environmental review process by publishing a Notice of Intent to prepare an EIS and conduct scoping (77 FR 65137; October 25, 2012). The NRC held one public meeting with a live Webcast and one Webcast-only meeting in November 2012, and two Webinars in December 2012 to obtain public input on the scope of the environmental review.[2] The transcripts for each of these meetings are available in ADAMS under Accession Nos. ML12331A347, ML12331A353, ML12355A174, and

[2] A Webcast is an internet-based meeting that includes both audio and video feeds. A Webinar is an internet-based meeting that does not include video.

ML12355A187. The scoping period ended on January 2, 2013. Starting in January 2013, the NRC Waste Confidence Directorate has held monthly public teleconferences to provide updates on the status of Waste Confidence activities.

The "Waste Confidence Generic Environmental Impact Statement Scoping Process Summary Report," which is available in ADAMS under Accession No. ML13060A128, provides a summary of the determinations and conclusions reached during the NRC's environmental scoping process. The Summary Report also contains a summary of comments received during the public scoping period and the NRC's responses. A separate document, "Scoping Comments on the Waste Confidence Generic Environmental Impact Statement," lists the scoping comments, organized by comment category (ADAMS Accession No. ML13060A130). The NRC is issuing this proposed rule and the draft NUREG-2157, "Waste Confidence Generic Environmental Impact Statement" (DGEIS) (ADAMS Accession No. MLXXXXX) for public comment.

III. Discussion

This discussion section has been divided into three subsections to better present information on the proposed rule and the Waste Confidence proceeding. Section A provides general information related to the Waste Confidence proceeding in general. Section B provides information related to the proposed rule changes. Sections A and B are in a question and answer format. Lastly, Section C contains the Commission's draft Decision.

A. General Information

A1. What Action Is the NRC Taking?

The NRC is proposing to issue a rule to codify its generic determination on continued storage of spent nuclear fuel at, or away from, reactor sites beyond a reactor's licensed life for

operation pending disposal at a repository. The analysis in the DEGIS provides a regulatory basis for the proposed rule.

A2. What Is the Waste Confidence Proceeding?

Historically, the Commission's Waste Confidence proceeding represented the Commission's generic determination and generic environmental analysis that spent nuclear fuel can be stored safely and without significant environmental impacts for a period of time past the licensed life for operation of a nuclear power reactor. This generic environmental analysis was reflected in 10 CFR 51.23, which addresses the NRC's NEPA obligations with respect to the continued storage of spent nuclear fuel beyond the licensed life for operation of a reactor, but before ultimate disposal.

This proposed rule and the DGEIS represent a change in the format of the Commission's Waste Confidence proceeding. As discussed in more detail below, the Commission is no longer making a determination that there will be no significant environmental impacts associated with continued storage. Instead, the Commission is preparing a DGEIS, which provides a more detailed analysis of the environmental impacts associated with continued storage. This proposed rule then codifies the environmental impacts reflected in the DGEIS.

A3. Why Is the NRC Doing This Now?

On June 8, 2012, the U.S. Court of Appeals for the District of Columbia Circuit vacated the Commission's 2010 update to the Waste Confidence Decision and rule, and remanded the Decision and rule to the NRC to address deficiencies related to the NRC's NEPA analysis. On September 6, 2012, the Commission instructed NRC staff to proceed with a generic EIS to analyze the environmental impacts of continued storage and address the issues raised in the Court's decision, and to update the Waste Confidence Decision and rule in accordance with the analysis in the EIS. The DGEIS and this proposed rule implement the Commission's direction.

A4. Whom Would This Action Affect?

This proposed rule would affect any nuclear power reactor applicant and licensee

undergoing issuance or renewal of an operating license for a nuclear power reactor under 10 CFR parts 50 or 54, "Requirements for renewal of operating licenses for nuclear power plants;" issuance of a combined license for a nuclear power reactor under 10 CFR part 52, "Licenses, certifications, and approvals for nuclear power plants;" or amendment of a license under 10 CFR parts 50 or 52. This proposed rule would also affect the issuance of an initial, amended, or renewed license for storage of spent nuclear fuel at an ISFSI under 10 CFR part 72, "Licensing requirements for the independent storage of spent nuclear fuel, high-level radioactive waste, and reactor-related greater than Class C waste." The proposed rule could also affect participants in any proceeding addressing these licensing actions.

A5. Why Is the NRC Generically Addressing the Environmental Impacts of Continued Storage?

Since 1984, the NRC has generically addressed the environmental impacts of continued storage though a generic NEPA analysis and rule. The rationale for adopting these generic environmental impacts is discussed in more detail below and in the DGEIS. Without a generic environmental impact analysis, site-specific consideration of the environmental impacts of continued storage would be necessary. The NRC's proposed reliance on a DGEIS and rule to address environmental impacts of continued storage of spent nuclear fuel will enhance the NRC's efficiency in individual licensing reviews by addressing a set of issues that are the same or largely similar at each power reactor or storage site and codifying them. The generic determination in 10 CFR 51.23 would satisfy the NRC's NEPA obligations with respect to the environmental impacts of continued storage.

A6. What Types of Waste Are Addressed by Waste Confidence?

The environmental analysis in the DGEIS and in this proposed rule covers low and high burn-up spent nuclear fuel generated in light-water nuclear power reactors. It also covers mixed oxide (MOX) fuel, since the MOX fuel would be substantially similar to existing light-water reactor fuel and is, in fact, intended for use in existing light-water reactors in the United States. It also covers spent nuclear fuel from small modular reactors. Small modular light-water

reactors being developed will use fuel very similar in form and materials to the existing operating reactors and will not, therefore, introduce new technical challenges to the disposal of spent nuclear fuel. Waste Confidence also covers the spent nuclear fuel from one high-temperature gas-cooled reactor (HTGR) built and commercially operated: Fort Saint Vrain. The spent nuclear fuel from Peach Bottom Unit 1 is not covered because it is no longer regulated by the NRC. (*See* Section 2.1.1.3 of the DGEIS).

A7. What Activities Are Not Addressed by Waste Confidence?

Waste Confidence does not consider transportation of spent nuclear fuel during operation, disposal of spent nuclear fuel, or storage of spent nuclear fuel during the licensed life for operation of the power reactor. Additionally, Waste Confidence does not address foreign spent nuclear fuel, non-power reactor spent fuel (e.g., research and test reactors), defense waste, Greater-than-Class C low-level waste, reprocessing of commercial spent nuclear fuel, and the need for nuclear power.

The NRC is participating in pre-application reviews of the DOE's Next Generation Nuclear Plant (NGNP). The NGNP would use nuclear fuel comprised of Tristructural-Isotopic-coated fuel particles contained in either fuel pebbles or prismatic fuel assemblies. However, because this fuel type has not completed fuel qualification testing, fuel from the NGNP program is not included in Waste Confidence at this time. Additionally, the continued storage of future HTGR fuels beyond the licensed life for operation of a future HTGR are not within the scope of Waste Confidence at this time.

A8. How Is Spent Nuclear Fuel Stored?

Spent nuclear fuel is stored in either spent fuel pools or in dry cask storage. Spent fuel pools are designed to store and cool the spent nuclear fuel following removal from the reactor. Spent fuel pools are massive, seismically-designed structures that are constructed from thick, reinforced concrete walls and slabs that vary between 0.7 and 3 meters (2 and 10 feet) thick. All spent fuel pools currently in operation are lined with stainless steel liners that vary in

thickness between 6 and 13 millimeters (0.25 and 0.5 inches); spent fuel pools have either a leak detection system to determine or administrative controls to monitor the spent fuel pool liner. Leak detection systems are usually made up of several channels that can be monitored individually, or are designed in such a way that leakage empties into drains that can be monitored. Leaked water is directed to a sump, liquid radioactive waste treatment system, or other cleanup or collection systems. Racks fitted in the spent fuel pools store the fuel assemblies in a controlled configuration (*i.e.*, so that the fuel is both sub-critical and in a coolable geometry). Spent fuel pool systems also include redundant monitoring, cooling, and makeup-water systems. The spent nuclear fuel assemblies are positioned in racks at the bottom of the pool, and are typically covered by at least 6 meters (20 feet) of water. Spent fuel pools are essentially passive systems. The water in the pools provides radiation shielding, spent nuclear fuel assembly cooling, and captures radionuclides in case of fuel rod leaks. Spent fuel pools are located at reactor sites, typically within the fuel-handling building (pressurized-water reactor (PWR)) or the reactor building (boiling-water reactor). A typical spent fuel pool at a light water reactor holds (with full core reserve maintained) the equivalent of about 6 core loads, or about 700 metric ton uranium (MTU). There is one away-from-reactor spent fuel pool (GE Morris) licensed under 10 CFR part 72 as an ISFSI. Information on the spent fuel pools and the quantity of spent nuclear fuel that can be stored in spent fuel pools is available in Appendix G of the DGEIS. (*See* Chapter 2 of the DGEIS).

Spent nuclear fuel is also stored in dry casks at ISFSIs licensed by the NRC under either a general license or a specific license. Dry cask storage shields people and the environment from radiation and keeps the spent nuclear fuel inside dry and nonreactive. Dry cask storage allows spent fuel that has already been cooled in the spent fuel pool for at least one year to be surrounded by inert gas inside a container called a cask. The casks are typically steel cylinders that are either welded or bolted closed. The steel cylinder provides a leak-tight confinement of the spent fuel. Each cylinder is surrounded by additional steel, concrete, or other material to

provide radiation shielding to workers and members of the public. Dry cask storage systems are passive systems that rely on natural air circulation for cooling and are hugely robust massive structures that are highly damage resistant. There are many different dry cask storage systems, but most fall into two main categories based on how they are loaded. The first is the bare fuel, or direct-load, casks in which spent nuclear fuel is loaded directly into a basket that is integrated into the cask. Bare fuel casks, which tend to be all metal construction, are generally bolted closed. The second is the canister-based system in which spent nuclear fuel is loaded into a basket inside a relatively thin-walled cylinder called a canister. The canister is usually loaded while inside a transfer cask, then welded and transferred vertically into either a concrete or metal storage overpack or horizontally into a concrete storage module. As of the end of 2012, ISFSIs were storing spent nuclear fuel in over 1,700 loaded dry casks. Information on the types of casks used to store spent nuclear fuel at each ISFSI is available in Appendix G of the DGEIS. (*See* Chapter 2 of the DGEIS).

A9. How Can the NRC Conduct a Generic Review When Spent Nuclear Fuel Is Stored at Specific Sites? Why Has a Site-Specific Review Not Been Conducted?

Historically, the Commission has chosen to address waste confidence generically, and this approach was reaffirmed by the D.C. Circuit Court of Appeals in the same decision that vacated and remanded the 2010 Waste Confidence Decision and rule. Although the environmental impacts of spent nuclear fuel storage during the licensed life for operation may be site specific, the impacts of continued storage may be assessed generically because:

1) Continued storage will involve spent nuclear fuel storage facilities for which the environmental impacts of operation are sufficiently understood as a result of lessons learned and knowledge gained from operating experience.

2) Activities associated with continued storage are expected to be within this well-understood range of operating experience; thus, environmental impacts can be reasonably predicted.

3) Changes in the environment around spent nuclear fuel storage facilities are sufficiently gradual and predictable to be addressed using a generic approach.

In evaluating the environmental impacts of continued storage of spent nuclear fuel, the NRC used existing environmental evaluations to help inform the impact determinations for continued storage, such as NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities Supplement 1 Regarding the Decommissioning of Nuclear Power Reactors Main Report," (ADAMS Accession No. ML023500395) and NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," Revision 1 (ADAMS Accession No. ML13106A241 for main volume 1, ML13106A242 for volume 2, and ML13106A244 for volume 3). The NRC also reviewed site-specific EISs and EAs for new and operating reactors and ISFSIs and subsequent renewals. The NRC staff also looked to other sources of information as needed, such as technical reports.

A10. Will the Waste Confidence Rule Authorize the Storage of Spent Nuclear Fuel at the Operating Reactor Site Near Me?

No, the Waste Confidence rule does not authorize the storage of spent nuclear fuel. The Waste Confidence rule is a generic determination regarding the potential environmental impacts from the continued storage of spent nuclear fuel, but before it is placed in a repository. The rule reflects only the generic environmental analysis of this one period of spent nuclear fuel storage: the timeframe beyond a reactor's licensed life for operation and before disposal. Waste Confidence is not a substitute for licensing actions that typically include site-specific NEPA analysis and site-specific safety analyses. (*See* also question A11).

In addition, the NRC's DGEIS and proposed rule do not pre-approve any particular waste storage or disposal site technology—although these Statements of Consideration do evaluate the technical feasibility of deep geologic disposal—nor do they require that a specific cask design be used for storage. Individual licensees and applicants, or in the case of a high-

level radioactive waste repository, DOE, will have to apply for and receive a license from the NRC before storing or disposing of any spent nuclear fuel.

A11. What Will Be Precluded From a Site-Specific Licensing Action After the Waste Confidence Rulemaking Is Complete?

The Waste Confidence rule will satisfy the NRC's NEPA obligations with respect to continued storage for initial and renewed licenses for reactors and ISFSIs. The environmental analysis that would accompany the licensing or license renewals of individual nuclear power reactors, as well as the initial and renewal licensing of an ISFSI would consider the potential environmental impacts of storage of spent nuclear fuel during the term of the license. What is not considered in those proceedings—due to the generic determination in 10 CFR 51.23(a)—is the potential environmental impact of continued storage of spent nuclear fuel beyond the licensed life for operations. The NRC's regulations allow participants in NRC licensing proceedings to apply for a waiver of a rule in a licensing proceeding if they believe the rule should not apply to the specific proceeding. (*See* 10 CFR 2.335(b)).

A12. Why Is There Not a Separate Waste Confidence Decision Document?

Historically, the technical basis on which generic environmental conclusions were incorporated into the Waste Confidence Decision has been explained and reflected in five "Findings" that addressed the technical feasibility of a mined geologic repository, the degree of assurance that disposal would be available by a certain time, and the degree of assurance that spent fuel and high-level waste could be managed safely for a certain period beyond the expiration of plants' operating licenses. Development of a GEIS is a fundamental departure from the approach used in past Waste Confidence proceedings. The DGEIS analyzes the foreseeable environmental impacts resulting from the most likely or expected course for storage of spent fuel based on current national policy and planning, but also goes on to analyze the potential impacts from a significant delay in repository availability as well as impacts from never having a repository. The DGEIS and the Statements of Consideration for this proposed rule

now addresses the issues assessed in the “Five Findings” as conclusions regarding the technical feasibility and availability of a repository, and conclusions regarding the technical feasibility of safely storing spent fuel in an at-reactor or away-from-reactor storage facility until sufficient repository capacity becomes available. These conclusions are discussed in more detail in Section III.C., *Draft Decision*, of this document.

Because the Decision no longer provides the basis for the rulemaking, it no longer needs to be a separate document and the NRC has included the draft Decision in the Statement of Considerations for this proposed rule. The new draft Decision is provided in its entirety in Section III.C, *Draft Decision,* of this document. The basis for the rule and Decision is in the DGEIS.

A13. How Can the NRC Complete the Environmental Impact Statement and Rule in 24 Months?

The Waste Confidence proceeding is a high priority for the Commission. The NRC formed a new organization, the Waste Confidence Directorate in the Office of Nuclear Material Safety and Safeguards, to oversee the development of the generic EIS, Decision and rule. In staffing the new Directorate, the NRC brought together a team consisting of the agency’s most experienced and knowledgeable NEPA and rulemaking practitioners. The Directorate is focused on Waste Confidence and has no other responsibilities. The staff’s schedule for the previous effort (Extended Storage and Transportation Safety and Security Project) was based on fewer resources, fewer staff members, and a variety of new issues related specifically to the long-term update, which are not at issue in this rulemaking. The current schedule will enable the NRC to conduct the hard look required by NEPA and optimize public participation in the process. Because information to be developed under the extended storage project is not yet available, the NRC assumed in the DGEIS that the storage casks and ISFSI pads would be replaced every 100 years. The DGEIS also assumes that all spent nuclear fuel would be removed from spent fuel pools at the end of the short-term storage period. This provides a reasonably conservative assumption for a storage facility that would require replacement at a

future point in time. However, this assumption does not mean that dry cask storage systems and facilities need to be replaced every 100 years to maintain safe storage. (*See* also question A14).

A14. What Is the Status of the Extended Storage Project?

The NRC continues work to identify and resolve potential issues for extended storage and transportation of spent nuclear fuel for periods beyond initial licensing and first renewal. Completion of the effort is currently planned for the end of the decade. This project focuses on technical and regulatory considerations for continued effective regulation of spent nuclear fuel storage and subsequent transportation over extended periods (up to 300 years). Presently, the NRC believes that the current regulatory framework used to renew current licenses can be extended to regulate the management of spent nuclear fuel and high-level radioactive waste for multiple renewal periods. The staff is examining technical areas associated with multiple renewals of fixed-term, dry storage licenses and certificates to address age-related degradation of dry cask storage systems, structures, and components. The NRC acknowledges that current licensing practices may evolve over time in response to improved understanding, operational experience, and Commission policy direction. As technical, regulatory, and policy issues are resolved, the NRC will revise guidance and staff qualification and training accordingly. As with any rule, the NRC will evaluate any new information that's developed during this project to determine whether it's necessary to update the Waste Confidence rule.

A15. Does the NRC Plan to Hold Public Meetings on Waste Confidence?

Yes, the NRC plans to hold 8 regional public meetings and 2 nationally Webcast meetings at NRC headquarters on the DGEIS and proposed rule. The regional meetings will be held in or near: Charlotte, North Carolina; Denver, Colorado; Toledo, Ohio; Boston (metro area), Massachusetts; New York City (metro area), New York; Minneapolis, Minnesota; San Clemente, California; and San Louis Obispo, California. These meetings will be held during the public comment period on the DGEIS and proposed rule. All meetings will be noticed on the

NRC's Public Meeting Schedule Web site at http://www.nrc.gov/public-involve/public-meetings/index.cfm. Information on the public meetings will also be made available through press releases, blog posts, and e-mails. A meeting notice will also be published in the *Federal Register*.

A16. How Can I Stay Informed of Waste Confidence Activities?

There are several ways in which interested stakeholders can stay informed and follow the NRC's Waste Confidence activities. The NRC staff periodically sends out e-mail announcements of new material and upcoming events. Anyone may sign up to receive e-mails about the Waste Confidence activities by e-mailing WCOutreach@nrc.gov.

The NRC staff will also periodically post updates to the Waste Confidence Web site. You can sign up for automatic e-mail alerts whenever the Waste Confidence Web site is updated using GovDelivery. Under Subscriber Preferences you can choose which **Waste Confidence Decision (WCD)** pages you would like to receive updates on.

You can monitor the docket for the Waste Confidence rulemaking on the Federal rulemaking Web site, http://www.regulations.gov, by searching on Docket ID **NRC-2012-0246**. In addition, the Federal rulemaking Web site allows you to receive alerts when changes or additions occur in a docket folder. To subscribe: 1) navigate to the docket folder **NRC-2012-0246**; 2) click the "E-mail Alert" link; and 3) enter your e-mail address and select how frequently you would like to receive e-mails (daily, weekly, or monthly).

A17. How Frequently Does the NRC Plan to Revisit Waste Confidence?

The Commission has reviewed Waste Confidence three times since 1984 (1990, 1999, and 2010) or approximately once every 10 years. The NRC does not have a preset timeframe for when Waste Confidence will be revisited. The Commission will review Waste Confidence for possible revision when warranted. The Commission would review the Waste Confidence rule should significant events occur that would call into question appropriateness of the rule.

A18. What Should I Consider as I Prepare to Submit My Comments to the NRC?

Tips for preparing your comments. When submitting your comments, remember to:

i. Identify the rulemaking (RIN 3150-AJ20; NRC-2012-0246).

ii. Explain why you agree or disagree; suggest alternatives and substitute language for your requested changes.

iii. Describe any assumptions and provide any technical information and/or data that you used.

iv. If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.

v. Provide specific examples to illustrate your concerns, and suggest alternatives.

vi. Explain your views as clearly as possible.

vii. Make sure to submit your comments by the comment period deadline identified.

viii. Section VII contains a request for comments on the use of plain language; and Section IX contains a request for comments on the draft environmental impact statement.

B. Waste Confidence Rulemaking

B1. What Is the Purpose of This Waste Confidence Rulemaking?

The NRC's use of a rule to satisfy its NEPA obligations with respect to continued storage will enhance efficiency in individual licensing reviews by addressing a set of issues that are the same or largely similar at each nuclear power reactor or storage site and codifying them. Part of the analysis for a nuclear reactor license or storage facility includes a review of the impacts caused by the spent nuclear fuel generated in the reactor, and the analysis must assess the impacts of the spent nuclear fuel from generation through disposal. If the Commission cannot have reasonable assurance that a disposal solution will be available at the end of a reactor's licensed life for operation, NEPA requires that the Commission assess the impacts of continued storage of the spent nuclear fuel pending disposal at a repository. The proposed rule would incorporate the results of the generic assessment of the environmental impacts of continued

spent nuclear fuel storage beyond the end of a reactor's licensed life for operation so that it is not necessary to repeat the identical analysis in individual licensing actions. Although the environmental impacts of spent nuclear fuel storage during the licensed life for operation may be site specific, the impacts of continuing to store the fuel after this time can be assessed generically because the initial impacts have been analyzed, are well understood, and the continued storage of spent nuclear fuel does not involve any significant changes in how the fuel is stored or the environmental impacts that result from storage. A generic environmental analysis, such as the one conducted in the DGEIS, applies to the issuance of a license, amendment, or license renewal of any power reactor or the licensing, amendment, or renewal of any ISFSI. The rule is based on the analysis of the environmental impacts of expected handling of spent fuel in the GEIS which includes conclusions on the timeframe by which the Commission expects a geologic repository to become available.

B2. What Is Meant by the Phrase "Licensed Life for Operation of a Reactor"?

The phrase "licensed life for operation of a reactor" describes the period of time during which the NRC licensing requirements for reactor facility design, construction and operation provide reasonable assurance that a reactor can be operated and spent fuel can be stored safely. It refers to the term of the license to operate a reactor, which in no case exceeds a 40-year initial license term and, for those reactors for which license renewal has been granted, two 20-year license extensions, for a total of up to 80 years. The phrase, "beyond licensed life for operation of a reactor," refers to the time period beyond the initial term to operate a reactor or, if the license is extended, beyond the renewed license term. The date of permanent cessation of operations does not mark the transition to "beyond licensed life for operation." Even if a reactor is shut down years before the end of its initial or extended operating or combined license term, the licensed life for operation continues to refer to the initial or renewed license term, and not the actual operational period of a reactor. Waste Confidence begins at the end of the licensed life for operation of a reactor. The starting point for Waste Confidence does not depend on

whether the spent nuclear fuel is stored in a spent fuel pool, dry casks under a general license, or dry casks under a specific license.

A couple of examples help illustrate the concept of beyond the licensed life for operation of a reactor. Reactor A received a 40-year license to operate in 1965, which meant the license would expire in 2005. Reactor A renewed its license for a 20-year term, which means the license now expires in 2025. Reactor A shuts down in 2025. Reactor A stores spent nuclear fuel in its spent fuel pool and in dry casks under a general license. The beyond licensed life for operation for Reactor A begins in 2025. Waste Confidence would apply to the spent nuclear fuel in both the spent fuel pool and in dry casks beginning in 2025.

Reactor B also received its initial license to operate in 1965. Reactor B shut down early in 2000. The beyond licensed life for operation of Reactor B begins in 2005, the original expiration date of the license. Waste Confidence for continued storage of the spent nuclear fuel begins in 2005.

Reactor C received its initial license in 1965. Reactor C received two 20-year renewals with expiration dates of 2025 and 2045. Reactor C shut down in 2030. Reactor C has spent nuclear fuel stored in the spent fuel pool and in dry cask under both a general license and a specific license. The beyond licensed life for operation of reactor C begins in 2045. Waste Confidence for continued storage of the spent nuclear fuel begins in 2045 for all of the spent nuclear fuel from Reactor C.

B3. What Timeframes Are Being Considered for Waste Confidence?

As discussed in the DGEIS, the NRC has analyzed three timeframes that represent various scenarios for the length of continued storage that will be needed before spent fuel is sent to a repository. The first, most likely, timeframe is the short-term timeframe, which analyzes 60 years of continued storage after the end of a reactor's licensed life for operation. As discussed in more detail in the DGEIS, the NRC believes this is the most likely timeframe because the DOE has expressed its intention to provide repository capacity by 2048, which is

well before the 60 years after licensed life for operation for all currently operating plants, and about 10 years before the end of this timeframe for the oldest spent fuel within the scope of the analysis. Further, international and domestic experience with deep geologic repository programs supports a timeline of 25 - 35 years to provide repository capacity for the disposal of spent fuel. The DOE's prediction of 2048 is in line with this expectation. The NRC acknowledges, however, that the short-term timeframe, although the most likely, is not certain. Accordingly, the GEIS also analyzed two additional timeframes. The long-term timeframe considers the environmental impacts of continued storage for a total of 160 years after the end of a reactor's licensed life for operation. Finally, although the NRC considers it highly unlikely, the DGEIS includes an analysis of an indefinite timeframe, which assumes that a repository does not become available.

By the end of the short-term period, some fuel could be up to 140 years old. Short-term storage of spent fuel includes:

- Continued storage of spent fuel in spent fuel pools (at-reactor only) and ISFSIs,
- Routine maintenance of spent fuel pools and ISFSIs (e.g., maintenance of concrete pads), and
- Handling and transfer of spent fuel from spent fuel pools to ISFSIs (all spent nuclear fuel is assumed to be removed from the spent fuel pool by the end of the short-term period).

Long-term storage is continued storage of spent nuclear fuel for an additional 100 years after the short-term period for a total of 160 years beyond the licensed life for operations of a reactor. The DGEIS assumes that all spent fuel has been transferred from the spent fuel pool to an ISFSI by the end of the short-term period. The DGEIS also assumes that a repository would become available by the end of this 160-year period. By the end of the long-term period, some fuel could be up to 240 years old. Long-term storage activities include:

- Continued storage of spent fuel in ISFSIs, including routine maintenance,
- One time replacement of ISFSIs and spent fuel canisters and casks, and
- Construction, operation, and one replacement of a dry transfer system facility (DTS).

The third timeframe is for indefinite storage, which assumes that a repository does not become available. The Commission does not believe that this scenario is likely to occur, but its inclusion in the analysis helps the GEIS to fully cover any likely environmental impacts associated with post – operational handling of spent fuel. The activities during the indefinite storage timeframe are the same as those that would occur for long-term storage; however, without a repository these activities would occur every 100 years.

B4. What Is the Significance of the Levels of Impact (e.g. SMALL, MODERATE, LARGE)?

The significance of the magnitude of the impact for most resource areas is expressed as SMALL, MODERATE, or LARGE. The general definitions of significance levels are:

SMALL: The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that radiological impacts that do not exceed permissible levels in the Commission's regulations are considered small.

MODERATE: The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The DGEIS discussion of each resource area includes an explanation of how the significance category was determined. For issues in which the significance determination is based on risk (i.e., the probability of occurrence as well as the potential consequences), the probability of occurrence as well as the potential consequences have been factored into the determination of significance. For some resource areas, like environmental justice, the impact determination language is specific to the authorizing regulation or statute.

B5. What Are the Environmental Impacts of At-Reactor Continued Storage?

The environmental impacts of continued storage were determined in the DGEIS. The DGEIS contains a detailed analysis of the impacts for short-term storage, long-term storage, and indefinite storage. The analysis considers both at-reactor storage and away-from-reactor storage[3]. Impacts due to at-reactor storage are addressed here and the impacts from away-from-reactor storage are addressed in Question B6.

For at-reactor storage, the unavoidable adverse environmental impacts for each resource area are SMALL for all timeframes with the exception of waste management impacts, which are SMALL to MODERATE for the indefinite storage timeframe, and historic and cultural impacts, which are SMALL to LARGE for the long-term and indefinite storage timeframes. These elevated impact conclusions are influenced, in part, by the uncertainties regarding the specific circumstances of continued storage over long timeframes, including site-specific characteristics that could affect the intensity of potential environmental impacts, and the resulting analysis assumptions that have been made by the NRC as documented in detail in Chapter 4. The moderate waste-management impacts are associated with the volume of nonhazardous solid waste generated by assumed facility replacement activities for only the indefinite timeframe. The SMALL to LARGE historic and cultural impacts are based on a combination of the additional surface-disturbing activities from DTS construction and facility replacement activities during long-term and indefinite timeframes and a range of site-specific characteristics that are assumed for the purpose of evaluating a reasonable range of potential impacts. More specifically, these potential historic and cultural impacts vary depending on whether resources are present, the extent of proposed land disturbance, if the area has been previously surveyed to identify historic and cultural resources, and if the licensee has management plans and procedures that are protective of historic and cultural resources. For

[3] For the purposes of the DGEIS impact analysis, the GE-Morris facility was considered under the at-reactor storage evaluation.

special status species, at-reactor ISFSI storage would be not likely to adversely affect special status species and habitats, whereas spent fuel pool continued storage impacts would be based on site-specific conditions and determined as part of an Endangered Species Act Section 7 consultation. The NRC environmental justice impact analysis concluded there would be no disproportionately high and adverse human health and environmental impacts on minority and low-income populations.

The following table provides a summary of the environmental impacts of continued at-reactor storage for the short-term timeframe. Detailed discussion for each resource area can be found in Chapter 4 of the DGEIS. Cumulative impacts are addressed in Chapter 6 of the DGEIS. Chapter 8 of the DGEIS provides a summary of the impacts.

Table 1 – Environmental Impacts of At-Reactor Continued Storage of Spent Nuclear Fuel for 60 Years Beyond the Licensed Life for Operation of a Reactor

Resource Area	Finding
Land Use	SMALL
Socioeconomics	SMALL
Environmental Justice	No disproportionately high and adverse impacts
Air Quality	SMALL
Climate Change	SMALL
Geology and Soils	SMALL
Surface Water Quality Use	 SMALL SMALL
Groundwater Quality Use	 SMALL SMALL
Terrestrial Ecology	SMALL
Aquatic Ecology	SMALL
Special Status Species and Habitats	Impacts from the spent fuel pool would be determined as part of Endangered Species Act Section 7 consultation; ISFSI operations are not likely to adversely affect special status species and habitats
Historic and Cultural Resources	SMALL

Noise	SMALL
Aesthetics	SMALL
Waste Management LLW Mixed Waste Nonradioactive Waste	 SMALL SMALL SMALL
Transportation Traffic Health impacts	 SMALL SMALL
Public and Occupational Health	SMALL
Accidents	SMALL
Terrorism Considerations	SMALL

B6. What Are the Environmental Impacts of Away-from-Reactor Continued Storage?

For away-from-reactor storage, the unavoidable adverse environmental impacts for each resource area would be SMALL except for air quality, terrestrial ecology, aesthetics, waste management, and transportation where the impacts would be SMALL to MODERATE. Socioeconomics and historic and cultural impacts would range from SMALL to LARGE. The potential MODERATE impacts on air, terrestrial wildlife, and transportation are based on construction-related potential fugitive dust emissions, terrestrial wildlife direct and indirect mortalities, and temporary construction traffic impacts. The potential MODERATE impacts on aesthetics and waste management are based on noticeable changes to the viewshed from constructing a new ISFSI, and the volume of nonhazardous solid waste generated by assumed ISFSI and DTS replacement activities for only the indefinite timeframe. Potential LARGE impacts on socioeconomics would be due to local economic tax revenue increases from an away-from-reactor ISFSI. The LARGE impacts on historic and cultural and special status species apply to assumed site-specific circumstances at an away-from-reactor ISFSI involving the presence of these resources during construction activities and absence of effective

protection measures. Specifically, these potential historic and cultural impacts vary depending on whether resources are present, the extent of proposed land disturbance, and whether the licensee has management plans and procedures that are protective of historic and cultural resources. For special status species, away-from-reactor ISFSI storage would be not likely to adversely affect special status species and habitats based on the assumption an ISFSI can be sited to avoid special status species and habitats. Impacts on special status species and habitats would be based on site-specific conditions and determined as part of an ESA Section 7 consultation. The NRC environmental justice impact analysis for an away-from-reactor ISFSI concluded there would be no disproportionately high and adverse human health and environmental impacts on minority and low-income populations.

The following table provides a summary of the environmental impacts from away-from-reactor continued storage: Detailed discussion for each resource area can be found in Chapter 5 of the DGEIS. Cumulative impacts are addressed in Chapter 6 of the DGEIS. Chapter 8 of the DGEIS provides a summary of the impacts.

Table 2 – Environmental Impacts of Away-from Reactor Continued Storage of Spent Nuclear Fuel for 60 Years Beyond the Licensed Life for Operation of a Reactor

Resource Area	Finding
Land Use	SMALL
Socioeconomics	SMALL (adverse) to LARGE (beneficial)
Environmental Justice	No disproportionately high and adverse impacts
Air Quality	SMALL to MODERATE
Climate Change	SMALL
Geology and Soils	SMALL
Surface Water Quality Use	 SMALL SMALL
Groundwater Quality Use	 SMALL SMALL

Terrestrial Ecology	SMALL to MODERATE
Aquatic Ecology	SMALL
Special Status Species and Habitats	Impacts from the construction of the ISFSI would be determined as part of Endangered Species Act Section 7 consultation. Assuming the ISFSI can be sited to avoid special status species and habitats, operation and replacement of the ISFSI is not likely to adversely affect special status species and habitats. Impacts would be determined as part of Endangered Species Act Section 7 consultation if continued storage would affect listed species or critical habitat.
Historic and Cultural Resources	SMALL to LARGE
Noise	SMALL
Aesthetics	SMALL to MODERATE
Waste Management	
LLW	SMALL
Mixed Waste	SMALL
Nonradioactive Waste	SMALL
Transportation	
Traffic	SMALL to MODERATE
Health	SMALL
Public and Occupational Health	SMALL
Postulated Accidents	SMALL
Terrorism Considerations	SMALL

B7. How Will the Proposed Rule Address the Impacts from Continued Storage of Spent Nuclear Fuel Beyond the Licensed Operating Life for a Reactor?

The NRC is proposing changes to 10 CFR 51.23(a) to reflect the preparation of a GEIS (NUREG-2157) which provides analysis that allows the Commission to conclude that: 1) a mined geologic repository can be available within 60 years following the licensed life of operation for a reactor; 2) it is feasible that the spent nuclear fuel can be stored safely; and 3) NUREG-2157 is adequate to reach a generic conclusion on the environmental impacts of

storage of spent fuel for 60 years beyond the licensed life for operation of a reactor.

Paragraph (b) of 10 CFR 51.23 would be revised to clarify that ISFSI renewals are included in the scope of the generic determination.

B8. What Is the Basis for Concluding That Continued Storage Can Occur for 60 Years?

Technical understanding and experience continues to support the technical feasibility of safe storage of spent nuclear fuel in spent fuel pools and in dry casks, based on their physical integrity over long periods of time (*e.g.,* slow degradation of spent fuel during storage in spent fuel pools and dry casks; engineered features of storage pools and dry casks to safely withstand accidents caused by either natural or man-made phenomena). Additionally, regulatory oversight has been shown to enhance safety designs and operations as concerns and information evolve over time (*e.g.,* security and safety enhancements made after the September 11, 2001, terrorist attacks and the March 2011 Fukushima Dai-ichi disaster; corrective actions to address spent fuel pool leaks).

Based on the technical information and the national and international experience with wet and dry storage of spent fuel, the NRC believes that it is technically feasible to safely store spent fuel in either wet or dry storage for at least 60 years beyond the licensed life for operations with only routine maintenance (*i.e*., no large-scale replacement of spent fuel pools or dry cask storage systems). This time period represents a potential service life for the spent fuel pools and dry cask storage systems on the order of 100 to 140 years when considering any storage that occurs during reactor operations. (*See* Section B.3 of Appendix B of the DGEIS and Section III.C.3, *Storage of Spent Nuclear Fuel at a Storage Facility,* of this document for additional information).

If necessary, there is no technical reason that storage of spent fuel in either spent fuel pools or dry casks cannot continue beyond the short-term time period. Storage of spent fuel beyond this time would continue under an approved aging management program to ensure that monitoring and maintenance are adequately performed. The DGEIS assumes that, at an

appropriate time, structures, systems, and components of the ISFSIs would be replaced as part of an approved aging management program. The DGEIS conservatively assumes that these replacement activities begin during the long-term time period; however, based on current information, there is no expectation or requirement for replacement to occur at any specific time in the future. Continued experience with storing spent fuel will guide and inform aging management plans. At present, replacement activities are expected to occur no earlier than at least 60 years after cessation of reactor operations. The Commission has selected 60 years beyond the licensed life for operation of a reactor as the appropriate timeframe to include in the rule.

B9. Did the NRC Address Accidents in the Environmental Impact Statement?

Yes, the DGEIS considered the risk and potential consequences of accidents and acts of sabotage during continued storage of spent nuclear fuel. This analysis assessed the environmental effects of man-made hazards and natural phenomena hazards, including flooding and earthquakes. As with all NEPA analyses, the DGEIS analyzed reasonably-foreseeable events, and did not consider worst-case impacts. Section 4.18 of the DGEIS contains a discussion of the environmental impacts of postulated accidents, both design-basis and severe accidents, during continued at-reactor storage and Section 5.18 contains a discussion related to away-from-reactor postulated accidents. Appendix F of the DGEIS contains a discussion on spent fuel pool fires. Sections 4.19 and 5.19 of the DGEIS address terrorism considerations.

B10. If The NRC Is Considering Extending the Timeframe Of Safe Storage, How Is That Not De Facto On Site Disposal?

The national policy of the United States continues to be disposal of spent nuclear fuel in a geologic repository. The Blue Ribbon Commission on America's Nuclear Future reaffirmed the need and feasibility of geologic disposal in its 2012 report (hereafter referred to as the BRC Report (ADAMS Accession No. ML120970375). In January 2013, DOE published its "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste"

(hereafter referred to as the DOE Strategy Report) (available at the DOE Web site at: http://energy.gov/sites/prod/files/ Strategy%20for%20the%20Management%20and%20Disposal%20of%20Used%20Nuclear%20 Fuel%20and%20High%20Level%20Radioactive%20Waste.pdf.). The DOE Strategy Report outlines the Administration's plans to implement a program over the next 10 years that, with the appropriate authorizations from Congress:

- Sites, designs and licenses, constructs, and begins operation of a pilot interim storage facility by 2021 with an initial focus on accepting spent nuclear fuel from shut-down nuclear power reactor sites;
- Advances toward the siting and licensing of a larger interim storage facility to be available by 2025 that will have sufficient capacity to provide flexibility in the waste management system and allows for acceptance of enough spent nuclear fuel to reduce expected government liabilities; and
- Makes demonstrable progress on the siting and characterization of repository sites to facilitate the availability of a geologic repository by 2048.

Although, the timeframe for storage of spent nuclear fuel is longer than originally planned, the national policy is still disposal of spent nuclear fuel in a geologic repository. The NRC does not endorse an extended timeframe for storage of spent nuclear fuel, nor does it create national policy for disposal of spent nuclear fuel. Rather, the NRC must respond to national policy, and ensure that national policy is carried out in a safe manner.

B11. Given That the U.S. Department of Energy Has Withdrawn the Yucca Mountain Application, How Can the NRC Conclude That Geologic Disposal Is Technically Feasible?

Waste Confidence has historically addressed the general technical feasibility of a repository and it is not dependent upon a specific site, such as Yucca Mountain. The national program remains for disposal of spent nuclear fuel in a deep geologic repository. The Blue Ribbon Commission reaffirmed the need and feasibility for geologic disposal of spent nuclear

fuel in its 2012 report. Further, it is internationally recognized as the best solution. Other countries are also pursuing geologic repositories for disposal of spent nuclear fuel and high-level radioactive waste; and the Commission has not identified anything that would challenge the technical feasibility of deep geologic disposal. The Commission has recognized in its previous Waste Confidence Decisions that a repository was technically feasible. Nothing in the Court's decision on the 2010 remand of the rule questioned the technical feasibility of a repository, but rather questioned the assumptions on when such a repository would be built.

The DOE Strategy Report presents the Administration's response to the BRC Report and provides a framework for moving toward a "sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel and high-level radioactive waste." A geologic repository remains part of that program for the disposal of spent nuclear fuel and high-level radioactive waste. (*See* also Appendix B of the DGEIS and Section III.C.2, *Geologic Repository – Technical Feasibility and Availability,* of this document).

B12. What Changes Are Being Proposed for the Timing of a Geologic Repository?

The NRC is proposing a change to 10 CFR 51.23(a) that would reflect the timeframe for repository availability. New paragraph (a)(1) of 10 CFR 51.23 would indicate that the Commission believes that the most reasonable scenario is that a mined geologic repository can be available within 60 years following the licensed life of operation for a reactor.

B13. Why Did the NRC Choose 60 Years as the Appropriate Timeframe for a Repository?

As discussed in the DGEIS, the NRC has analyzed three timeframes that represent various scenarios for the length of continued storage that will be needed before spent fuel is sent to a repository. The first, most likely, timeframe is the short-term timeframe, which analyzes 60 years of continued storage after the end of a reactor's licensed life for operation. As discussed in more detail in the DGEIS, the NRC believes this is the most likely timeframe because the Department of Energy has expressed its intention to provide repository capacity by 2048, which is well before the 60 years after licensed life for operation for all currently operating

plants, and about 10 years before the end of this timeframe for the oldest spent fuel within the scope of this analysis. Further, international and domestic experience with deep geologic repository programs supports a timeline of 25-35 years to provide repository capacity for the disposal of spent fuel. The DOE's prediction of 2048 is in line with this expectation. The NRC acknowledges, however, that the short-term timeframe, although the most likely, is not certain. Accordingly, the DGEIS also analyzed two additional timeframes. The long-term timeframe considers the environmental impacts of continued storage for a total of 160 years after the end of a reactor's licensed life for operation. Finally, although the NRC considers it highly unlikely, the DGEIS includes an analysis of an indefinite timeframe, which assumes that a repository does not become available.

In picking a timeframe by which the Commission believes that a geologic repository can be available, the Commission in no way means to imply that it supports storage of spent nuclear fuel for an indefinitely long period. The Commission supports timely disposal of spent nuclear fuel and high-level radioactive waste in a geologic repository. However, spent nuclear fuel will need to be stored for several decades at either reactor sites or away-from-reactor sites before ultimate disposal in a geologic repository. Having considered all available information, the Commission believes that a realistic timeframe for repository availability is 60 years beyond the licensed life for operation of any reactor. (*See* also the discussion in Appendix B of the DGEIS and Section III.C.2, *Geologic Repository – Technical Feasibility and Availability*).

B14. What Changes Are Being Proposed to Address Waste Confidence for License Renewal?

Table B-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants" addresses the environmental impacts of license renewal activities by resource area. Table B-1 is located in Appendix B to subpart A of 10 CFR part 51, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant." When the Commission issued the final rule on the environmental effects of license renewal, it was not able to rely on the Waste Confidence rule for two of the issues (78 FR XXXX: Month DD, 2013). The Commission

noted that upon issuance of the GEIS and revised Decision and rule, the NRC would make any necessary conforming changes to the license renewal rule. The proposed rule would revise two finding column entries to address Waste Confidence. The "Offsite radiological impacts of spent nuclear fuel and high-level waste disposal" issue would be reclassified as a Category 1 impact and the finding column entry revised to address Waste Confidence. For the "Onsite storage of spent nuclear fuel' issue, the finding column entry would be revised to include the period of continued storage.

C. Draft Decision

C.1. Introduction

Historically, the Waste Confidence Decision has been explained and reflected in five "Findings" that addressed the technical feasibility of a mined geologic repository, the degree of assurance that disposal would be available by a certain time, and the degree of assurance that spent fuel and high-level waste could be managed safely for a certain period beyond the expiration of plants' operating licenses Development of a DGEIS is a fundamental departure from the approach used in past Waste Confidence Decisions. While the GEIS analyzes the impacts based on Commission conclusions as to the likely timeframe for repository availability, it also evaluates possible uncertainties, partially by analyzing the foreseeable environmental impacts resulting from a significant delay in repository availability as well as impacts from never having a repository. Based on the NRC's analyses in the DGES, the Decision now addresses the issues assessed in the "Five Findings" as conclusions, regarding the agency's prediction as to the availability of a repository for disposal of spent nuclear fuel generated in a power reactor (Section III.C.2., *Geologic Repository – Technical Feasibility and Availability*) and the technical feasibility of safe storage of spent nuclear fuel in an at-reactor or away-from-reactor storage

facility until sufficient repository capacity becomes available (Section III.C.3., *Storage of Spent Nuclear Fuel at a Storage Facility*). A separate Decision and "Findings" to support that Decision are no longer necessary. The Commission's action in this case consists solely of the DGEIS and this proposed rule. The NRC has prepared draft NUREG-2157, "Waste Confidence Generic Environmental Impact Statement" (DGEIS), to support the Waste Confidence rule. Specific sections of the DGEIS are referenced, as appropriate, throughout this section (Section III.C., *Draft Decision*). The following paragraphs frame the issues considered in developing these conclusions in terms of the technical feasibility and availability of a repository and the safe management of continued storage of spent nuclear fuel.

C.2. Geologic Repository—Technical Feasibility and Availability

The issue of the technical feasibility of a geologic repository was historically addressed in Finding 1 of the Waste Confidence Decision and the availability of a repository was addressed in Finding 2. "Technical feasibility" simply means whether a geologic repository is technically possible using existing technology without any fundamental breakthroughs in science and technology. If technically feasible, then the question becomes what is a reasonable timeframe for the siting, licensing, construction, and opening of a geologic repository.

In past Waste Confidence proceedings in 1984, 1990, and 2010, the NRC reviewed the technical feasibility of deep geologic disposal and each time concluded that this method of disposal is technically feasible. As discussed in more detail below, the NRC has not found any new information that would challenge this determination. In fact, new information that has been developed since 2010 provides further support for the Commission's conclusion that deep geologic disposal is technically feasible.

The DOE's selection of a suitable geologic setting is governed by the Nuclear Waste Policy Act (NWPA) (96 Stat. 2201 (1983) (current version at 42 U.S.C. 10132 (2006)). The

DOE explored potential repository sites before the NWPA was enacted, but the NWPA set in place a formal process and schedule for the development of two geologic repositories. The following brief summary of key provisions of the NWPA may assist readers in understanding DOE's process for locating a suitable geologic setting.

As initially enacted, Section 112 of the NWPA directed DOE to issue guidelines for the recommendation of sites and then to nominate at least five sites as suitable for site characterization for selection as the first repository site, and not later than January 1, 1985, to recommend three of those sites to the President for characterization as candidate sites. Not later than July 1, 1989, DOE was to again nominate five sites and recommend three of them to the President for characterization for selection as the second repository. Section 113 of the NWPA directed DOE to carry out site characterization activities for the approved sites. Following site characterization, Section 114 directed DOE to recommend sites to the President as suitable for development as repositories and the President was to recommend one site to the Congress by March 31, 1987, and another site by March 31, 1989, for development as the first two repositories. States and affected Indian tribes were given the opportunity to object, but if the recommendations were approved by Congress, DOE was to submit applications for a construction authorization to the NRC. The NRC was given until January 1, 1989, to reach a decision on the first application, and until January 1, 1992, on the second. The Commission was directed to prohibit the emplacement, in the first repository, of more than 70,000 metric tons heavy metal (MTHM) until a second repository was in operation. In 1987, Congress amended the NWPA to restrict site characterization solely to a site at Yucca Mountain, Nevada and terminated the program for a second repository. The NWPA provided that if DOE at any time determines Yucca Mountain to be unsuitable for development as a repository, DOE must report to Congress its recommendations for further action to ensure the safe, permanent disposal of spent nuclear fuel and high-level radioactive waste, including the need for new legislation.

With respect to the issue of identifying a suitable geologic setting as host for a technically acceptable site, DOE made its suitability determination for the Yucca Mountain site in 2002. On June 3, 2008, DOE submitted the application for a construction authorization to the NRC and on September 8, 2008, the NRC staff notified the DOE that it found the application acceptable for docketing (73 FR 53284; September 15, 2008) and began its review. Although DOE subsequently filed a motion with the NRC Atomic Safety and Licensing Board seeking permission to withdraw the license application for a high-level nuclear waste repository at Yucca Mountain (ADAMS Accession No. ML100621397), the NRC's review continued.

In 2011, the NRC published NUREG-2108, "Technical Evaluation Report on the Content of the U.S. Department of Energy Yucca Mountain Repository License Application - Preclosure Volume: Repository Safety Before Permanent Closure" (ADAMS Accession No. ML11241A053) and NUREG-2107, "Technical Evaluation Report on the Content of the U.S. Department of Energy's Yucca Mountain Repository License Application" (ADAMS Accession No. ML11223A273). These documents contained the NRC staff's Technical Evaluation Reports that included technical reviews of DOE's license application for Yucca Mountain in the areas of safety before permanent closure and after permanent closure. The NRC staff's review did not identify any issues that would challenge the feasibility of geologic disposal.

Additionally, the DOE has sited and constructed, and is operating, a deep geologic repository for defense-related transuranic radioactive wastes near Carlsbad, New Mexico. The Waste Isolation Pilot Plant (WIPP), in operation since 1999, is located in the Chihuahauan Desert of southeastern New Mexico, approximately 26 miles east of Carlsbad. At this site, the DOE has successfully disposed of transuranic waste left over from nuclear weapons research and testing operations. The WIPP project provides additional evidence that a geologic repository is technically feasible. During its 14 years of operation, no issues have been identified that would challenge the feasibility of geologic disposal.

Today, the consensus within the scientific and technical community engaged in spent nuclear fuel management activities at both a national and international level continues to be that safe geologic disposal is achievable with currently available technology (*See, e.g.,* BRC Report (Section 4.3)). When Congress amended the NWPA in 1987 to focus exclusively on the Yucca Mountain site, it did so for budgetary reasons and not because the other sites DOE was considering were technically unacceptable. Ongoing research in the United States and other countries supports the conclusion that geologic disposal remains viable and that acceptable sites can be identified. Despite decades of research into various geologic media, no insurmountable technical or scientific problem has emerged to disturb the confidence that safe disposal of spent nuclear fuel and high-level radioactive waste can be achieved in a mined geologic repository. There has been significant progress in the scientific understanding and technological development needed for geologic disposal over the past two decades. There is now a much better understanding of the processes that affect the ability of repositories to isolate waste over long periods (International Atomic Energy Agency (IAEA), "Scientific and Technical Basis for the Geologic Disposal of Radioactive Wastes, Technical Reports Series No. 413," 2003). The ability to characterize and quantitatively assess the capabilities of geologic and engineered barriers has been repeatedly demonstrated (NRC, "Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada; Proposed Rule," (64 FR 8640, 8649; February 22, 1999); Organization for Economic Cooperation and Development, Nuclear Energy Agency, "Lessons Learned from Ten Performance Assessment Studies," 1997). Specific sites have been investigated and extensive experience has been gained in underground engineering (IAEA, "Radioactive Waste Management Studies and Trends, IAEA/WMDB/ST/4," 2005; IAEA, "The Use of Scientific and Technical Results from Underground Research Laboratory Investigations for the Geologic Disposal of Radioactive Waste, IAEA-TECDOC-1243," 2001). These advances and others throughout the world continue to confirm the soundness of the basic concept of deep geologic disposal (IAEA, "Joint

Convention on Safety of Spent Fuel Management and on Safety of Radioactive Waste Management, INFCIRC/546," 1997). (Note that copies of all IAEA documents are available on the IAEA Web site (http://www.IAEA.org)).

In the United States, the technical approach for safe high-level radioactive waste disposal has remained unchanged for several decades: use a deep geologic repository containing natural barriers to hold canisters of high-level radioactive waste with additional engineered barriers to further retard radionuclide release. Although some elements of this technical approach have changed in response to new knowledge, safe disposal is still feasible with current technology.

The Blue Ribbon Commission on America's Nuclear Future in its January 2012 report recommended "prompt efforts to develop one or more geologic disposal facilities" (p vii). The report did not identify any obstacles to the technical feasibility of siting, constructing, and operating a repository. In the DOE Strategy Report, DOE responded to the BRC Report by presenting a framework for "moving toward a sustainable program to deploy an integrated system capable of transporting, storing, and disposing of used nuclear fuel and high-level radioactive waste from civilian nuclear power generation…." The new DOE strategy includes a nuclear waste management system consisting of a pilot interim storage facility, a larger full-scale interim storage facility, and a geologic repository. DOE's stated objectives are consistent with the continuing United Stataes policy under the Nuclear Waste Policy Act of 1982, as amended, that it is a federal responsibility to site construct and operate a geologic repository as the appropriate long-term solution for disposition of spent nuclear fuel and high-level radioactive waste. Further, no new information has emerged that would cause the Commission to revisit its conclusions from previous Waste Confidence rulemakings that deep geologic disposal is technically feasible. The Commission therefore concludes that deep geologic disposal continues to be technically feasible.

Given that geologic repositories continue to be technically feasible, the question then becomes how long will it take to successfully site, license, construct, and open a repository. In answering this question, the Commission has, among other things, historically drawn upon international experience to inform its conclusion of how long it will likely take to successfully site, license, construct, and open a repository. Other nations as well as the United States have not approached repository availability with urgency because of the perceived high degree of safety provided by interim storage, either at reactors or at independent storage facilities. Of the 24 countries (other than the United States) considering disposal of spent or reprocessed nuclear fuel in deep geologic repositories, ten have established target dates for the availability of a repository. Most of the 14 countries that have not established target dates rely on centralized interim storage, which may include a protracted period of onsite storage before shipment to a centralized facility.[4]

In 1997, the United Kingdom (UK) rejected an application for the construction of a rock characterization facility at Sellafield, leaving the country without a path forward for long-term management or disposal of either intermediate-level waste or spent nuclear fuel. In 1998, an inquiry by the UK House of Lords endorsed geologic disposal, but specified that public acceptance was required. As a result, the UK Government embraced a repository plan based on the principles of voluntarism and partnership between communities and implementers. This led to the initiation of a national public consultation, and major structural reorganization within the UK program. The UK Nuclear Decommissioning Authority envisions availability of a geologic disposal facility for intermediate-level waste in 2040 and a geologic facility for spent nuclear fuel and high-level radioactive waste in 2075; however, there have been changes in societal acceptance in the UK for the siting of a geological disposal facility. In 2007, the

[4] The three countries with target dates that plan direct disposal of spent fuel are: Czech Republic (2050), Finland (2020), and Sweden (2025). The seven countries with target dates for disposal of reprocessed spent fuel and high-level radioactive waste are: Belgium (2035), China (2050), France (2025), Germany (2025), Japan (2030s), Netherlands (2103), Switzerland (2042).

Scottish Government officially rejected any further consultation with the UK Government on deep geologic disposal of high-level radioactive waste and spent nuclear fuel. This action by the Scottish Government effectively ended more than 7 years of consultations with stakeholders near Scottish nuclear installations and represents a major setback for the UK program. In 2013, the Cumbria County Council voted to withdraw from the UK process to find a host community for an underground radioactive waste disposal facility and ending the site selection process in west Cumbria.

In Germany, a large salt dome at Gorleben had been under study since 1977 as a potential spent nuclear fuel repository. After decades of intense discussions and protests, the utilities and the government reached an agreement in 2000 to suspend exploration of Gorleben for at least 3, and at most 10, years. In 2003, the Federal Ministry for the Environment set up an interdisciplinary expert group to identify, with public participation, criteria for selecting new candidate sites. In October 2010, Germany resumed exploration of Gorleben as a potential spent nuclear fuel repository. In March 2013, Germany announced plans to form a 24-member commission to develop siting criteria. The Commission will hold public meetings through 2015 on the issue of a permanent repository for high-level nuclear waste.

Initial efforts in France, during the 1980s, also failed to identify potential repository sites, using solely technical criteria. Failure of these attempts led to the passage of nuclear waste legislation that prescribed a period of 15 years of research. Reports on generic disposal options in clay and granite media were prepared and reviewed by the safety authorities in 2005. In 2006, conclusions from the public debate on disposal options, held in 2005, were published. Later that year, the French Parliament passed new legislation designating a single site for deep geologic disposal of intermediate- and high-level radioactive waste. This facility, to be located in the Bure region of northeastern France, is scheduled to open in 2025, about 34 years after passage of the original Nuclear Waste Law of 1991.

In Switzerland, after detailed site investigations in several locations, the Swiss National Cooperative for Radioactive Waste Disposal proposed, in 1993, a deep geologic repository for low- and intermediate-level waste at Wellenberg. Despite a 1998 finding by Swiss authorities that technical feasibility of the disposal concept was successfully demonstrated, a public cantonal referendum rejected the proposed repository in 2002. Even after more than 25 years of high quality field and laboratory research, Swiss authorities do not expect that a deep geologic repository will be available before 2040.

In 1998, an independent panel reported to the Governments of Canada and Ontario on its review of Atomic Energy of Canada Ltd.'s concept of geologic disposal (Canadian Nuclear Fuel Waste Disposal Concept Environmental Assessment Panel, *Report of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel*, February 1998). The panel found that from a technical perspective, safety of the concept had been adequately demonstrated, but from a social perspective, it had not. The panel concluded that broad public support is necessary in Canada to ensure the acceptability of a concept for managing nuclear fuel wastes. The panel also found that technical safety is a key part, but only one part, of acceptability. To be considered acceptable in Canada, the panel found that a concept for managing nuclear fuel wastes must: 1) have broad public support; 2) be safe from both a technical and social perspective; 3) have been developed within a sound ethical and social assessment framework; 4) have the support of Aboriginal people; 5) be selected after comparison with the risks, costs, and benefits of other options; and 6) be advanced by a stable and trustworthy proponent and overseen by a trustworthy regulator. Resulting legislation mandated a nationwide consultation process and widespread organizational reform.

In 2007, the Government of Canada announced its selection of the Adaptive Phased Management approach and directed the Nuclear Waste Management Organization (NWMO) to take at least 2 years to develop a "collaborative community-driven site-selection process." The NWMO will use this process to open consultations with citizens, communities, Aboriginals, and

other interested parties to find a suitable site in a willing host community. For financial planning and cost estimation purposes only, the NWMO assumes the availability of a deep geological repository in 2035, 27 years after initiating development of new site selection criteria, 30 years after embarking on a national public consultation, and 37 years after rejection of the original geologic disposal concept (NWMO, *Annual Report 2007: Moving Forward Together*, March 2008). In 2009, NWMO proposed a site selection process for public comment, and after considering the comments and input received is now accepting expressions of interest from potential host communities (NWMO, *Annual Report 2009: Moving Forward Together*, March 2010).

Repository development programs in Finland and Sweden are further along than in other countries, but have taken time to build support from potential host communities. In Finland, preliminary site investigations started in 1986, and detailed characterizations of four locations were performed between 1993 and 2000. In 2001, the Finnish Parliament ratified the Government's decision to proceed with a repository project at a chosen site only after the 1999 approval by the municipal council of the host community. In December 2012, Posiva (the nuclear waste management company in Finland) submitted a construction license application for a final repository that will hold spent nuclear fuel from Finland's nuclear reactors. Finland expects this facility to begin receipt of spent nuclear fuel for disposal in 2020, 34 years after the start of preliminary site investigations.

Between 1993 and 2000, Sweden conducted feasibility studies in eight municipalities. One site was found technically unsuitable, and two sites were eliminated by municipal referenda. Three of the remaining five sites were selected for detailed site investigations. Municipalities adjacent to two of these sites agreed to be potential hosts and one refused. Since 2007, detailed site investigations were conducted at both Oesthammer and Oskarshamn, both of which already host nuclear power stations. On June 3, 2009, the Swedish Nuclear Fuel and Waste Management Company, SKB, selected the Forsmark Site located in the

Oesthammer municipality for the Swedish spent nuclear fuel repository. The SKB submitted a license application in spring 2011. A government decision is expected in 2015. If Swedish authorities authorize construction, the repository could be available for disposal around 2025, about 30 years after feasibility studies began.

Based on international experience, it would appear that 25-35 years is a reasonable estimate for the amount of time necessary to site, license, and open a geologic repository. The time DOE will need to develop a repository site will depend upon a variety of factors, including the passage of any required enabling legislation, budgeted funding, and the identification of a number of well-characterized sites suitable for high-level radioactive waste disposal. Broader institutional issues also bear on the time it takes to implement geologic disposal. International and domestic experience have made it clear that technical experience and confidence in geologic disposal, on their own, are not sufficient to bring about the broad social and political acceptance needed to construct a repository.

Before DOE can start the development of a new site, Congress will need to provide additional direction, beyond the current NWPA, for the long-term management and disposal of spent nuclear fuel and high-level radioactive waste. Whatever approach Congress mandates, international and domestic experience since 1990 suggests that greater attention needs to be paid to developing societal and political acceptance in concert with essential technical, safety, and security assurances. While there is no technical basis for making precise estimates of the minimum time needed to accomplish these objectives, examination of the international examples cited previously would support a range of between 25 and 35 years. The Commission believes that societal and political acceptance must occur before a successful repository program can be completed, and that this is unlikely to occur until a Federal decision is made, whether for technical, environmental, political, legal, or societal reasons, that will allow the licensing and construction of a repository to proceed. The Blue Ribbon Commission recommended using a siting process that is consent-based. In response to the BRC report, the

DOE Strategy Report includes a strategy that includes the establishment of a consent-based siting process.

Another important institutional issue is whether funding for a new repository program is likely to be available. The provisions of NWPA for funding the repository have proved to be adequate for the timely development of a repository in the sense that there have always been more than sufficient funds available to meet the level of funding Congress appropriates for the repository program. Section 302(e)(2) of NWPA provides that the Secretary of Energy may make expenditures from the Nuclear Waste Fund, subject to appropriations by the Congress. The DOE Strategy Report states the Nuclear Waste Fund has a balance of approximately $28 billion, with approximately $750 million added to the fund each year (DOE Strategy report, p 11). Thus, the Nuclear Waste Fund has the capacity to ensure timely development of a repository consistent with Congressional funding direction.

Arriving at an estimate of the time necessary to successfully site, license, and construct a repository involves considering the technical and institutional factors discussed previously. From a purely technical perspective, siting, licensing, and constructing a repository could be accomplished in less time than it took DOE to submit its license application for the Yucca Mountain site, which was 26 years measured from the beginning of site characterization. The time needed to develop a societal and political consensus for a repository could add to this time. The DOE is currently the agency responsible for carrying out the national policy to site and build a repository. The DOE Strategy Report states that it is the Administration's goal to have a repository sited by 2026, licensing to be complete by 2042, and the repository constructed and open for operations by 2048. The total of 35 years is consistent with international efforts and estimates of between 25 and 35 years to site, license, construct, and open a repository.

Another factor to consider is whether a repository will be needed because the fuel can no longer be stored safely at the reactor site or at an away-from-reactor ISFSI. The DGEIS describes the environmental impacts of continued storage for three timeframes: short-term

storage (60 years beyond licensed life for operation), long-term storage (160 years beyond licensed life for operations), and indefinite storage (no repository). Appendix B of the DGEIS describes the technical feasibility of continued safe management of spent nuclear fuel storage. The environmental impacts of continued spent fuel storage are addressed in Chapters 4 (at-reactor) and 5 (away-from-reactor) of the DGEIS and summarized in Chapter 8. Based on current information, there is no safety or environmental reason that dictates when the spent nuclear fuel must be placed in a geologic repository. (*See* also Appendix B of the DGEIS and Section III.C.3, *Storage of Spent Nuclear Fuel at a Storage Facility,* of this document).

The DGEIS assumes that in the long-term storage and indefinite storage scenario that the spent nuclear fuel will be removed from any spent fuel pools at the end of the short-term storage period and conservatively assumes that the storage casks and ISFSI pads will need to be replaced every 100 years. In addition, the NRC continues work on the Extended Storage and Transportation Safety and Security Project. This Project is principally focused on identifying and addressing the technical and regulatory considerations for ensuring effective regulation of spent nuclear fuel storage and subsequent transportation over extended periods (300 years).

According to the NRC's "High-Value Datasets," all but one of the current reactor operating licenses will expire by 2048 and that license expires in 2049. (http://www.nrc.gov/public-involve/open.html#datasets). Although some of these licenses could be renewed, which would extend their operating periods, it is likely that spent nuclear fuel will have to be stored for several decades beyond the reactor's licensed life for operation at a number of the reactor sites. There are now 23 reactors that were formerly licensed to operate by the NRC or the Atomic Energy Commission and have been permanently shut down. In addition, licensees for several operating reactors have announced their intent for early shutdown (for example, Crystal River and Kewaunee). Sections 50.82(a)(3) and 52.110(c) of 10 CFR, which contain the license termination requirements for nuclear power reactors, require that decommissioning be completed within 60 years of permanent cessation of operations.

Based on the end of licensed life for operations of the 23 shut down reactors, Dresden 1 reaches 60 years beyond licensed life for operations in 2059. This time period represents a potential service life for the spent fuel pools and dry cask storage systems on the order of 100 to 140 years when considering any storage that occurs during reactor operations. The Commission is confident that spent fuel can continue to be safely managed in spent fuel pools and dry casks, and that regulatory oversight exists to ensure the aging management programs continue to be updated to address the monitoring and maintenance of structures, systems and components that are important to safety. (See Appendix B of the DGEIS and Section III.C.3., *Storage of Spent Nuclear Fuel at a Storage Facility,* of this document).

Back to the starting questions: 1) is a geologic repository technically feasible; and 2) when can a repository be available for disposal of spent nuclear fuel generated in a reactor. *Webster's Third New International Dictionary* (1993) defines "feasible" as "capable of being done, executed, or effected: possible of realization." As discussed in this section, geologic disposal continues to be the favored disposition path both nationally and internationally. Moreover, geologic disposal has moved significantly beyond a theoretical concept as demonstrated by: 1) submission of a license application for a potential repository at Yucca Mountain and the NRC conducting a technical review of that application; 2) submission on December 28, 2012, of a construction licence application by Posiva for a final repository that will hold spent nuclear fuel from Finland's nuclear reactors; and 3) submission in spring 2011, of an application by SKB for permission to build a repository for spent nuclear fuel in Sweden. Additionally, a deep geologic repository for defense-related transuranic radioactive wastes in Carlsbad, New Mexico (WIPP) began disposal operations in March 1999. Based on all of the information in this section and Appendix B of the DGEIS, the Commission concludes that a geologic repository is technically feasible.

In picking a timeframe by which the Commission has confidence that a geologic repository can be available, the Commission is not concluding that it supports storage of spent

nuclear fuel for an indefinitely long period. The Commission supports timely disposal of spent nuclear fuel and high-level radioactive waste in a geologic repository. However, spent nuclear fuel will need to be stored for several decades at either reactor sites or at away-from-reactor sites beyond the licensed life for operations before ultimate disposal in a geologic repository. Having considered all of the available information, the Commission believes that a reasonable timeframe for repository availability is within 60 years beyond the licensed life for operation of any reactor. Based on international experience, this timeframe should provide adequate time for the United States to site, construct, license, and open a geologic repository. For currently shutdown reactors, this would mean a repository by 2059. The 2059 date is several years beyond DOE's estimate of 2048 to site, construct, license, and open a repository. For new reactors, 60 years beyond the licensed life of the reactor would mean that repository capacity would be available in 120 to 140 years. Therefore, the Commission concludes that a mined geologic repository can be available within 60 years beyond the licensed life for any reactor.

If it becomes clear that a repository or some other disposal solution will not be available by 2059, the Commission will revisit and reassess its Waste Confidence DGEIS and rule.

At some point, without a repository being available, the United States may need to reassess its current policy on disposal of spent nuclear fuel and high-level waste in a geologic repository. The Commission is not providing an exact timeframe by which it would no longer have confidence that a geologic repository can be developed. However, if new information should become available in the future that raises questions as to the continued appropriateness of the rule developed in response to the information in the GEIS, the Commission can initiate rulemaking on its own initiative or at the request of the public to make appropriate modifications to the rule.

C.3. Storage of Spent Nuclear Fuel

Continued storage of spent nuclear fuel at-reactor or away-from-reactor sites will be necessary until a repository is available for permanent disposal. During the continued storage period, the storage of spent nuclear fuel at a storage facility is focused on safe spent nuclear fuel management. Safe spent nuclear fuel management involves a regulatory framework and the technical feasibility of safe storage. The regulatory framework applicable to both wet (spent fuel pool) and dry storage of spent nuclear fuel is discussed in Section C.3.a., *Regulatory Framework*. The technical feasibility of safe storage of spent nuclear fuel in spent fuel pools is discussed in Section C.3.b.i., *Technical Feasibility of Wet Storage*, and in dry cask storage in Section C.3.b.ii., *Technical Feasibility of Dry Storage*. (*See* also Section B.3 of Appendix B of the DGEIS).

C.3.a. Regulatory Framework

A strong regulatory framework that involves regulatory oversight, continuous improvement based on events, and licensee compliance is important to the continued safe storage of spent nuclear fuel because it assures that licensees will do what is necessary to safely store spent nuclear fuel until repository capacity is available. The regulatory framework was previously addressed in Findings 3 and 5. Finding 3 analyzed whether high-level radioactive waste and spent nuclear fuel will be safely managed until repository capacity is available. Finding 5 dealt with whether safe storage capacity would be made available if necessary. The key question of these Findings is whether a regulatory framework exists to ensure the continued safe management of spent nuclear fuel and whether licensees will do what is necessary to safely store their spent nuclear fuel until repository capacity for their spent nuclear fuel is available.

After the end of a reactor's licensed life for operations, the spent nuclear fuel is stored in either spent fuel pools or in dry cask storage. At-reactor storage of spent nuclear fuel in spent fuel pools is covered by the part 50 or part 52 license. Currently only one away-from-reactor

ISFSI stores spent nuclear fuel in a spent fuel pool—the GE Morris facility. The DGEIS assumes that no new away-from-reactor spent fuel pool storage facilities are constructed. Monitoring of the structural integrity of the spent fuel pool is addressed through aging management programs. In particular, the aging management program focuses on the pool's water chemistry as it relates to the integrity of the stainless steel liner, spent fuel storage racks, and spent fuel storage racks neutron absorbing sheets. The program includes specifications for chemical species, impurities and additives, sampling and analysis frequencies, and corrective actions for control of water chemistry. In addition, the program includes monitoring of spent fuel pool water level in accordance with technical specifications and leakage from leak chase channels (NUREG-1801 Rev 2 "Generic Aging Lessons Learned (GALL) Report" Final Report, December 2010 (ADAMS Accession No. ML103490041)).

Spent nuclear fuel can also be stored in dry casks in onsite ISFSIs licensed by the NRC under either a general license or a specific license or in an away-from-reactor ISFSI under a specific license. Currently there are 69 ISFSIs licensed to operate in 34 States under either specific (15) or general (54) 10 CFR part 72 licenses[5]. A specific license for an ISFSI under part 72 can be granted by the NRC after a review of the safety, environmental, and physical security aspects of the proposed ISFSI and the financial aspects of the licensee. If the NRC concludes that the ISFSI can operate safely and prepares either an EA and FONSI or EIS, then a license is issued. This license contains requirements on topics such as leak testing and monitoring and specifies the quantity and type of material the licensee is authorized to store at the site. Neither the initial nor renewal license terms for an ISFSI are to exceed 40 years from the date of issuance. Part 72 of 10 CFR also contains the regulatory framework for licensing a monitored retrievable storage facility should the need arise.

[5] The Private Fuel Storage (PFS) facility was licensed, however, as a result of legal challenges, the proposed PFS ISFSI has not been constructed. On December 20, 2012, PFS submitted a request to the NRC to terminate its license (ADAMS Accession No. ML12356A063).

A general license under subpart K of 10 CFR part 72, “General License for Storage of Spent Fuel at Power Reactor Sites,” authorizes storage of spent fuel in casks previously approved by the NRC at a site already licensed to possess fuel to operate a nuclear power reactor. Under 10 CFR 72.210, “General license issued,” a general license for the storage of spent nuclear fuel in an ISFSI at power reactor sites is issued to those persons authorized to possess or operate nuclear power reactors under 10 CFR parts 50 or 52. The general license is limited to spent nuclear fuel that the general licensee is authorized to possess at the site under the part 50 or 52 license for the site. The general license is further limited to storage of spent nuclear fuel in casks approved and fabricated under the provisions of subpart L of part 72, “Approval of Spent Fuel Storage Casks;” the approved cask designs are listed in 10 CFR 72.214, “List of approved spent fuel storage casks.” The NRC has approved 34 designs. The NRC conducts a technical review of each cask design before approving the design and listing it in 10 CFR 72.214. After the NRC staff documents its review of the proposed cask design in a safety evaluation report, the NRC conducts a rulemaking to add the design to the list of approved cask designs. Licensees that use the approved design must follow the constraints of the Certificate of Compliance and the technical specifications for the design. Licensees must demonstrate that it is safe to store spent fuel in dry casks at their site, including analysis of earthquake intensity and tornado missiles. Licensees also review their programs (such as security and emergency planning) and make any changes to those programs needed to accommodate an ISFSI at their site.

Parts 50, 52, and 72 of 10 CFR all have provisions for license renewal. The current regulatory framework for storage of spent nuclear fuel allows for multiple license renewals subject to aging management analysis and planning. An applicant for storage license renewal must provide appropriate technical bases for identifying and addressing aging-related effects, and develop specific aging management plans to justify extended operations of ISFSIs under the renewed license term. The regulatory framework for storage is supported by well-developed

regulatory guidance; voluntary domestic and international consensus standards; research and analytical studies; and processes for implementing licensing reviews, inspection programs, and enforcement oversight.

Another regulatory aspect that factors into continued safe storage of spent nuclear fuel is the financial qualifications of the licensee or applicant. Holders of both generally and specifically ISFSI licenses have to address financial assurance. Specifically licensed ISFSIs are required to demonstrate financial qualifications before they are issued a license. Section 72.22(e) of 10 CFR requires an applicant for a specific license to store spent nuclear fuel, to demonstrate its financial qualifications by demonstrating that it either possesses or has reasonable assurance of obtaining the funds necessary to cover ISFSI construction, operating, and decommissioning costs. Most specific licensees are financially backed by a utility, which, under 10 CFR 50.54(bb), are required to have a program to manage and provide funding for the management of spent fuel following permanent cessation of operations until title to and possession of the fuel is transferred to the Secretary of Energy. Other specific licensees not located at a reactor site that are currently storing spent nuclear fuel are backed either by a large corporation, such as General Electric (the GE Morris ISFSI), or by the DOE, in the case of the Three Mile Island Unit 2, and Ft. Saint Vrain ISFSIs.

As required under 10 CFR 72.30(c), all general licensees must provide financial assurance for sufficient funds to decommission the ISFSI. Further, the NRC's regulations require that every nuclear power reactor operating license issued under 10 CFR part 50 and every combined license issued under 10 CFR part 52 must contain a condition requiring each licensee to submit written notification to the Commission of the licensee's plan for managing irradiated fuel after reactor shutdown. The submittal, required by 10 CFR 50.54(bb), must include information on how the licensee intends to provide funding for the management of its spent fuel.

A number of activities occur after a reactor licensee declares permanent cessation of

operations. These activities are divided into three phases: 1) initial activities; 2) major decommissioning and storage activities; and 3) license termination activities. The initial activities include the licensee's certification to the NRC within 30 days of the decision or requirement to permanently cease operations. This is followed by certification of permanent fuel removal from the reactor. In accordance with the license termination requirements for power reactors in 10 CFR 50.82(a)(3) and 52.110(c), decommissioning is to be completed within 60 years of permanent cessation of operations. Completion of decommissioning beyond 60 years will be approved by the NRC only when necessary to protect public health and safety. Factors that will be considered by the Commission include unavailability of waste disposal capacity and other site-specific factors, including the presence of other nuclear facilities at the site. Given this regulatory framework, it may be reasonably assumed that each nuclear power plant, including its onsite spent fuel pool, will be decommissioned within 60 years of permanent cessation of operations. The DGEIS assumes that all of the spent nuclear fuel from the spent fuel pool is removed from the pool by the end of the short-term timeframe. (*See* Section 2.2.1.1 of the DGEIS for more information on decommissioning during the short-term period).

As part of its oversight, the NRC can issue orders and new or amended regulations to address emerging issues that could impact the storage of spent nuclear fuel. For example, following the terrorist attacks of September 11, 2001, the NRC undertook an extensive reexamination of spent fuel pool safety and security issues. In 2002, the NRC issued orders to licensees that required power reactors in decommissioning, wet ISFSIs, and dry storage ISFSIs to enhance security and improve their capabilities to respond to, and mitigate the consequences of, a terrorist attack. These orders required additional security measures, including increased patrols, augmented security forces and capabilities, and more restrictive site access controls to reduce the likelihood of a successful terrorist attack. In 2007, the NRC issued a final rule revising the Design Basis Threat, which also increased the security requirements for power reactors and their spent fuel pools (72 FR 12705; March 19, 2007). More recently in March

2009, the NRC issued a final rule to improve security measures at nuclear power reactors, including spent fuel pools (74 FR 13926; March 27, 2009). The NRC also plans to codify enhanced security measures at ISFSIs in a future rulemaking. (74 FR 66589; December 16, 2009).

The Nuclear Energy Institute developed its Groundwater Protection Initiative in 2006 in response to leaks containing radioactive material at several plants. The initiative is described in NEI-07-07, "Industry Ground Water Protection Initiative - Final Guidance Document" (ADAMS Accession No. ML072610036). All nuclear power reactor licensees have committed to follow the Initiative, which identifies actions to improve licensee responses to inadvertent releases, including releases from spent fuel pools that may result in low, but detectible, levels of plant-related radioactive materials in subsurface soils and water. The Initiative identifies the actions licensees are expected to take, including the development of written groundwater protection programs, improved stakeholder communications, and program oversight. An important objective of the Initiative is to detect leaks well before radionuclide concentrations approach regulatory limits for radioactive releases. The Initiative also addresses detection and remediation of leaks. The NRC continues to monitor the implementation and maintenance of licensee's groundwater monitoring programs through the reactor oversight process. (*See* Appendix E of the DGEIS for more information on both NRC's and industry's activities related to spent fuel pool leaks). On June 17, 2011, the NRC issued its Decommissioning Planning Rule (76 FR 35512). This rule requires licensees of operating facilities to minimize the introduction of significant residual radioactivity into the site, including the subsurface, and to perform radiological surveys to identify the extent of significant residual radioactivity at their sites, including the subsurface. The NRC has found that the groundwater monitoring conducted in accordance with the Groundwater Protection Initiative developed by the Nuclear Energy Institute is generally adequate to comply with these regulations (Regulatory Guide 4.22, *Decommissioning Planning During Operations* (ADAMS Accession No. ML12158A361)).

Other examples of the NRC's oversight are the additional requirements that the NRC has imposed in response to the March 11, 2011 severe earthquake and subsequent tsunami that resulted in extensive damage to the six-unit Fukushima Dai-ichi nuclear power plant in Japan. On March 12, 2012, NRC issued multiple orders and a request for information to all of its nuclear power plant licensees. The orders addressed: 1) mitigating strategies for beyond-design basis external events; and 2) reliable spent fuel pool instrumentation. The request for information was designed to gather information to allow the NRC to reevaluate seismic and flooding hazards at operating reactor sites and to determine whether appropriate staffing and communication can be relied upon to coordinate event response during a prolonged station blackout event, as was experienced at Fukushima Dai-ichi.

Another aspect of NRC's regulatory program for continued storage, as for reactors and other licensed facilities generally, involves generic communications. Generic communications include, but are not limited to, generic letters, bulletins, information notices, and regulatory issue summaries. Generic letters request licensee actions and/or information to address issues regarding emergent or routine matters of safety, security, safeguards, or environmental significance. Bulletins request licensee actions and/or information to address significant issues regarding matters of safety, security, safeguards, or environmental significance that have great urgency. Both generic letters and bulletins require a written response from the licensee. Information notices are used to communicate operating or analytical experience to the nuclear industry. The industry is expected to review the information for applicability and consider appropriate actions to avoid similar problems. Regulatory issue summaries are used to communicate and clarify the NRC's technical or policy positions on regulatory matters. Neither an information notice nor a regulatory issue summary requires written responses from licensees.

For example, Information Notice 2012-20, "Potential Chloride-Induced Stress Corrosion Cracking of Austenitic Stainless Steel and Maintenance of Dry Cask Storage System Canisters"

(ADAMS Accession No. ML12319A440) informed licensees about the potential for chloride-induced stress corrosion cracking of austenitic stainless steel and maintenance of dry cask storage system canisters. Although an immediate safety concern did not exist, NRC was alerting its licensees and certificate holders that their monitoring programs need to address this concern as part of an aging management program to ensure appropriate actions (e.g., maintenance) could be taken before there were any impacts.

As demonstrated by these examples, the NRC's regulatory framework allows the Agency to respond to emerging events and take appropriate action to continue to protect the public health and safety and the environment. Continued industry engagement ensures that any issues are identified and addressed through the current regulatory process before they could advance to a level where there is a significant public health and safety or environmental impact.

While the NRC has established the necessary regulatory framework for continued safe spent nuclear fuel management, reactor and ISFSI licensees have acted prudently to safely manage their spent nuclear fuel. In the late 1970s and early 1980s, the need for alternative storage began to grow as spent fuel pools at many nuclear reactors began to fill up with stored spent nuclear fuel. Spent fuel pool re-racking, fuel-pin consolidation, and onsite dry cask storage have been successfully employed to increase onsite storage capacity. There are currently 69 licensed ISFSIs. Additionally, 13 licensees have indicated plans to develop an ISFSI under a general license. Only four reactor sites have not yet announced intentions regarding an ISFSI.

To date, the NRC has renewed five specific 10 CFR part 72 ISFSI licenses. These renewals include the 10 CFR part 72 specific licenses for the General Electric Morris Operation (the only wet, or pool-type, ISFSI), as well as the Surry, H.B. Robinson, Oconee, and Fort St. Vrain ISFSIs. Specific licenses for all but one of the ISFSIs will expire by 2048. It is expected that license renewals will be requested by the licensees of these facilities, unless a permanent

repository or some other interim storage option is made available. The NRC has received renewal applications for the Calvert Cliffs and Prairie Island ISFSIs.

In addition, issuance of Materials License No. SNM-2513 for the Private Fuel Storage, LLC (PFS) facility has confirmed the feasibility of licensing an away-from-reactor ISFSI under 10 CFR part 72. While there were several issues that prevented the PFS ISFSI from being built and operated, the extensive review of safety and environmental issues associated with licensing the PFS facility provides additional confidence that spent nuclear fuel can be safely stored at an away from reactor ISFSI for long periods after storage at a reactor site.

The NRC will continue its regulatory control and oversight of spent nuclear fuel storage at both operating and decommissioned reactor sites for both specific and general 10 CFR part 72 licenses and part 50 or 52 licenses. Decades of operating experience and ongoing NRC inspections demonstrate that these reactor and ISFSI licensees continue to meet their obligation to safely store spent fuel in accordance with the requirements of 10 CFR Parts 50 and 72. If the NRC were to find noncompliance with these requirements or otherwise identify a concern with the safe storage of the spent fuel, the NRC would evaluate the issue and take corrective action to protect the public health and safety and the environment.

As noted in the preceding paragraphs, licensees have continued to develop and successfully use onsite spent nuclear fuel storage capacity in the form of spent fuel pool and dry cask storage. Based on the preceding discussion, the Commission believes that utilities will have the necessary resources to meet obligations related to the storage of any spent nuclear fuel after reactor operations cease. The Commission concludes that the regulatory framework exists to support that spent nuclear fuel can be managed in a safe manner until sufficient repository capacity is available.

C.3.b. Storage of Spent Nuclear Fuel

Finding 4 assessed the safe storage of spent nuclear fuel pending ultimate disposal at a repository. Issues related to storage focus on the technical feasibility of safe storage of spent nuclear fuel. To address the feasibility of long-term safe storage, the Commission needs to evaluate: 1) the technical feasibility of safe wet storage, including the long-term integrity of spent nuclear fuel under water pool storage conditions and the structure and component safety for extended facility operation for storage of spent nuclear fuel in water pools; and 2) the technical feasibility of safe dry storage. The Commission also needs to evaluate the potential risks of accidents and acts of sabotage at spent nuclear fuel storage facilities. Although the DGEIS doesn't explicitly evaluate safety, it does include evaluations of accidents, public health, and safeguards impacts for three different timeframes and contains a discussion on the technical feasibility of safe storage. The timeframes evaluated in the DGEIS are short-term storage that assumes a repository would be available at 60 years beyond the licensed life for operations; long-term storage that assumes a repository would be available at 160 years beyond the licensed life for operations; and indefinite storage that assumes no repository becomes available. The technical feasibility of safe storage beyond a reactor's licensed life of operation is addressed in the following sections.

C.3.b.i. Technical Feasibility of Wet Storage

The technical feasibility of continued safe wet storage is supported by a number of technical considerations. First, the integrity of spent fuel and cladding under the controlled water chemistry within the spent fuel pool is supported by operating experience as well as a number of scientific studies. Further, the spent fuel pool's robust technical design protects against a range of natural and man-induced challenges. These considerations are discussed in the following paragraphs.

The Commission found in 1984 that research and experience in the United States and other countries confirmed that long-term storage could be safely undertaken (49 FR 34681-

34682; August 31, 1984). In 1990, the Commission determined that experience with water storage of spent nuclear fuel continued to confirm that pool storage is a benign environment for spent nuclear fuel that does not lead to significant degradation of spent nuclear fuel integrity and that the water pools in which the assemblies are stored will remain safe for extended periods. Further, degradation mechanisms are well understood and allow time for appropriate remedial action (55 FR 38509-38511; September 18, 1990). In sum, based on both experience and scientific studies, the Commission found wet storage to be a fully-developed technology with no associated major technical problems.

Almost 30 years of additional experience has been gained since the publication of the Waste Confidence rulemaking in 1984 during which time the technical basis for very slow degradation rates of spent nuclear fuel in spent fuel pools has continued to grow. For example, several studies have supported the low degradation of cladding material (IAEA TECDOC-1012, *Durability of Spent Nuclear Fuels and Facility Components in Wet Storage,* 1988*;* IAEA TECDOC 1343, *Spent Fuel Performance Assessment and Research: Final report of a Co-ordinated Research Project on Spent Fuel Performance Assessment and Research (SPAR) 1997–2001*, 2003; IAEA Technical Report Series No. 443, *Understanding and Managing Ageing of Materials in Spent Fuel Storage Facilities,* 2006). The IAEA TECDOC-1012 noted that “The zirconium alloys represent a class of materials that is highly resistant to degradation in wet storage, including some experience in aggressive waters. The only adverse experience involves Zircaloy clad metallic uranium where mechanical damage to the cladding was a prominent factor during reactor discharge, exposing the uranium metal fuel to aqueous corrosion. Otherwise, the database for the zirconium alloys supports a judgment of satisfactory wet storage in the time frame of 50 to 100 years or more” (p 5). The IAEA TECDOC 1343 in discussing spent nuclear fuel storage experience reported on four degradation mechanisms that may affect cladding integrity during wet storage (i.e., mechanical stresses, oxidative corrosion, electrochemical corrosion, and hydriding) and found: 1) “processes straining the cladding can

be ruled out at the relevant temperature and stresses of interest;" 2) for wet storage in de-mineralised water of well-controlled chemistry, "zirconium alloys are virtually immune to (uniform) oxidative corrosion;" 3) "electrochemical corrosion has never been observed when direct contact of both Zircaloy and stainless steel occurs in nuclear fuels, either in-reactor or in wet storage;" and 4) the long-term storage temperature lies below the ductile/brittle transition temperature of hydride Zircaloys, which means the cladding will withstand elastic deformation up to raised yield stresses, and "plastic deformation under those conditions would be negligible." (p 50-51).

The IAEA Technical Report Series No. 443 stated that "[D]estructive and non-destructive examinations of fuel rods, visual evidence and coupon studies [11, 13, 54–58] all support resistance to aqueous corrosion. There have been no reports of fission gas evolution, indicative of cladding failure in wet storage. Rod consolidation campaigns have been conducted without any indication of storage induced degradation. There is a sufficient database to indicate that wet storage of fuel with Zirconium alloy cladding can be extended for at least several decades."

Based on available information and operating experience, degradation of the fuel cladding occurs slowly over time in the spent fuel pool environment. Degradation of the spent nuclear fuel should be minimal, particularly over the short-term storage period. Thus, it is expected that only routine maintenance will be needed over the short-term storage period. The GEIS assumes that the spent fuel pool will be decommissioned before the end of the short-term storage period, however, the NRC is not aware of any information that would call into question the technical feasibility of continued safe storage of spent fuel in spent fuel pools beyond the short-term storage period. (*See* Section B.3.1 of Appendix B of the DGEIS).

In its initial Waste Confidence Decision, the Commission found that the risks of major accidents at spent fuel pools resulting in offsite consequences were remote because of the secure and stable character of the spent nuclear fuel in the storage pool environment and the absence of reactive phenomena—"driving forces"—that might result in dispersal of radioactive

material. The Commission noted that storage pools and ISFSIs are designed to safely withstand accidents caused by either natural or man-made phenomena, and that, due to the absence of high temperature and pressure conditions, human error does not have the capability to create a major radiological hazard to the public (49 FR 34658; pp. 34684-34685). By 1990, the NRC staff had spent several years studying the potential for a catastrophic loss of reactor spent fuel pool water, which could cause a fuel fire in a dry pool. The NRC concluded that, because of the large inherent safety margins in the design and construction of a spent fuel pool, no action was needed to further reduce the risk (55 FR 38472; p. 38511).

The NRC has continued its examination of spent fuel pool storage to ensure that adequate safety is maintained and that there are no adverse environmental effects from the storage of spent nuclear fuel in spent fuel pools. In 1997, the safety and environmental effects of spent fuel pool storage were addressed in conjunction with regulatory assessments of permanently shutdown nuclear plants and decommissioning nuclear power plants in NUREG/CR-6451, "A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants" (ADAMS Accession No. ML082260098). The study provided reasonably bounding estimates of fuel coolability and offsite consequences for the most severe accidents, which would involve draining of the spent fuel pool.

In 2001, the NRC issued NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066), which examined spent fuel pool accident risk at decommissioning nuclear power plants and provides a newer and more robust analysis of the safety and environmental effects of spent fuel pool storage. This study provided the results of the NRC staff's latest evaluation of the accident risk in a spent fuel pool at decommissioning plants. NUREG-1738 found that a postulated accident causing a zirconium cladding fire could result in unacceptable offsite doses; however, the likelihood for such an accident to occur was estimated to be less than three chances in one million (p 3-29). NUREG-1738 states: "[T]he risk at decommissioning plants is low and well

within the Commission's safety goals. The risk is low because of the very low likelihood of a zirconium fire even though the consequences from a zirconium fire could be serious." (p 5-3). In arriving at this conclusion, NUREG-1738 considered a wide range of initiating events (p 3-2, 3-3), including, but not limited to events that might lead to rapid loss of pool water, such as seismic events, cask drop, aircraft impact, and missiles generated by tornados. The risk is low because of the very low likelihood of a zirconium fire even though the consequences from a zirconium fire could be serious (*i.e.* frequency on the order of 10^{-7} per year or less for events leading to a rapid loss of pool water). The low probability for these varied events to initiate a rapid loss of water from the pool is a direct result of the robustness of the structural design of the spent fuel pool; however, there is a very low likelihood of a zirconium fire. The results of NUREG-1738, as well as other studies, are discussed in more detail in Appendix F of the DGEIS. Appendix F also contains information on actions that the NRC has required licensees to take in response to significant events including the September 11, 2001, terrorist attack and the March 11, 2011, Fukushima Dai-ichi event in Japan.

Given the physical robustness of the pools, the physical security measures, and the spent fuel pool mitigation measures, and based upon the NRC's site evaluations of every spent fuel pool in the United States, the NRC has determined that the risk of a spent fuel pool zirconium fire, whether caused by an accident or a terrorist attack, is very low. In addition, the NRC has approved license amendments and issued safety evaluations to incorporate mitigation measures into the plant licensing bases of all operating nuclear power plants in the United States. (*See* 73 FR 46207-46208; August 8, 2008 and Sections 4.18, 4.19, 5.18, 5.19, and Appendix F of the DGEIS).

Monitoring of the structural integrity of the spent fuel pool is addressed through aging management programs. In particular, the aging management program focuses on the pool's water chemistry as it relates to the integrity of the stainless steel liner, spent fuel storage racks, and spent fuel storage racks neutron absorbing sheets. The program includes specifications for

chemical species, impurities and additives, sampling and analysis frequencies, and corrective actions for control of water chemistry. In addition, the program includes monitoring of spent fuel pool water levels in accordance with technical specifications and leakage from leak chase channels (NUREG-1801 Rev 2 "Generic Aging Lessons Learned (GALL) Report" Final Report, December 2010.(ADAMS Accession No. ML103490041)).

Another issue related to storage of spent nuclear fuel in a spent fuel pool is possible leakage from the pool into the environment. The spent fuel pool liner and the leakage collection system normally prevent spent fuel pool water from leaking into the environment. However, small leaks can occur. Available data indicate that spent fuel pool leakage has occurred at several reactor sites. (*See* Appendix E of the DGEIS for information on spent fuel pool leaks).

Spent fuel pools are massive, seismically-designed structures that are constructed from thick, reinforced concrete walls and slabs designed to be seismically robust. Thus, the likelihood of major accidents at spent fuel pools resulting in offsite consequences are very remote. The NRC is not aware of any additional studies that would question the low probability of spent fuel pool accidents and thereby also question the technical feasibility of continued safe storage of spent nuclear fuel in spent fuel pools for the 60 years after licensed life for operation considered in the draft GEIS.

C.3.b.ii. Technical Feasibility of Dry Storage

The feasibility of dry cask storage is supported by years of experience as well as technical studies and NRC reviews that have examined and confirmed the integrity of spent nuclear fuel and cladding under the controlled and somewhat benign environment (benign relative to the radiation and temperature environment within the operating reactor) within dry cask storage systems and the robustness of the structural design of the dry cask storage system against a variety of challenges both natural and man-induced. Those features are addressed in the following paragraphs and in Section B.3.2 of Appendix B of the DGEIS.

In 1984, the Commission based its findings regarding the safety of dry storage on an understanding of the material degradation processes, derived largely from technical studies, together with the recognition that dry storage systems are simple and easy to maintain (49 FR 34683-34684; August 31, 1984). By 1990, the NRC and ISFSI licensees had considerable experience with dry storage. The NRC staff safety reviews of topical reports on storage system designs, the licensing and inspection of dry storage at two reactor sites under 10 CFR part 72, and the NRC's promulgation of an amendment to 10 CFR part 72 that incorporated a monitored retrievable storage installation (a dry storage facility) into the regulations confirmed the 1984 conclusions on the safety of dry storage. (55 FR 38509-38513; September 18, 1990).

Spent fuel has been safely stored in dry casks for more than 25 years. As with wet storage, the overall experience with dry cask storage of similar fuel types, including the cladding, has been similar—slow degradation. Spent nuclear fuel is allowed to cool in a spent fuel pool before being transferred into dry cask storage, which reduces the potential for significant degradation. Recent studies have confirmed the reliability of dry cask storage. For example, a dry cask storage characterization project examined and tested a dry cask storage system. The 2003 Argonne National Laboratories report prepared for the NRC, NUREG/CR-6831, "Examination of Spent PWR Fuel Rods after 15 Years in Dry Storage," (ADAMS Accession No. ML032731021) stated the results of this program suggest the viability of spent fuel cladding to remain as a barrier to fission product release during extended storage up to 100 years in a dry cask environment (p xi). These results were for spent fuel with a burnup limit of 35 gigawatt days per metric ton Uranium (GWd/MTU). The IAEA Technical report Series No. 443 stated that "[p]ower reactor fuel with zirconium alloy cladding has been placed into dry storage in approximately a dozen countries. The technical basis for satisfactory dry storage of fuel clad with zirconium alloys includes hot cell tests on single rods, whole assembly tests, demonstrations using casks loaded with irradiated fuel assemblies and theoretical analysis."

Although the current record for dry cask storage supports the technical feasibility of continued safe storage, the NRC constantly works to investigate and monitor the behavior of the spent fuel storage systems to identify any unexpected and deleterious safety conditions before a problem develops. Recently, concerns have been identified regarding the potential detrimental effects of hydride reorientation on cladding behavior, such as reduced ductility. Reduced ductility, making the cladding more brittle, increases the difficulty of keeping spent nuclear fuel assemblies intact during handling operations and transportation. Research performed in Japan and the United States indicated that: 1) hydrides could reorient at a significantly lower stress than previously believed; and 2) high burn-up fuel could exhibit a higher ductile-to-brittle transition temperature due to the presence of radial hydrides (Billone, M.C., T.A. Burtseva, and R.E. Einziger.2013 "Ductile-to-Brittle Transition Temperature for High-Burnup Cladding Alloys Exposed to Simulated Drying-Storage Conditions." Journal of Nuclear Materials 433(1–3,): 431–448. Available at http://www.sciencedirect.com/science/article/pii/S0022311512005181). This phenomenon could influence the timing and approach used for re-packaging spent nuclear fuel. Currently the NRC is not aware of information that would require high burn-up fuel to be repackaged during the short-term time period in the draft GEIS. Should spent fuel cladding be more brittle, greater care could be required during handling operations, regardless of when repackaging would occur, to limit the potential for damage to spent nuclear fuel assemblies that could affect easy retrievability of the spent nuclear fuel and complicate repackaging operations.

Based on available information and operating experience, degradation of the spent nuclear fuel should be minimal over the short-term storage period, if the conditions inside the canister are appropriately maintained (i.e., consistent with the technical specifications for storage). Thus, as discussed in more detail in the DGEIS, it is expected that only routine maintenance will be needed over the short-term storage period. The DGEIS assumes that the repackaging of spent nuclear fuel would occur every 100 years if storage continues beyond the

short-term storage period, which may include different approaches for repackaging at times significantly beyond the short-term storage period (e.g., placement of damaged spent nuclear fuel in smaller canisters). The NRC is not aware of any additional studies that would question the technical feasibility of continued safe storage of spent nuclear fuel in dry casks for the time periods considered in the draft GEIS.

In 2007, the NRC published a pilot probabilistic risk assessment methodology that assessed the risk to the public and identified the dominant contributors to risk associated with a welded canister dry spent fuel storage system at a specific boiling water reactor site (NUREG-1864, "A Pilot Probabilistic Risk Assessment of a Dry Cask Storage System at a Nuclear Power Plant," March 2007 (ADAMS Accession No. ML071340012)). The NRC study developed and assessed a comprehensive list of initiating events, including dropping the cask during handling and external events during onsite storage (such as earthquakes, floods, high winds, lightning strikes, accidental aircraft crashes, and pipeline explosions) and reported that the analysis indicate that the risk is solely from latent cancer fatalities and that the overall risk of dry cask storage was found to be extremely low. (The NRC determined that the estimated aggregate risk is an individual probability of a latent cancer fatality of $1.8x10^{-12}$ during the period encompassing the initial cask loading and first year of service, and $3.2x10^{-14}$ per year during subsequent years of storage (p 9-2)).

Several characteristics of dry cask storage contribute to the low risk associated with dry cask storage. First, these systems are passive. Second, they rely on natural air circulation for cooling. Third, they are inherently robust, massive concrete and steel structures that are highly damage resistant. The robustness of these dry cask storage systems has been tested by significant challenges, such as the 2011 Mineral, Virginia earthquake that affected North Anna Nuclear Plant, and the 2011 earthquake and tsunami that damaged the Fukushima Dai-ichi nuclear power plant. Neither event resulted in the release of radionuclides from the dry cask storage containers. The NRC and licensee experience to date with ISFSIs and with certification

of casks indicates that interim storage of spent nuclear fuel at reactor sites can be safely and effectively conducted using passive dry storage technology. There have not been any safety problems during dry storage. If problems do occur, the NRC typically issues generic communications to address the problem and provide direction for preventing its recurrence.

Thus, technical studies and practical operating experience to date confirm the physical integrity of dry cask storage structures and thereby demonstrate the technical feasibility of continued safe storage of spent nuclear fuel in dry cask storage systems for the time periods considered in the DGEIS. The DGEIS conservatively assumes that the dry casks would need to be replaced if storage continues beyond the short-term time period. The DGEIS considers replacement of dry casks after 100 years of service life, even though studies and experience to date do not preclude a longer service life. NRC continues to evaluate aging management programs and monitor dry cask storage so that it can update its service life conclusions as necessary and consider any circumstances that might require repackaging of spent fuel earlier than anticipated.

In summary, storage of spent nuclear fuel will be necessary until a repository is available for permanent disposal. The storage of spent nuclear fuel in any combination of storage in spent fuel pools or dry casks will continue as a licensed activity under regulatory controls and oversight. Licensees have continued to develop and successfully use onsite spent nuclear fuel storage capacity in the form of spent fuel pools and dry cask storage in a safe and environmentally sound fashion. Technical understanding and experience continues to support the technical feasibility of safe storage of spent nuclear in spent fuel pools and in dry casks, based on their physical integrity over long periods of time (*e.g.,* slow degradation of spent fuel during storage in spent fuel pools and dry casks; engineered features of storage pools and dry casks to safely withstand accidents caused by either natural or man-made phenomena). Additionally, regulatory oversight has been shown to enhance safety designs and operations as concerns and information evolve over time (*e.g.,* security and safety enhancements made after

the September 11, 2001 terrorist attacks and the March 2012 Fukushima Dai-ichi disaster; corrective actions to address spent fuel pool leaks as discussed in Appendix E of the DGEIS).

Based on the technical information and the national and international experience with wet and dry storage of spent fuel, the NRC believes that it is technically feasible to safely store spent fuel in either wet or dry storage for at least 60 years beyond the licensed life for operations with only routine maintenance (*i.e.*, no large-scale replacement of spent fuel pools or dry cask storage systems). This time period represents a potential service life for the spent fuel pools and dry cask storage systems on the order of 100 to 140 years when considering any storage that occurs during reactor operations. The Commission concludes that spent fuel can continue to be safely managed in spent fuel pools and dry casks, and that regulatory oversight exists to ensure the aging management programs continue to be updated to address the monitoring and maintenance of structures, systems, and components that are important to safety. Based on all of the information set forth in Appendix B of the DGEIS and Section III.C.3., *Storage of Spent Nuclear Fuel*, the Commission concludes that spent nuclear fuel can be safely managed in spent fuel pools and dry casks during the time periods evaluated in the DGEIS.

IV. Discussion of Proposed Amendments by Section

Section 51.23 Environmental effect of continued storage of spent nuclear fuel beyond the licensed life for operation of a reactor.

The title of the section would be revised to reflect that the section is no longer based on an EA and FONSI, but on an EIS and that environmental effects of continued storage are included in the section.

Paragraph (a) of 10 CFR 51.23 would be revised to provide the Commission's generic

determination on the continued storage of spent nuclear fuel. The proposed amendments would state that, based on the analysis in NUREG-2157, the Commission has concluded that a mined geologic repository can be available with 60 years following the licensed life of operation of a reactor and that the analysis is adequate to determine that it is feasible to safely store spent nuclear fuel and that the analysis is adequate to reach a generic conclusion on the environmental impacts of continued storage for 60 years beyond the licensed life for operation of a reactor.

Paragraph (b) of 10 CFR 51.23 would be revised to clarify that ISFSI renewals are included in the scope of the generic determination.

Table B-1—Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants.

Table B-1 addresses the environmental impacts of license renewal activities by resource area. When the Commission issued the final rule on the environmental effects of license renewal (XX FR XXXX; Month, Day, 2013), it was not able to rely on the Waste Confidence Decision and rule for two of the issues. The Commission noted that upon issuance of the GEIS and revised Decision and rule, the NRC would make any necessary conforming changes to the license renewal rule. This proposed rule would revise these two finding column entries to address Waste Confidence. The "Offsite radiological impacts of spent nuclear fuel and high-level waste disposal" issue would be reclassified as a Category 1 impact and the finding column entry would be revised to address Waste Confidence. For the "Onsite storage of spent nuclear fuel" issue, the finding column entry would be revised to include the period of continued storage beyond the licensed life for operation of a reactor.

V. Availability of Documents

The NRC is making the documents identified in the following table available to interested

persons through one or more of the methods provided in Section I.A., *Accessing Information*, of this document, as indicated.

References are also available through the Waste Confidence Decision Website at www.nrc.gov. References are organized by the document in which the reference appears (DGEIS chapter and appendix and the proposed rule *Federal Register* notice), as well as alphabetical order by author with links to electronically available documents.

Document	PDR	Web	ADAMS
Waste Confidence Related Documents			
Federal Register Notice - Notice of Intent (77 FR 65137; October 25, 2012)	X	X	ML12305A035
Draft NUREG-2157, "Waste Confidence Generic Environmental Impact Statement"	X	X	MLxxxxxx
"Waste Confidence Generic Environmental Impact Statement Scoping Process Summary Report"	X	X	ML13060A128
"Scoping Comments on the Waste Confidence Generic Environmental Impact Statement"	X	X	ML13060A130
Transcript of November 14, 2012, Waste Confidence Scoping Meeting - Afternoon Session.	X	X	ML12331A347
Transcript of November 14, 2012, Waste Confidence Scoping Meeting - Evening Session 9pm-12am.	X	X	ML12331A353
Transcript of Scoping Meeting for the Waste Confidence Environmental Impact Statement: Webinar December 5, 2012,	X	X	ML12355A174
December 6, 2012 Waste Confidence Scoping Webinar Transcript	X	X	ML12355A187
Minnesota v. NRC, 602 F.2d 41 (D.C. Cir. 1979)			
(*New York v. NRC*, 681 F.3d 471 (D.C. Cir. 2012)	Via link http://www.cadc.uscourts.gov/internet/op		

Document	PDR	Web	ADAMS
	inions.nsf/57ACA94A8FFAD8AF85257A1700502AA4/$file/11-1045-1377720.pdf		
Federal Register Notice announcing generic proceeding on Waste Confidence (44 FR 61372, 61373; October 25, 1979)	X		
Federal Register Notice - 1984 Waste Confidence Final Rule (49 FR 34688; August 31, 1984)	X		ML033000242
Federal Register Notice - 1984 Final Waste Confidence Decision (49 FR 34658; August 31, 1984)	X		ML033000242
Federal Register Notice - 1990 Waste Confidence Final Rule (55 FR 38472; September 18, 1990)	X		ML031700063
Federal Register Notice - 1990 Waste Confidence Decision (55 FR 38474; September 18, 1990)	X		ML031700063
Federal Register Notice - 1999 Waste Confidence Decision Review (64 FR 68005; December 6, 1999)	X		ML003676331
Federal Register Notice - 2010 Waste Confidence Final Rule (75 FR 81037; December 23, 2010)	X		ML103350175
Federal Register Notice - 2010 Waste Confidence Decision Update (75 FR 81032; December 23, 2010)	X		ML120970147
Commission Order CLI-12-16	X		ML12220A094
SRM-COMSECY-12-0016 - Approach for Addressing Policy Issues Resulting from Court Decision to Vacate Waste Confidence Decision and Rule	X		ML12250A032
Waste Confidence References – NRC Documents			
Federal Register Notice announcing the 1977 Denial of PRM-50-18 (42 FR 34391; July 5, 1977)	X		
Federal Register Notice - “Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca	X		

Document	PDR	Web	ADAMS
Mountain, Nevada; Proposed Rule,” (64 FR 8640, 8649; February 22, 1999)			
Federal Register Notice - Final Rule to Amend 10 CFR 73.1: Design Basis Threat (72 FR 12705; March 19, 2007)	X		ML070520692
Federal Register Notice - Power Reactor Security Requirements Final Rule (74 FR 13926; March 27, 2009)	X		ML083380546
Federal Register Notice - Denial of Petitions for Rulemaking (PRM-51-10 and PRM-51-12) (73 FR 46204: August 8, 2008)	X		ML081890124
Federal Register Notice - “Draft Technical Basis for Rulemaking Revising Security Requirements for Facilities Storing SNF and HLW; Notice of Availability and Solicitation of Public Comments” (74 FR 66589; December 16, 2009)	X		ML093340103
Federal Register Notice - Decommissioning Planning Rule (76 FR 35512; June 17, 2011)	X		ML103510117
Federal Register Notice - License Renewal GEIS Final Rule (78 FR XXX: Month, Day, 2013)	X		MLXXXXXX
Department of Energy; Notice of Acceptance for Docketing of a License Application for Authority to Construct a Geologic Repository at a Geologic Repository Operations Area at Yucca Mountain, Nevada (73 FR 53284; September 15, 2008).	X		ML082490757
NUREG 0586,”Generic Environmental Impact Statement for Decommissioning of Nuclear Facilities, Supplement 1: Regarding the Decommissioning of Nuclear Power Reactors,” Volume 1 Main report. November 2002.	X		ML023500395
NUREG-1437, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants” 2013			ML13106A241 for main volume 1, ML13106A242 for volume 2, and ML13106A244 for volume 3

Document	PDR	Web	ADAMS
NUREG-1738 "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants"	X		ML010430066
NUREG-1801 Rev 2 "Generic Aging Lessons Learned (GALL) Report" Final Report.	X		ML103490041
NUREG-1864, "A Pilot Probabilistic Risk Assessment of a Dry Cask Storage System at a Nuclear Power Plant."	X		ML071340012
NUREG-2107, "Technical Evaluation Report on the Content of the U.S. Department of Energy's Yucca Mountain Repository License Application"	X		ML11223A273
NUREG-2108 "Technical Evaluation Report on the Content of the U.S. Department of Energy Yucca Mountain Repository License Application - Preclosure Volume: Repository Safety Before Permanent Closure"	X		ML11250A093
NUREG/CR-6451, "A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants"			ML082260098
NUREG/CR-6831, "Examination of Spent PWR Fuel rods after 15 Years in Dry Storage,"			ML032731021
Regulatory Guide 4.22, *Decommissioning Planning During Operations*	X		ML12158A361
NRC Information Notice IN 2012-20, "Potential Chloride-Induced Stress Corrosion Cracking of Austenitic Stainless Steel and Maintenance of Dry Cask Storage System Canisters"	X		ML12319A440
NRC Order Number EA-12-049, Issuance of Order to Modify Licenses With Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events.			ML12054A735
NRC Order EA-12-051, Issuance of Order to Modify Licenses With Regard to Reliable Spent Fuel Pool Instrumentation.			ML12054A679
NRC High-Value Datasets,	X		

Document	PDR	Web	ADAMS
Waste Confidence References – Non-NRC Documents			
NRDC v. NRC, 582 F.2d 166 (2d Cir. 1978)			
Nuclear Waste Policy Act 96 Stat. 2201 (1983) (current version at 42 U.S.C. 10132 (2006))			
Blue Ribbon Commission on America's Nuclear Future, *Report to the Secretary of Energy*	X		ML120970375
DOE, *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*	http://energy.gov/sites/prod/files/Strategy%20for%20the%20Management%20and%20Disposal%20of%20Used%20Nuclear%20Fuel%20and%20High%20Level%20Radioactive%20Waste.pdf.		
Letter from J M Maddox, Eddy-Lea Energy Alliance, LLC, to C Haney, NMSS, re Notice of Intent to Submit a License Application for Consolidated Used Nuclear Fuel Storage Facility, February 26, 2013	X		ML13067A278
DOE Motion to Withdraw Application for Yucca Mountain	X		ML100621397
Request for Termination of NRC License No. SNM-2513 for Private Fuel Storage LLC.	X		ML12356A063
Billone, M.C., T.A. Burtseva, and R.E. Einziger.2013 "Ductile-to-Brittle Transition Temperature for High-Burnup Cladding Alloys Exposed to Simulated Drying-Storage Conditions." Journal of Nuclear Materials 433(1–3,): 431–448.	http://www.sciencedirect.com/science/article/pii/S0022311512005181		
IAEA, "Scientific and Technical Basis for the Geologic Disposal of Radioactive Wastes, Technical Reports Series No. 413"	http://www-pub.iaea.org/MTCD/Publications/PDF/TRS413_web.pdf		

Document	PDR	Web	ADAMS
IAEA Technical Report Series No. 443, “Understanding and Managing Ageing of Materials in Spent Fuel Storage Facilities”	http://www-pub.iaea.org/MTCD/publications/PDF/TRS443_web.pdf		
IAEA, “Radioactive Waste Management Studies and Trends, IAEA/WMDB/ST/4,”	http://www-pub.iaea.org/MTCD/Publications/PDF/WMDB-ST-4.pdf		
IAEA TECDOC-1012, “Durability of Spent Nuclear Fuels and Facility Components in Wet Storage”	http://www-pub.iaea.org/MTCD/publications/PDF/te_1012_prn.pdf		
IAEA, “The Use of Scientific and Technical Results from Underground Research Laboratory Investigations for the Geologic Disposal of Radioactive Waste, IAEA-TECDOC-1243,”	http://www-pub.iaea.org/MTCD/Publications/PDF/te_1243_prn.pdf		
IAEA TECDOC 1343, “Spent Fuel Performance Assessment and Research: Final report of a Co-ordinated Research Project on Spent Fuel Performance Assessment and Research (SPAR) 1997–2001”	http://www-pub.iaea.org/MTCD/publications/PDF/te_1343_web.pdf		
IAEA, “Joint Convention on Safety of Spent Fuel Management and on Safety of Radioactive Waste Management, INFCIRC/546,”	http://www.iaea.org/Publications/Documents/Infcircs/1997/infcirc546.pdf		
Organization for Economic Cooperation and Development, Nuclear Energy Agency, “Lessons Learned from Ten Performance Assessment Studies,” 1997			
Organization for Economic Cooperation and Development, Nuclear Energy Agency, “Lessons Learned from Ten Performance Assessment Studies,”			
Canadian Nuclear Fuel Waste Disposal Concept Environmental Assessment Panel, *Report of the Nuclear Fuel Waste Management and Disposal Concept Environmental Assessment Panel*			

Document	PDR	Web	ADAMS
NWMO, *Choosing a Way Forward: The Future Management of Canada's Used Nuclear Fuel, Final Study Report*,			
NWMO, *Annual Report 2007: Moving Forward Together*			
NWMO, *Annual Report 2009: Moving Forward Together*			
NEI, "Industry Ground Water Protection Initiative-Final Guidance Document," NEI-07-07	X		ML072610036

VI. Agreement State Compatibility

Under the "Policy Statement on Adequacy and Compatibility of Agreement State Programs" approved by the Commission on June 30, 1997, and published in the Federal Register (62 FR 46517; September 3, 1997), this proposed rule would be classified as Compatibility Category "NRC." The NRC program elements in this category are those that relate directly to areas of regulation reserved to the NRC by the Atomic Energy Act of 1954, as amended, or the provisions of Title 10 of the *Code of Federal Regulations*. These program elements are not adopted by Agreement States.

VII. Plain Writing

The Plain Writing Act of 2010 (Pub. L. 111-274) requires Federal agencies to write documents in a clear, concise, and well-organized manner. The NRC has written this document to be consistent with the Plain Writing Act as well as the Presidential Memorandum, "Plain Language in Government Writing," published June 10, 1998 (63 FR 31883). The NRC requests comment on the proposed rule with respect to the clarity and effectiveness of the language used.

VIII. Voluntary Consensus Standards

The National Technology Transfer and Advancement Act of 1995 (Pub. L. 104-113) requires that Federal agencies use technical standards that are developed or adopted by voluntary consensus standards bodies unless the use of such a standard is inconsistent with applicable law or otherwise impractical. In this proposed rule, the NRC would modify its generic determination on the consideration of environmental impacts of continued storage of spent nuclear fuel beyond the licensed life for reactor operations. The NRC is not aware of any voluntary consensus standards that address the proposed subject matter of this proposed rule. The NRC will consider using a voluntary consensus standard if an appropriate standard is identified. If a voluntary consensus standard is identified for consideration, the submittal should explain why the standard should be used.

IX. Draft Environmental Impact Statement: Availability

As required by the National Environmental Policy Act of 1969, as amended, and the NRC's regulations in subpart A of 10 CFR part 51, the NRC has prepared a Draft Generic Environmental Impact Statement (NUREG-2157) to support this proposed rule. An interested person may access this environmental impact statement as indicated under Section V of this document, "Availability of Documents."

The NRC requests public comment on the DGEIS. The NRC has sent a copy of the DGEIS and this proposed rule to every State Liaison Officer and requested their comments on the draft statement. Comments on the draft statement may be submitted to the NRC as indicated under the ADDRESSES heading of this document.

X. Paperwork Reduction Act Statement

This proposed does not contain new or amended information collection requirements subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing requirements were approved by the Office of Management and Budget, approval number 3150-0021.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid Office of Management and Budget control number.

XI. Regulatory Analysis

A draft regulatory analysis has not been prepared for this proposed regulation because this regulation does not establish any requirements that would place a burden on licensees. A cost-benefit analysis of the alternatives considered in the DGEIS was prepared as part of the DGEIS (Chapter 7). If continued storage of spent nuclear fuel beyond the licensed life for operations must be accessed in site-specific licensing actions, the primary costs accrue to NRC and to license applicants. License applicants ultimately shoulder the majority of costs incurred to the NRC in the course of licensing actions through the NRC's license-fee program. Costs also accrue through NRC adjudicatory activities, which affect the NRC, license applicants, and petitioners or intervenors. The DGEIS estimates that it could cost over $24 million to address continued storage in site-specific proceedings.

XII. Regulatory Flexibility Certification

In accordance with the Regulatory Flexibility Act of 1980 (5 U.S.C. 605(b)), the Commission certifies that this rule would not, if promulgated, have a significant economic impact on a substantial number of small entities. The proposed rule would modify the generic determination on the consideration of environmental impacts of continued storage of spent nuclear fuel beyond the end of the licensed life for reactor operations. This generic determination provides that no discussion of any environmental impact of spent nuclear fuel storage in reactor facility storage pools or ISFSIs for the period following the term of the reactor operating license or amendment or initial ISFSI license or amendment for which application is made is required in any environmental report, environmental impact statement, environmental assessment, or other analysis prepared in connection with certain actions. The proposed rule would affect only the licensing of nuclear power plants or ISFSIs. Entities seeking or holding NRC licenses for these facilities do not fall within the scope of the definition of "small entities" set forth in the Regulatory Flexibility Act or the size standards established by the NRC at 10 CFR 2.810.

XIII. Backfitting and Issue Finality

The NRC has determined that the backfit rules (§§ 50.109, 70.76, 72.62, or 76.76) and the issue finality provisions in 10 CFR part 52 do not apply to this proposed rule because this amendment does not involve any provisions that will either impose backfits as defined in 10 CFR chapter I, or represent non-compliance with the issue finality of provisions in 10 CFR part 52. Therefore, a backfit analysis is not required for this proposed rule, and the NRC did not prepare a backfit analysis for this proposed rule.

List of Subjects In 10 CFR Part 51

Administrative practice and procedure, Environmental impact statement, Nuclear materials, Nuclear power plants and reactors, Reporting and recordkeeping requirements

For the reasons set out in the preamble and under the authority of the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; and 5 U.S.C. 553; the NRC is proposing to adopt the following amendments to 10 CFR part 51.

Part 51 - Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions

1. The authority citation for part 51 continues to read as follows:

AUTHORITY: Atomic Energy Act sec. 161, 1701 (42 U.S.C. 2201, 2297f); Energy Reorganization Act secs. 201, 202, 211 (42 U.S.C. 5841, 5842, 5851); Government Paperwork Elimination Act sec. 1704 (44 U.S.C. 3504 note). Subpart A also issued under National Environmental Policy Act secs. 102, 104, 105 (42 U.S.C. 4332, 4334, 4335); Pub. L. 95-604, Title II, 92 Stat. 3033-3041; Atomic Energy Act sec. 193 (42 U.S.C. 2243). Sections 51.20, 51.30, 51.60, 51.80. and 51.97 also issued under Nuclear Waste Policy Act secs. 135, 141, 148 (42 U.S.C. 10155, 10161, 10168). Section 51.22 also issued under Atomic Energy Act sec. 274 (42 U.S.C. 2021) and under Nuclear Waste Policy Act sec. 121 (42 U.S.C. 10141). Sections 51.43, 51.67, and 51.109 also issued under Nuclear Waste Policy Act sec. 114(f) (42 U.S.C. 10134(f)).

2. In § 51.23, the title of the section is revised and paragraphs (a) and (b) are

revised to read as follows:

§ 51.23 Environmental effect of continued storage of spent nuclear fuel beyond the licensed life for operation of a reactor.

(a) The Commission has developed a generic environmental impact statement (NUREG-2157) addressing the environmental impact of storage of spent fuel beyond the licensed life for operation of a reactor, which also includes analyses of different timings for the availability of a repository. Based on NUREG-2157, the Commission has concluded the following:

(1) The most reasonable scenario is that a mined geologic repository can be available within 60 years following the licensed life of operation for a reactor;

(2) The analysis in NUREG-2157 is adequate to determine that it is feasible that the spent nuclear fuel can be stored safely; and

(3) The analysis in NUREG-2157 is adequate to reach a generic conclusion on the environmental impacts of storage of spent fuel for 60 years beyond the licensed life for operation of a reactor.

(b) As provided in §§ 51.30(b), 51.53, 51.61, 51.80(b), 51.95, and 51.97(a), and within the scope of the generic determination in paragraph (a) of this section, no discussion of any environmental impact of spent fuel storage in reactor facility storage pools or independent spent fuel storage installations (ISFSI) for the period following the term of the reactor operating license or amendment, reactor combined license or amendment, or ISFSI license, renewal, or amendment for which application is made, is required in any environmental report, environmental impact statement, environmental assessment, or other analysis prepared in connection with the issuance or amendment of an operating license for a nuclear power reactor under parts 50 and 54 of this chapter, or issuance or amendment of a combined license for a nuclear power reactor under parts 52 and 54 of this chapter, or the issuance of an initial license for storage of spent fuel at an ISFSI, or any amendment thereto.

*   *   *   *   *

3. In appendix B to subpart A of part 51, footnote 7 is being removed from the table and the “Onsite storage of spent nuclear fuel” issue and “Offsite radiological impacts of spent nuclear fuel and high-level waste disposal” issue under the “Waste Management” section of Table B-1 is revised to read as follows:

Appendix B to Subpart A—Environmental Effect of Renewing the Operating License of a Nuclear Power Plant

Table B-1—Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants[1]

*   *   *   *   *

Issue	Category[2]	Finding[3]
Waste Management		
Onsite storage of spent nuclear fuel	1	SMALL. The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated onsite with small environmental effects through dry or pool storage at all plants, if a permanent repository or monitored retrievable storage is not available.

Offsite radiological impacts of spent nuclear fuel and high-level waste disposal	1	For the high-level waste and spent-fuel disposal component of the fuel cycle, the EPA established a dose limit of 15 millirem (0.15 mSv) per year for the first 10,000 years and 100 millirem (1.0 mSv) per year between 10,000 years and 1 million years for offsite releases of radionuclides at the proposed repository at Yucca Mountain, Nevada. The Commission concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high level waste disposal, this issue is considered Category 1.

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Dated at Rockville, Maryland, this______________ day of_______, 2013.

For the Nuclear Regulatory Commission.

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Annette Vietti-Cook,
Secretary of the Commission.