displays a currently valid OMB control number.

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.

Regulatory Flexibility Certification

Under the Regulatory Flexibility Act of 1980, 5 U.S.C. 605(b), the Commission certifies that this rule, if adopted, would not have a significant economic impact on a substantial number of small entities. The proposed rule would describe a revised basis for continuing in effect the current provisions of 10 CFR 51.23(b) which provides that no discussion of any environmental impact of spent 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. This rule affects only the licensing and operation of nuclear power plants or ISFSIs. Entities seeking or holding Commission 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.

Backfit Analysis

The NRC has determined that the backfit rule (§§ 50.109, 70.76, 72.62, or 76.76) does not apply to this proposed rule because this amendment would not involve any provisions that would impose backfits as defined in the backfit rule. Therefore, a backfit analysis is not required.

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 amendment 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: Sec. 161, 68 Stat. 948, as amended, sec. 1701, 106 Stat. 2951, 2952, 2953, (42 U.S.C. 2201, 2297(f)); secs. 201, as amended, 202, 88 Stat. 1242, as amended, 1244 (42 U.S.C. 5841, 5842); sec. 1704, 112 Stat. 2750 (44 U.S.C. 3504 note). Subpart A also issued under National Environmental Policy Act of 1969, secs. 102, 104, 105, 83 Stat. 853–854, as amended (42 U.S.C. 4332, 4334, 4335), and Public Law 95–604, Title II, 92 Stat. 3033–3041; and sec. 193, Public Law 101–575, 104 Stat. 2835 (42 U.S.C. 2243). Sections 51.20, 51.30, 51.60, 41.80, and 51.97 also issued under secs. 135, 141, Public Law 97–425, 96 Stat. 2232, 2241, and sec. 148, Public Law 100–203, 101 Stat. 1330–223 (42 U.S.C. 10155, 10161, 10168). Section 51.22 also issued under sec. 274, 73 Stat. 688, as amended by 92 Stat. 3036–3038 (42 U.S.C. 2021) and under Nuclear Waste Policy Act of 1982, sec. 121, 96 Stat. 2228 (42 U.S.C. 10141). Sections 51.43, 51.67, and 51.109 also under Nuclear Waste Policy Act of 1982, sec 114(f), 96 Stat 2216, as amended (42 U.S.C. 10134 (f)).

2. In § 51.23, paragraph (a) is revised to read as follows:

§ 51.23 Temporary storage of spent fuel after cessation of reactor operation—generic determination of no significant environmental impact.

(a) The Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts 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 independent spent fuel storage installations until a disposal facility can reasonably be expected to be available.

* * * * *

Dated at Rockville, Maryland, this 29th day of September 2008.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,

Secretary of the Commission.

[FR Doc. E8–23384 Filed 10–8–08; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

10 CFR Part 51

[Docket ID–2008–0482]

Waste Confidence Decision Update

AGENCY: Nuclear Regulatory Commission.

ACTION: Update and proposed revision of Waste Confidence Decision.

SUMMARY: On September 18, 1990, the Nuclear Regulatory Commission (NRC or Commission) issued a decision reaffirming and revising, in part, the five Waste Confidence findings reached in its 1984 Waste Confidence Decision. The 1984 decision and the 1990 review were products of rulemaking proceedings designed to assess the degree of assurance that radioactive wastes generated by nuclear power plants can be safely disposed of, to determine when such disposal or offsite storage would 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. The Commission has decided to again undertake a review of its Waste Confidence findings as part of an effort to enhance the efficiency of combined operating license proceedings for applications for nuclear power plants anticipated in the near future. To assure that its Waste Confidence findings are up-to-date, the Commission has prepared an update of the findings and proposes to revise two of the findings. The purpose of this notice is to seek public comment on the update and the proposed revisions.

The Commission proposes that the second and fourth findings in the Waste Confidence Decision be revised as follows:

Finding 2: The Commission finds reasonable assurance that sufficient mined geologic repository capacity can reasonably be expected to be available within 50–60 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 fuel originating in such reactor and generated up to that time.

Finding 4: The Commission finds reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely 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 independent spent fuel storage installations.

The Commission proposes to reaffirm the remaining findings. Each finding, any proposed revisions, and the reasons for revising or reaffirming them are discussed below. In keeping with the proposed revised Findings 2 and 4, the Commission is publishing concurrently

in this issue of the **Federal Register** proposed conforming amendments to its 10 CFR part 51 rule providing its generic determination on the environmental impacts of storage of spent fuel at, or away from, reactor sites after the expiration of reactor operating licenses.

DATES: Submit comments by December 8, 2008. Comments received after this date will be considered if it is practical to do so, but NRC is able to assure consideration only for comments received on or before this date.

ADDRESSES: You may submit comments by any one of the following methods. Comments submitted in writing or in electronic form will be made available for public inspection. Because your comments will not be edited to remove any identifying or contact information, the NRC cautions you against including any information in your submission that you do not want to be publicly disclosed.

Federal e-Rulemaking Portal: Go to *http://www.regulations.gov* and search for documents filed under Docket ID [NRC–2008–0482]. Address questions about NRC dockets to Carol Gallagher 301–415–5905; e-mail *Carol.Gallagher@nrc.gov.*

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

E-mail comments to: *Rulemaking.Comments@nrc.gov.* If you do not receive a reply e-mail confirming that we have received your comments, contact us directly at 301–415–1677.

Hand deliver comments to: 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 am and 4:15 pm Federal workdays. (Telephone 301–415–1677).

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

You can access publicly available documents related to this document using the following methods:

NRC's Public Document Room (PDR): The public may examine and have copied for a fee publicly available documents at the NRC's PDR, Public File Area O1 F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland.

NRC's Agencywide Documents Access and Management System (ADAMS): Publicly available documents created or received at the NRC are available electronically at the NRC's Electronic Reading Room at *http://www.nrc.gov/reading-rm/adams.html.* From this page, the public can gain entry into ADAMS, which provides text and image files of NRC's public documents. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's PDR reference staff at 1–800–397–4209, 301–415–4737, or by e-mail to *pdr.resource@nrc.gov.*

FOR FURTHER INFORMATION CONTACT: Neil Jensen, Office of the General Counsel, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001, telephone 301–415–8480, e-mail, *neil.jensen@nrnc.gov.*

SUPPLEMENTARY INFORMATION:

Background

In October 1979, the NRC initiated a rulemaking proceeding, known as the Waste Confidence proceeding, to assess its degree of 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 1372; October 25, 1979). The Commission's action responded to a remand from the U.S. Court of Appeals for the District of Columbia Circuit in *State of Minnesota* v. *NRC,* 602 F.2d 412 (1979). That case raised the question whether an offsite storage or disposal solution would be available for the spent nuclear fuel (SNF) produced at the Vermont Yankee and Prairie Island reactors at the expiration of the licenses for those facilities in the 2007–2009 period or, if not, whether the SNF could be stored at those reactor sites until an offsite solution was available. The Waste Confidence proceeding also stemmed from the Commission's statement, in its denial of a petition for rulemaking filed by the Natural Resources Defense Council (NRDC), that it intended to reassess periodically its finding of reasonable assurance that methods of safe permanent disposal of high-level radioactive waste (HLW) would be available when they were needed. Further, the Commission stated 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)).[1]

The Waste Confidence proceeding resulted in five Waste Confidence findings which the Commission issued August 31, 1984; 49 FR 34658:

(1) The Commission finds reasonable assurance that safe disposal of HLW and SNF in a mined geologic repository is technically feasible;

(2) The Commission finds reasonable assurance that one or more mined geologic repositories for commercial HLW and SNF will be available by the years 2007–2009, and that sufficient repository capacity will be available within 30 years beyond the expiration of any reactor operating license to dispose of existing commercial HLW and SNF originating in such reactor and generated up to that time;

(3) The Commission finds reasonable assurance that HLW and SNF will be managed in a safe manner until sufficient repository capacity is available to assure the safe disposal of all HLW and SNF;

(4) The Commission finds reasonable assurance that, if necessary, spent 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 independent spent fuel storage installations (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.

Based on these findings, the Commission amended 10 CFR part 51 of its regulations to provide a generic determination, codified in 10 CFR 51.23(a), that for at least 30 years beyond the expiration of reactor operating licenses, no significant environmental impacts will result from the storage of spent fuel in reactor facility storage pools or ISFSIs located at reactor or away-from-reactor sites.

The Commission conducted a review of its findings in 1989–1990 which 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 operating license referred to the full 40 year initial license for operation, as well as any additional term of a revised or renewed license. These findings are:

[1] The NRDC petition asserted that the Atomic Energy Act of 1954, as amended (AEA), required NRC to make a finding, before issuing an operating license for a reactor, that permanent disposal of HLW generated by that reactor can be accomplished safely. The Commission found that the AEA did not require this safety finding to be made in the context of reactor licensing, but rather in the context of the licensing of a geologic disposal facility.

(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 HLW and SNF originating in such reactor and generated up to that time;

(4) The Commission finds reasonable assurance that, if necessary, spent fuel generated in 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 amended the generic determination made in 10 CFR 51.23(a) consistent with these revised findings (55 FR 38472; September 18, 1990):

> The Commission has made a generic determination that, if necessary, spent fuel generated in 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]. Further, the Commission believes there is 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 of any reactor to dispose of the commercial [HLW and SNF] originating in such reactor and generated up to that time.

This generic determination is applied in licensing proceedings conducted under 10 CFR Parts 50, 52, 54 and 72. *See* 10 CFR 51.23 (2008).

In 1999, the Commission reviewed its Waste Confidence findings and concluded that experience and developments since 1990 had confirmed the findings and made a comprehensive reevaluation of the findings unnecessary. It also stated that it would consider undertaking such a reevaluation when the impending repository development and regulatory activities run their course or if significant and pertinent unexpected events occur, raising substantial doubt about the continuing validity of the Waste Confidence findings (64 FR 68005; December 6, 1999).

The Commission does not believe that the criteria set in 1999 for reopening the Waste Confidence findings have been met. However, the Commission is now preparing to conduct a significant number of proceedings on combined construction permit and operating license (COL) applications for new reactors. The Commission anticipates that the issue of waste confidence may be raised in those proceedings and desires to take a fresh look at its Waste Confidence findings to take into account developments since 1990. For this purpose, the Commission has prepared this update of the Waste Confidence findings and now proposes the following revisions of Findings 2 and 4:

(2) The Commission finds reasonable assurance that sufficient mined geologic repository capacity can reasonably be expected to be available within 50–60 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 HLW and SNF originating in such reactor and generated up to that time.

(4) The Commission finds reasonable assurance that, if necessary, spent 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.

The update restates and supplements the bases for the earlier findings. The Commission seeks public comment on the update and on its proposed revisions of Findings 2 and 4.

The Commission is also publishing concurrently in this issue of the **Federal Register** a proposed rule revising 10 CFR 51.23(a) to conform with the proposed revisions of Findings 2 and 4.

I. Finding 1: The Commission Finds Reasonable Assurance That Safe Disposal of High-Level Radioactive Waste and Spent Fuel in a Mined Geologic Repository Is Technically Feasible

A. Bases for Finding 1

The Commission reached this finding in 1984 and reaffirmed it in 1990. The focus of this finding is on whether safe disposal of HLW and SNF is technically possible using existing technology and without a need for any fundamental breakthroughs in science and technology. To reach this finding, the Commission considered the basic features of a repository designed for a multi-barrier system for waste isolation and examined the problems the Department of Energy (DOE) would need to resolve in developing a final design for such a repository. The Commission identified three major technical problems: (1) The selection of a suitable geologic setting as host for a technically acceptable repository site; (2) the development of waste packages that will contain the waste until the fission products are greatly reduced; and (3) the development of engineered barriers, such as backfilling and sealing of the drifts and shafts of the repository, that can effectively retard migration of radionuclides out of the repository (49 FR 34667; August 31, 1984).

DOE's selection of a suitable geologic setting has been governed by Congress' passage of the Nuclear Waste Policy Act of 1982, Public Law 97–425, 42 U.S.C. 10101 *et seq.* (NWPA) and by the 1987 amendments to NWPA in the Nuclear Waste Policy Amendments Act, Pub. L. 100–202 (NWPAA). DOE had begun to explore potential repository sites before the NWPA, but that Act set in place a formal process and schedule for the development of two geologic repositories. The following brief summary of key provisions of these Acts may assist readers in understanding the process followed by DOE in locating a suitable geologic setting.

As initially enacted, NWPA directed DOE to issue guidelines for the recommendation of sites and then to nominate at least 5 sites as being suitable for site characterization for selection as the first repository site and, not later than January 1, 1985, to recommend 3 of those sites to the President for characterization as candidate sites. Section 112 of NWPA, 42 U.S.C. 10132. Not later than July 1, 1989, DOE was to again nominate 5 sites and recommend 3 of them to the President for characterization for selection of the second repository. *Id.* DOE was then to carry out site characterization activities for approved sites. Section 113 of NWPA, 42 U.S.C. 10133. Following site characterization, DOE was then 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. Section 114 of NWPA, 42 U.S.C. 10134. States and affected Indian tribes were given the opportunity to object, but if the recommendations were approved by Congress, DOE was then to submit applications for a construction authorization to NRC. *Id.* 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 of heavy metal (MTHM) until a

second repository was in operation. *Id.* The 1987 NWPAA, *inter alia,* restricted site characterization solely to a site at Yucca Mountain, NV (YM) and terminated the program for a second repository. The NWPAA provided that if DOE at any time determines YM to be unsuitable for development as a repository, DOE must report to Congress its recommendations for further action to assure the safe, permanent disposal of SNF and HLW, including the need for new legislation. Section 113 of NWPA, as amended, 42 U.S.C. 10133.

In 1984, the Commission reviewed DOE's site exploration program and concluded that it was providing information on site characteristics at a sufficiently large number and variety of sites and geologic media to support the expectation that one or more technically acceptable sites would be identified (49 FR 34668; August 31, 1984). In 1990, the Commission noted that the 1987 amendment of NWPA that focused solely on the YM site carried the potential for considerable delay in opening a repository if that site were found to be unlicenseable. However, the possibility of that delay did not undermine the Commission's confidence that a technically acceptable site would be located, either at YM or elsewhere. The Commission observed that the NRC staff had provided extensive comments on DOE's draft environmental assessments of the 9 sites it had identified as being potentially acceptable and on the final environmental assessments for the 5 sites nominated.[2] NRC had not identified any fundamental technical flaw or disqualifying factor which would render any of the sites unsuitable for characterization or potentially unlicenseable, although NRC noted that many issues would need to be resolved during site characterization for YM or any other site (55 FR 38486; September 18, 1990).

With respect to the development of effective waste packages, the Commission, in 1984, reviewed DOE's scientific and engineering program on this subject. The Commission also considered whether the possibility of renewed reprocessing of SNF might alter the technical feasibility of achieving a suitable waste package because of the need to accommodate a waste form other than spent fuel. The Commission concluded that the studies of DOE and others demonstrated that the chemical and physical properties of SNF and HLW can be sufficiently understood to permit the design of a suitable waste package and that the possibility of commercial reprocessing would not substantially affect this conclusion (49 FR 34671; August 31, 1984). In 1990, the Commission reviewed continued research and experimentation on waste packages that were undertaken by DOE in other countries, particularly Sweden and Canada. NRC noted that DOE had narrowed the range of waste package designs to a design tailored for unsaturated tuff at the YM site due to the 1987 redirection of the HLW program. NRC also noted that some reprocessing wastes from the defense program and the West Valley Demonstration Project were now anticipated to be disposed in the repository. However, NRC remained confident that, given a range of waste forms and conservative test conditions, the technology is available to design acceptable waste packages (55 FR 38489; September 18, 1990).

With respect to the development of effective engineered barriers, the Commission's confidence in 1984 rested upon its consideration of DOE's ongoing research and development activities regarding backfill materials and borehole and shaft sealants which led it to the conclusion that these activities provided a basis for reasonable assurance that engineered barriers can be developed to isolate or retard radioactive material released by the waste package (49 FR 34671; August 31, 1984). In 1990, although DOE's research had narrowed to focus on YM, the Commission continued to have confidence that backfill or packing materials can be developed as needed for the underground facility and waste package, and that an acceptable seal can be developed for candidate sites in different geologic media (55 FR 38489–38490; September 18, 1990).

B. Evaluation of Finding 1

There remains high confidence among the scientific and technical community engaged in waste management that safe geologic disposal is achievable with currently available technology. *See, e.g.,* National Research Council, *''Technical Bases for Yucca Mountain Standards,''* 1995. No insurmountable technical or scientific problem has emerged to disturb this confidence that safe disposal of SNF and HLW can be achieved in a mined geologic repository. To the contrary, there has been significant progress in the enhancement of scientific understanding and technological development needed for geologic disposal over the past 18 years. There is now a much deeper understanding of processes that affect the ability of repositories to isolate waste over long periods. *Id.* at 71–72; 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, in underground research laboratories, 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.

In the United States, the technical approach for safe HLW disposal has remained unchanged for several decades: Use a deep geologic repository containing natural barriers to hold canisters of HLW with additional engineered barriers to further retard radionuclide release. Although some specifics in this technical approach have changed in response to new knowledge (*e.g.*, engineered backfill was removed as a design concept for YM in the late 1990s in response to enhanced understandings of heat and water transfer processes in the near-field drift environment), safe disposal continues to appear to be a feasible goal with current technology. Assessments for long-term performance of a potential repository at YM were conducted by DOE in 1998 (DOE/RW–0508, Viability Assessment) and 2002 (DOE/RW–0539, Site Recommendation). These assessments used existing technology and available scientific information, and did not identify areas where fundamental

[2] Under the program established by the initial NWPA, DOE had nominated sites at Hanford WA, Yucca Mountain NV, Deaf Smith County TX, Davis Canyon UT, and Richton Dome MS, and had recommended the first 3 sites for site characterization.

breakthroughs in science or technology were needed to support the assessments.

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 YM site in 2002. On June 3, 2008, DOE submitted the application to NRC and on September 08, 2008, NRC Staff notified DOE that it found the application acceptable for docketing (73 FR 53284; September 15, 2008). Whether this particular site will be found to be technically acceptable must await the outcome of an NRC licensing proceeding. The 1987 amendments to NWPA barred DOE from continuing site investigations elsewhere within the U.S. However, Congress' decision to focus solely on YM was not based on any finding that information DOE had obtained on other sites ruled them out for technical reasons; rather, the decision was aimed at controlling the costs of the HLW program (55 FR 38486; September 18, 1990). Repository programs in other countries are actively considering crystalline rock, clay formations, and salt formations as repository host media. IAEA, ''Radioactive Waste Management Status 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. Many of these programs have been conducting research on these geologic media for several decades. Although there are relative strengths to the capabilities of each of these potential host media, no geologic media previously identified as a candidate host has been ruled out based on technical or scientific information. Salt formations currently are being considered as hosts only for reprocessed nuclear materials because heat-generating waste, like spent nuclear fuel, exacerbates a process by which salt can rapidly deform. This process could potentially cause problems for keeping drifts stable and open during the operating period of a repository.

In 2001, NRC amended its regulations to include a new 10 CFR Part 63, ''Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada,'' (66 FR 55732; November 2, 2001), which requires use of both natural and engineered barriers to meet overall total system performance objectives without pre-determined subsystem performance requirements, such as substantially complete containment for a waste package, as is required in 10 CFR Part 60.[3] Accordingly, U.S. research and development activities have focused on understanding the long-term capability of natural and engineered barriers which can prevent or substantially reduce the release rate of radionuclides from a potential repository system. Although the performance of individual barriers may change through time, the overall performance of the total system is required to be acceptable throughout the performance period for the repository. In this context of total system performance, research and development has supported the view that it appears technically possible to design and construct a waste package and an engineered barrier system that, in conjunction with natural barriers, could prevent or substantially reduce the release rate of radionuclides from a potential repository system during the performance period. NRC, ''Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada; Proposed Rule,'' (64 FR 8649; February 22, 1999); IAEA, ''Joint Convention on Safety of Spent Fuel Management and on Safety of Radioactive Waste Management, INFCIRC/546,'' 1997.

Since the Commission last considered Waste Confidence issues, NRC has issued design certifications under its regulations at 10 CFR Part 52, ''Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants,'' and is currently reviewing several plant designs in response to applications for design certifications and for COL applications that reference designs under review or designs previously certified. These facilities would use the same or similar fuel assembly designs as the nuclear power plants currently operating in the United States. A need for possible design changes for repository disposal may be affected by the extent of a licensee's reliance on cladding or fuel type as a barrier to waste isolation. If limited reliance is placed on the barrier capabilities of cladding or fuel type in a demonstration of compliance with repository safety requirements, then minimal design changes may be needed to accommodate new types of SNF or cladding. As such, the new reactor designs and specific license applications currently under review would not raise issues as to the technical feasibility of repository disposal.

NRC is also engaged in preliminary interactions with DOE and possible reactor vendors proposing advanced reactor designs that are different from the currently operating light-water reactors. Some of these advanced reactors use gas-cooled or liquid metal cooled technologies and have fuel and reactor components that might require different transportation and storage containers. Geometric, thermal, and criticality constraints could conceivably require a design modification to disposal containers from that currently proposed for YM. Nevertheless, the technical requirements for disposal of advanced reactor components appear similar to the requirements for disposal of components for current light water reactors. For example, DOE currently plans to dispose of spent fuel at YM from both gas-cooled (Peach Bottom 1) and liquid-metal cooled (Fermi 1) reactors, using the same basic technological approach as for other SNF. Although radionuclide inventory, fuel matrix, and cladding characteristics for advanced fuels might be distinct from current light-water reactors, the safe disposal of advanced fuel appears to involve the same scientific and engineering knowledge as used for fuel from current light-water reactors.

There is currently a high uncertainty regarding the growth of advanced reactors in the U.S. The licensing strategy developed by NRC and DOE for the next generation nuclear plant (NGNP) program found that an aggressive licensing approach may lead to operation of a prototype facility in 2021. Based on comparison with current disposal strategies for fuel from existing gas cooled or liquid-metal cooled reactors, NRC is confident that current technology appears to be adequate to support the safe disposal of spent fuel from a potential prototype facility. In addition to the NGNP activities related to the prototype reactor, various activities, such as DOE's Advanced Fuel Cycle Initiative, are underway to evaluate fuel cycle alternatives that could affect the volume and form of waste from the prototype reactor or other advanced nuclear reactor designs. The need to consider waste disposal as part of the overall research and development activities for advanced reactors is recognized and included in the activities of designers, DOE and NRC. *See, e.g.*, DOE Nuclear Energy Research Advisory Committee and the Generation IV International Forum, ''A Technology Roadmap for Generation IV

[3] NRC's regulations at 10 CFR Part 63 apply only to the proposed repository at YM. NRC's regulations at 10 CFR Part 60, ''Disposal of High-Level Radioactive Wastes in Geologic Repositories,'' govern the licensing of any repository other than one located at YM. However, at the time Part 63 was proposed, the Commission indicated it would consider revising Part 60 if it seemed likely to be used in the future. 64 FR 8640, 8643; February 22, 1999.

Nuclear Energy Systems,'' December 2002.

Based on the information described previously, the Commission proposes to reaffirm Finding 1.

II. Finding 2 (1990): 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 That 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 Fuel Originating in Such Reactor and Generated Up to That Time

A. Bases for Finding 2

The dual objectives of this finding are to predict when a repository will be available for use and to predict how long spent fuel may need to be stored at a reactor site until repository space is available for the spent fuel generated at that reactor. With respect to the first prediction, the Commission's focus in 1984 was on the years 2007–2009, the years during which the operating licenses for the Vermont Yankee and Prairie Island nuclear power plants would expire.[4] In 1984, DOE anticipated that the first repository would begin operation in 1998 and the second in 2004. However, NRC concluded that technical and institutional uncertainties made it preferable to focus on the 2007–2009 time period. The technical uncertainties involved the questions of how long it would take DOE to locate a suitable geologic setting for a potentially technically acceptable repository and how long it would take to develop an appropriate waste package and engineered barriers. The Commission expressed the view that despite early delays DOE's program was on track and, under the impetus given by the recently-enacted NWPA, would timely resolve the technical problems (49 FR 34674–34675; August 31, 1984).

The Commission also identified institutional uncertainties that needed to be resolved: (1) Measures for dealing with Federal-state disputes; (2) An assured funding mechanism that would be sufficient over time to cover the period for developing a repository; (3) An organizational capability for managing the HLW program; and (4) A firm schedule and establishment of responsibilities. The Commission expressed its confidence in the ability of the provisions of the then recently-passed NWPA to timely resolve these uncertainties (49 FR 34675–34679; August 31, 1984).

With respect to the second prediction, NRC reviewed DOE's estimates of the amount of installed generating capacity of commercial nuclear power plants in the year 2000 and concluded that the total amount of spent fuel that would be produced during the operating lifetimes of these reactors would likely be about 160,000 MTHM. To accommodate this amount, NRC assumed that two repositories would be needed. NRC calculated that if the first repository began to receive SNF in 2005, and the second in 2008, then all the SNF would be emplaced by about 2026. This would mean that sufficient repository capacity would be available within 30 years beyond the expiration of any reactor license for disposal of its SNF (49 FR 34679; August 31, 1984).

In reviewing these predictions in 1990, the Commission faced a considerably changed landscape. First, DOE's schedule for the availability of a repository had slipped several times so that its then-current projection was 2010. Second, Congress' 1987 amendment of NWPA had confined site characterization to the YM site, meaning that there were no ''back-up'' sites being characterized in case the YM site should be found unsuitable or unlicenseable. Finally, site characterization activities at YM had not proceeded without problems, notably in DOE's schedule for sub-surface exploration and in development of its quality assurance program. Given these considerations, the Commission found it would not be prudent to reaffirm its confidence in the availability of a repository in the 2007–2009 period (55 FR 38495; September 18, 1990).

Instead, the Commission found that it would be reasonable to assume that DOE could make its finding whether YM was suitable for development of a repository by the year 2000. The Commission was unwilling to assume that DOE would make a finding of suitability (which would be necessary for a repository to be available by 2010). To establish a new time-frame for repository availability, the Commission made the assumption that DOE would find the YM site unsuitable by the year 2000 and that (as DOE had estimated) it would take 25 years for a repository to become available at a different site.

The Commission then considered whether it had sufficient bases for confidence that a repository would be available by 2025 using the same technical and institutional criteria it had used in 1984. The Commission found no reason to believe that another potentially technically acceptable site could not be located if the YM site were found unsuitable. The development of a waste package and engineered barriers was tied up with the question of the suitability of the YM site but NRC found no reason to believe that a waste package and engineered barriers could not be developed for a different site by 2025, if necessary (55 FR 38495; September 18, 1990). The institutional uncertainties were perhaps more difficult to calculate. The Commission acknowledged that DOE's efforts to address the concerns of States, local governments and Indian tribes had met with mixed results. Nevertheless, the Commission retained its confidence that NWPA, as amended, had achieved the proper balance between providing for participation by affected parties and providing for the exercise of Congressional authority to carry out the national program for waste disposal (55 FR 38497; September 18, 1990). Similarly, the Commission believed that management and funding issues had been adequately resolved by NWPA, as amended, and would not call into question the availability of a repository by 2025 (55 FR 38497–38498; September 18, 1990). Thus, except for the schedule, the Commission was confident that the HLW program set forth in the amended NWPA would ultimately be successful.

The Commission also considered whether the termination of activities for a second repository, combined with the 70,000 MTHM limit for the first repository, together with its new projection of 2025 as the time for the availability for a repository, undermined its prediction that sufficient repository capacity would be available within 30 years beyond expiration of any reactor operating license to dispose of the SNF originating in such reactor and generated up to that time (55 FR 38501–38504; September 18, 1990). The Commission noted that almost all reactor licenses would not expire until some time in the first three decades of the twenty-first century and license renewal was expected to extend the terms of some of these licenses. Thus, a repository was not needed by 2007–2009 to provide disposal capacity within 30 years beyond expiration of

[4] Under the court remand which 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 (DCDC Cir. 1979).

most operating licenses.[5] The Commission acknowledged, however, that it appeared likely that two repositories would be needed to dispose of all the SNF and HLW from the current generation of reactors unless Congress provided statutory relief from the 70,000 MTHM limit for the first repository and unless the first repository had adequate capacity to hold all the SNF and HLW generated. This was because DOE's spent fuel projections, in 1990, called for 87,000 MTHM to have been generated by the year 2036. In addition, DOE's projections were based on the assumption of no new reactor orders. The Commission believed that that assumption probably underestimated the total spent fuel discharges to be expected due to the likelihood of reactor license renewals. The Commission expressed the belief that if the need for a second repository was established, Congress would provide the needed institutional support and funding, as it had for the first repository.[6] The Commission reasoned that if work began on the second repository program in 2010, that repository could be available by 2035. Two repositories available in approximately 2025 and 2035, each with acceptance rates of 3400 MTHM/year within several years after commencement of operations, would provide assurance that sufficient repository capacity will be available within 30 years of operating license expiration for reactors to dispose of the spent fuel generated at their sites up to that time. The Commission concluded that a second repository, or additional capacity at the first repository, would be needed only to accommodate the additional quantity of spent fuel generated during the later years of reactors operating under a renewed license. The Commission stated that the availability of a second repository would permit spent fuel to be shipped offsite well within 30 years after expiration of these reactors' operating licenses and that the same would be true of the spent fuel discharged from any new generation of reactor designs (55 FR 38503–38504; September 18, 1990).

The Commission acknowledged that there were several licenses that had been prematurely terminated where it was possible that SNF would be stored more than 30 years beyond the effective expiration of the license and that there could be more of these premature terminations. However, the Commission remained confident that in these cases, the overall safety and environmental impacts of extended spent fuel storage would be insignificant. The Commission had found that spent fuel could be safely stored for at least 100 years (Finding 4),[7] and that spent fuel in at-reactor storage would be safely maintained until disposal capacity at a repository was available (Finding 3). The Commission emphasized that it had not identified a date by which a repository must be available for health and safety reasons. The Commission found that in effect, under the second part of Finding 2, safe management and safe storage would not need to continue for more than 30 years beyond expiration of any reactor's operating license because sufficient repository capacity was expected to become available within those 30 years (55 FR 38504; September 18, 1990).

B. Evaluation of Finding 2

As explained previously, the Commission based its estimate in 1990 on the premise that at least one geologic repository would be available within the first quarter of the twenty-first century on an assumption that DOE would make its suitability determination under section 114 of NWPA around the year 2000. To avoid being put in the position of assuming the suitability of the YM site, the Commission then assumed that DOE would find that site unsuitable and, as DOE had estimated, that it would take 25 years before a repository could become available at an alternate site.

DOE made its suitability determination in early 2002 and found the YM site suitable for development as a repository.[8] Although DOE's application for a construction authorization for a repository was considerably delayed from the schedule set out in NWPA,[9] on June 3, 2008, DOE submitted the application to NRC and on September 08, 2008, NRC Staff notified DOE that it found the application acceptable for docketing (73 FR 53284; September 15, 2008). DOE's current estimate of the best achievable date for opening of the YM repository, assuming it is licensed, is 2020. At the hearing before the Subcommittee on Energy and Air Quality of the House Committee on Energy and Commerce held on July 15, 2008, Edward F. Sproat III, Director of DOE's Office of Civilian Radioactive Waste Management (OCRWM), informed the Congress that DOE could be ready to begin accepting SNF by 2020, but only if adequate funding is provided.

The NWPA process thus remains on track for making available a geologic repository for the disposal of SNF and HLW. DOE's projection of a date for repository availability has moved from 2010 in 1990 to 2020 today and could slip further. Even with some slippage in DOE's schedule, it remains possible that a repository will be available by 2025. Of course, now the only repository that could become available by 2025 is the proposed repository at YM and it will only become available if the Commission issues a construction authorization and a subsequent authorization to receive and possess HLW. In 2005, the State of Nevada filed a petition for rulemaking with NRC (PRM–51–8) which raised the question whether continued use of the 2025 date, in effect, indicated prejudgment of the outcome of any licensing proceeding that might be held. The Commission rejected this notion in its denial of the petition:

> Even if DOE's estimate as to when it will tender a license application should slip further, the 2025 date would still allow for unforeseen delays in characterization and licensing. It also must be recognized that the Commission remains committed to a fair and comprehensive adjudication and, as a result, there is the potential for the Commission to deny a license for the Yucca Mountain site based on the record established in the adjudicatory proceeding. That commitment is not jeopardized by the 2025 date for repository availability. The Commission did not see any threat to its ability to be an

[5] NRC identified Dresden 1, licensed in 1959, as the earliest licensed power reactor and noted that 30 years beyond its licensed life for operation would be 2029 and that it was possible, if a repository were to become available by 2025, for all the Dresden 1 SNF to be removed from that facility by 2029 (55 FR 38502; September 18, 1991).

[6] DOE is statutorily required to report to the President and to Congress on the need for a second repository between January 1, 2007 and January 1, 2010. Section 161 of NWPA, as amended, 42 U.S.C. 10172a. DOE intends to submit the report in 2008.

[7] The Commission conservatively assumed that licenses would be renewed for 30 year terms (55 FR 38503; September 18, 1990). Thus, the initial 40 year term of the operating license, plus 30 years for the renewed operating license term and 30 years beyond the expiration of the renewed license amounts to storage for at least 100 years.

[8] On February 14, 2002, the Secretary of Energy recommended the YM site for the development of a repository to the President thereby setting in motion the approval process set forth in sections 114 and 115 of the NWPA. *See* 42 U.S.C. 10134(a)(1); 10134(a)(2); 10135(b), 10136(b)(2). On February 15, 2002, the President recommended the site to Congress. On April 8, 2002, the State of Nevada submitted a notice of disapproval of the site recommendation to which Congress responded, on July 9, 2002, by passing a joint resolution approving the development of a repository at YM which the President signed on July 23, 2002. See Pub. L. No. 107–200, 116 Stat. 735 (2002) (codified at 42 U.S.C. 10135 note (Supp. IV 2004)).

[9] Section 114(b) of NWPA directs the Secretary of Energy to submit a construction authorization application to NRC within 90 days of the date the site designation becomes effective. 42 U.S.C. 10134(b).

impartial adjudicator in 1990 when it selected the 2025 date even though then, as now, a repository could only become available if the Commission's decision is favorable. Should the Commission's decision be unfavorable and should DOE abandon the site, the Commission would need to reevaluate the 2025 availability date, as well as other findings made in 1990. *State of Nevada; Denial of a Petition for Rulemaking* (70 FR 48329, 48333; August 17, 2005).

In the absence of an unfavorable NRC decision and DOE's abandonment of the site, the Commission found no reason to reopen its Waste Confidence findings.

However, the Commission has now considered the recommendations of the Combined License Review Task Force Report and, in its June 22, 2007, Staff Requirements Memorandum (SRM) on that report, has approved rulemaking to resolve generic issues associated with combined license applications. SRM—COMDEK–07–0001/COMJSM–07–0001—Report of the Combined License Review Task Force (ML071760109). In a subsequent SRM of September 7, 2007, the Commission expressed the view that a near-term update to the Waste Confidence findings was appropriate. SRM—Periodic Briefing on New Reactor Issues (ML072530192). The staff, in its response to these SRMs, recognized that there would likely be long-term inefficiencies in combined license application proceedings, due to the need to respond to potential questions and petitions directed to the existing Waste Confidence Decision, and committed to evaluate possible updates to the decision.[10] See memorandum from Luis A. Reyes to the Commissioners, ''Rulemakings that Will Provide the Greatest Efficiencies to Complete the Combined License Application Reviews in a Timely Manner,'' December 17, 2007, at 3 (ML073390094). Undertaking a public rulemaking proceeding now to consider revisions to the Waste Confidence findings and rule—rather than waiting until some point closer to the 2025 date—will allow sufficient time to conduct a studied and orderly reassessment and, as appropriate, to revise and update the findings and rule. In particular, it will allow the Commission to consider alternative time-frames which would provide reasonable assurance for the availability of a repository.

One possibility might be to make an assumption that the Commission would ultimately find the YM site unacceptable by a certain date and then set the expected availability of a different repository at a time around 25 years later in accordance with DOE's 1990 estimate of the time it would take to make a repository available at a different site. However, the Commission rejected this route in the denial of the Nevada petition:

> [T]he use of a Commission acceptability finding as the basis for repository availability is impossible to implement because it would require the Commission to prejudge the acceptability of any alternative to Yucca Mountain in order to establish a reasonably supported outer date for the Waste Confidence finding. That is, if the Commission were to assume that a license for the Yucca Mountain site might be denied in 2015 and establish a date 25 years hence for the 'availability' of an alternative repository (*i.e.*, 2040), it would still need to presume the 'acceptability' of the alternate site to meet that date (70 FR 48333; August 17, 2005).

Another approach would be to revise the finding to include a target date or timeframe for which it now seems reasonable to assume that a repository would be available. A target date for when a disposal facility can reasonably be expected to be available would result from an examination of the technical and institutional issues that would need to be resolved before a repository could be available. The target date approach would be consistent with the HLW disposal programs in other countries, as explained further in this document. The target date could be placed in the finding itself, or described in the explanation for the finding. A target date is admittedly not very different from ''the first quarter of the twenty-first century'' as stated in the current finding, but this approach would make it more clear that specification of a particular time for when a repository could be built does not imply that radioactive waste would pose unsafe conditions if a repository were not available at that time. The capability to safely store radioactive waste over long periods is a viable interim alternative not dependent on any one specific year for availability of a repository. The Commission has adopted this approach in updating its finding.

Most countries possessing HLW and SNF eventually plan to confine these wastes using deep geologic disposal. Currently, there are 24 other countries that consider disposal of spent or reprocessed nuclear fuel in deep geologic repositories. From the vantage point of near-term safety, there has been little urgency in these countries for implementing disposal facilities because of the perceived high degree of safety provided by interim storage, either at reactors or at independent storage facilities. Of these 24 countries,10 have established target dates for the availability of a repository. Most of the 14 countries which 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.[11]

The ''target date'' approach would need to assume a beginning date for a new repository program. NRC believes that it is reasonable to select 2025 as the starting point, the current outer date of the Commission's prediction of repository availability. It is reasonable to assume that it will be known by 2025 whether a repository is available at the YM site. If it is not available, it seems reasonable to assume that a new repository program would get underway around that time. The need for a new repository program would not necessarily be the result of an NRC denial of the license application; it could result from a change in national policy for HLW disposal, a court reversal of a Commission licensing action, or other factors. The assumption of a need for a new repository program would be based on an assumption that the proposed YM repository does not become available, and not on an assumption that NRC determines that facility to be technically unacceptable. In sum, the Commission would be saying that it will remove its expectation that a repository will be available by 2025 but, even in the event that the YM repository does not become available, it retains confidence that spent fuel can be safely stored with no significant environmental impact until a repository can reasonably be expected to be available and that the Commission has a target date for the availability of the repository in that circumstance.

If it is assumed that a new repository program begins around the year 2025, then setting a target date for the

[10] Challenges to 10 CFR 51.23 in individual COL proceedings would likely be addressed through application of 10 CFR 2.335, ''Consideration of Commission rules and regulations in adjudicatory proceedings.'' This rule generally prohibits attacks on NRC rules during adjudicatory proceedings but does allow a party to an adjudicatory proceeding to petition that application of a specified rule be waived or an exception made for the particular proceeding. 10 CFR 2.335(b). The sole ground for such a waiver or exception is that ''special circumstances with respect to the subject matter of the particular proceeding are such that the application of the rule or regulation * * * would not serve the purposes for which the rule or regulation was adopted.'' *Id.* Thus, a review of the Waste Confidence findings and rule now might be expected to obviate such challenges in individual COL proceedings.

[11] The three countries with target dates that plan direct disposal of SNF are: Czech Republic (2050), Finland (2020), and Sweden (2020). The seven countries with target dates that plan disposal of reprocessed SNF/HLW are: Belgium (2035), China (2050), France (2025), Germany (2025), Japan (2030s), Netherlands (2013), Switzerland (2042).

availability of a repository becomes a matter of examining the technical and institutional problems DOE would need to resolve to achieve the target date. The technical problems should be the same as the ones NRC examined in the earlier Waste Confidence reviews, namely, how long it would take DOE to locate a suitable site and how long it would take to develop a waste package and engineered barriers for that site. For the reasons explained in our evaluation of Finding 1, the Commission continues to have reasonable assurance that disposal in a geologic repository is technically feasible. That is the approach being taken in all the countries identified previously which have set target dates for the availability of a repository. It is also the approach of 14 other countries which have HLW disposal programs, but which have not set target dates.[12] In addition when Congress amended NWPA in 1987 to focus exclusively on the YM site, it did so for budgetary reasons and not because the sites DOE was considering at the time were discovered to be technically unacceptable. The research being done nationally and internationally strongly suggests that potentially acceptable sites exist and can be identified.

The amount of time DOE might need to develop an alternative repository site would depend upon the context of any enabling legislation, budgetary constraints, and the degree of similarity between a candidate site and other well-characterized sites with similar HLW disposal concepts. DOE began characterization of the YM site in 1982, made its suitability determination in 2002, and submitted a license application in 2008. However, the history of potential repository development at YM may be a poor indicator of the amount of time needed to develop a new repository. Many problems extraneous to site characterization activities adversely impacted DOE's repository program, such as changes in enabling legislation, public confidence issues, funding in Congressional appropriations, and significant delay in issuing environmental standards. In terms of the technical work alone, a lot would depend on whether Congress established a program involving characterization of many sites preliminary to the recommendation of a single site (similar to the 1982 NWPA) or a program focused on a single site (similar to the amended NWPA). The former would likely take longer but might have a better chance of success if problems developed with the single site. Much would also depend on whether the site(s) chosen for characterization is similar to sites in this or other countries for which much information is available or whether the site(s) would present novel challenges for which much fundamental knowledge would have to be developed. An alternative site with a disposal approach that is similar to that used in other international repository programs could make use of the extensive knowledge from those international programs to gain efficiencies in the alternative repository development program.

In addition, there should be a certain amount of ''lessons learned'' from the YM repository program that could help to shorten the length of a new program. For example, performance assessment techniques have improved significantly over the past 20 years (*e.g.*, the Goldsim software package of DOE's Total System Performance Assessment was not available 20 years ago and represents a significant improvement over the FORTRAN language of years past) such that performance assessment models are easier to develop and more reliable from what was available 20 years ago. Similarly, operational and manufacturing aspects developed during the YM program (*e.g.*, manufacturing of waste packages, excavation of drifts, waste handling), would be applicable to another program. Also, regulatory issues considered during the YM program (*e.g.*, burn-up credit for nuclear fuel and seismic performance analysis) should provide information useful for setting new standards or revising current standards.[13]

Whether waste package and engineered barrier information developed during the YM repository program would be transferable to a new program depends heavily on the degree of similarity between an alternative site and YM. The fundamental physical characteristics of the potential YM repository are significantly different from other potential repository sites that were considered in the U.S. repository program before 1987. If YM does not become available, DOE could select an alternative candidate site that was similar to YM in important physical characteristics (such as oxidizing conditions, drifts above the water table with low amounts of water infiltration, water chemistry buffered by volcanic tuff rocks). In this instance, much of the existing knowledge for engineered barrier performance at YM might be transferable to a different site. Nevertheless, much of DOE's current research on engineered barriers for YM could be inapplicable if an alternative site had significantly different characteristics than the YM site, such as an emplacement horizon in reducing conditions below the water table. In this instance, research from additional programs by DOE, industry, and other countries might provide important information on engineered barriers, provided DOE's alternative was analogous to sites and engineered barriers being considered elsewhere.

It is important to note, however, that broader institutional issues have emerged since 1990 that bear on the time it takes to implement geologic disposal. International developments have made clear that technical experience and confidence in geologic disposal, on their own, have not sufficed to bring about the broader societal and political acceptance needed to realize the authorization of a single national repository.

In the United Kingdom (UK), in 1997, an application for the construction of a rock characterization facility at Sellafield was rejected, leaving the country without a path forward for long-term management or disposal of HLW or SNF. In 1998, an inquiry by the UK House of Lords subsequently 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. In 2007, the Scottish Government officially rejected any further consultation with the UK Government on deep geologic disposal of HLW and SNF. Discussions may continue on issues of interim storage only. This action by the Scottish Government effectively ends more than 7 years of consultations with stakeholders from communities near Scottish nuclear installations and represents another major setback for the UK program.

In Germany, a large salt dome at Gorleben has been under study since 1977 as a potential repository for SNF. After decades of intense discussions and protests, an agreement was reached in 2000 between the utilities and the government to suspend exploration of Gorleben for at least three, and at most,

[12] These countries are: Brazil, Canada, Hungary, Lithuania, Romania, South Korea, Slovak Republic, Spain (direct disposal of SNF); Bulgaria, India, Italy, Russia, United Kingdom, Ukraine (disposal of reprocessed SNF/HLW).

[13] Both NRC's Part 63 and EPA's Part 197 are applicable only for a repository at YM. NRC and EPA have in place standards for a repository at a different site, but these standards would likely be revised in a new repository program.

ten 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.

After detailed site investigations in several locations in Switzerland, in 1993, the Swiss national cooperative for radioactive waste disposal proposed a deep geologic repository for low- and intermediate-level waste at Wellenberg. Despite a finding by Swiss authorities, in 1998, 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 a deep geologic repository will be available in their country 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. Eight years later, in 2005, a newly-created Nuclear Waste Management Organization (NWMO), recommended an Adaptive Phased Management approach for long-term care of Canada's SNF, based on the outcomes of the public consultation. This approach includes both a technical method and a new management system. According to NWMO, it ''* * * provides for centralized containment and isolation of used nuclear fuel deep underground in suitable rock formations, with continuous monitoring and opportunity for retrievability; and it allows sequential and collaborative decision-making, providing the flexibility to adapt to experience and societal and technological change.'' NWMO, *Choosing a Way Forward: The Future Management of Canada's Used Nuclear Fuel, Final Study Report,* November 2005.

In 2007, the Government of Canada announced its selection of the Adaptive Phased Management approach, and directed NWMO to take at least two years to develop a ''collaborative community-driven site-selection process.'' NWMO must then use this process to open consultations with citizens, communities, Aboriginals, and other interested parties to find a suitable site in a willing host community. The Canadian Government explicitly acknowledges that this approach will ''take time to develop a process that is open, transparent, inclusive, and that is built on a solid foundation of trust, integrity and respect for Canadians and the environment.'' The Honorable Gary Lunn, P.C., M.P., Minister of Natural Resources, Canada, to President of NWMO, July 12, 2007. For financial planning and cost estimation purposes only, 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.

Repository development programs in Finland and Sweden are much further advanced, but have nonetheless taken the time to build support from potential host communities. Preliminary site investigations in Finland began 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 municipal council of the host community had approved the siting of the disposal facility in 1999. Finland expects this facility to begin receipt of SNF for disposal in 2020, 34 years after the start of preliminary site investigations.

Between 1993 and 2000, Sweden conducted feasibility studies in eight municipalities. Based on technical considerations, one site was found unsuitable for further study, and two, based on municipal referenda, decided against allowing further investigations. 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. One of the two volunteer sites will be selected for development as a repository and an application to the Swedish safety authorities is expected in 2009. If construction is authorized, Sweden expects the repository to be available for disposal in 2018, 25 years after starting feasibility studies in 1993.

If YM is not licensed, Congress will need to provide direction to DOE for development of a new site or, potentially, a new management concept, for the long-term management and disposal of SNF and HLW. Whatever approach Congress mandates, international experience since 1990 would appear to suggest that greater attention may need 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.

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 assuring the timely development of a repository in the sense that there have always been more than sufficient funds available for meeting 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 (NWF), subject to appropriations by the Congress. At the FY 2009 Appropriations Hearing (April 10, 2008), Edward F. Sproat III, Director of OCRWM, DOE, stated that the NWF has a balance of approximately $21.0 billion. Thus, the NWF has the capacity to ensure timely development of a repository consistent with Congressional funding constraints. Moreover, DOE is in the process of preparing contracts to be signed by utilities planning to build new reactors. Therefore, there will be a source of funding for disposal of the fuel to be generated by these reactors.

Arriving at a target date involves balancing the technical and institutional factors discussed previously. It appears that the technical work needed to make a repository available could probably be done in less time than it took DOE to

submit a license application for the YM site (26 years measured from the beginning of site characterization). However, as discussed previously, the time needed to develop societal and political acceptance of a repository might range between 25 and 35 years. Therefore, if the starting point for a new program were 2025, a reasonable target date would be 2050–2060 for the availability of a repository.

Finding 2 also includes the prediction that 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 HLW and SNF originating in such reactor and generated up to that time. As explained previously, in 1990 DOE projected that 87,000 MTHM would be generated by the year 2036. Given the statutory limit of 70,000 MTHM for the first repository, either statutory relief from that limit or a second repository would be needed. The Commission's continued assurance that sufficient repository capacity would be available within 30 years of license expiration of all reactors rested on an assumption that two repositories would be available in approximately 2025 and 2035, each with acceptance rates of 3400 MTHM/year within several years after commencement of operations. *See* 55 FR 38502; September 18, 1990.

If an assumption is made, for purposes of establishing a target date, that a repository will not become available until approximately 2050–2060, it appears that a finding that sufficient repository space will be available within 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) is not supportable.[14] According to the 2007–2008 USNRC Information Digest, NUREG–1350, Vol. 19, Table 11, p.48 (Information Digest), there are 18 reactor operating licenses that will expire between 2009 and 2020. There are an additional 44 licenses that will expire between 2021 and 2030. Many of these licenses may be renewed which would extend their operating lifetimes, but this cannot be assumed.[15] For licenses that are not renewed, some spent fuel will need to be stored for more than 30 years beyond the expiration of the license if a repository is not available until 2050–2060. According to the Information Digest, Appendix B, there are 22 reactors which were formerly licensed to operate, but which have been permanently shut down. Thirty years beyond their licensed life of operation will come as early as 2029 for Dresden 1 and as late as 2056 for Millstone 1, but for most of these plants, 30 years beyond the licensed life for operation will fall in the 2030s and 2040s. Thus, for virtually all of these plants, spent fuel will have to be stored beyond 30 years from the expiration of the license if a repository is not available until 2050–2060.

In 1990, the Commission emphasized that this 30 year period was not a safety finding. It was only an estimate of how long it was likely that SNF would need to be stored, given its confidence that repository disposal would be available by 2025. In fact, the Commission said it was not concerned about the fact that it was already clear in 1990 that a few reactors would need to store spent fuel on-site beyond 30 years after the effective expiration date of their licenses (*i.e.*, the date the license prematurely terminated) due to its confidence in the safety of spent fuel storage (55 FR 38503; September 18, 1990). For the reasons presented in the evaluation of Finding 4, the Commission is now able to say that there is no public health and safety or environmental concern if its target date of 2050–2060 for the availability of a disposal facility results in the need to store fuel at some reactors for a 50–60 year period after expiration of the license or even longer.

Based on the information described previously, the Commission is proposing to revise Finding 2 to eliminate a specific date for the availability of a repository and to state that a repository may reasonably be expected to be available within 50–60 years beyond the licensed life for operation of any reactor.

C. Proposed Finding 2

The Commission finds reasonable assurance that sufficient mined geologic repository capacity can reasonably be expected to be available within 50–60 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 HLW and spent fuel originating in such reactor and generated up to that time.

D. Specific Question for Public Comment

An alternative approach would be for the Commission to revise Finding 2 without reference to a timeframe for the availability of a repository. (The proposed revision to simplify 10 CFR § 51.23(a) removes the reference to a repository date although it is based on an expectation of repository availability by 2050–2060 as set forth in the proposed revision to Finding 2). In 2005, in response to PRM–51–8, the Commission had declined to consider such an approach to define ''availability'' based on a presumption that some acceptable disposal site would become available at some undefined time in the future. The Commission concluded then that such an approach would be a departure from the framework it had established in its original 1984 decision to use a specific timeframe as a basis for assessing the degree of assurance that radioactive waste can be disposed of safely and for determining when such disposal will be available (70 FR. 48333; August 17, 2005).

The Commission's proposed revision of Finding 2 is based on its assessment not only of our understanding of the technical issues involved, but also predictions of the time needed to bring about the necessary societal and political acceptance for a repository site. Recognizing the inherent difficulties in making such predictions, the Commission seeks specific comment on whether it should revise its approach to Finding 2 and adopt a more general finding of reasonable assurance that SNF generated in any reactor can be stored safely and without significant environmental impacts until a disposal facility can reasonably be expected to be available. In other words, in response to the court's concerns that precipitated the original Waste Confidence proceeding, the Commission could now say that there is no need to be concerned about the possibility that spent fuel may need to be stored at onsite or offsite storage facilities at the expiration of the license (including a renewed license) until such time as a repository is available because we have reasonable assurance that spent fuel can be so stored for long periods of time, safely and without significant environmental impact. Such a finding would be made on the basis of the Commission's accumulated experience of the safety of long-term spent fuel storage with no significant environmental impact (see Finding 4)

[14] Based on the inventory of SNF in nuclear power plant pools and interim storage facilities, the amount of spent fuel is anticipated to exceed the 70,000 MTHM disposal limit in the NWPA by 2010. *See* Institute of Nuclear Material Management Seminar XXV, January 16, 2008, paper by Bob Quinn of Energy Solutions, *Industry Perspective on the GNEP—Yucca Mountain Relationship.* Therefore, a new repository program would need to remove this limit or provide for more than one repository.

[15] Six of these reactor operating licenses have already been renewed (Dresden 2, Ginna, Nine Mile Point 1, Robinson 2, Point Beach 1, and Monticello). Forty-two other reactor operating licenses have been renewed and the renewed licenses will expire after 2030.

and its accumulated experience of the safe management of spent fuel storage during and after the expiration of the reactor operating license (see Finding 3).

The Commission seeks comment on this alternative revision of Finding 2 and whether additional information is needed for or accompanying changes should be made to its other Findings on the long term storage of spent fuel if such a revision of Finding 2 were to be adopted.

III. Finding 3: The Commission Finds Reasonable Assurance That HLW and Spent Fuel Will Be Managed in a Safe Manner Until Sufficient Repository Capacity Is Available To Assure the Safe Disposal of All HLW and Spent Fuel

A. Bases for Finding 3

The Commission reached this finding in 1984, and reaffirmed it in 1990. The focus of this finding is on whether reactor licensees can be expected to safely store their spent fuel in the period between the cessation of reactor operations and the availability of repository capacity for their fuel. The Commission placed its main reliance that the spent fuel would be managed safely on the fact that, under either a possession-only Part 50 license or a Part 72 license, the utility would remain under NRC's regulatory control and inspections and oversight of storage facilities would continue (49 FR 34679–34680; August 31, 1984; 55 FR 38508; September 18, 1990). In 1990, when extended storage at the reactor site seemed more probable, the Commission pointed out that NRC's regulations provided for license renewals of Part 72 licenses and that NRC was considering issuance of a general Part 72 license under which spent fuel could be stored in NRC-certified casks,[16] (55 FR 38508; September 18, 1990). The Commission reasoned that these regulations would provide further mechanisms for NRC supervision of spent fuel management by licensees. The Commission was not concerned about then-looming contractual disputes between DOE and the utilities regarding DOE's obligation to begin removing spent fuel from reactor sites in 1998 because NRC licensees cannot abandon spent fuel in their possession and would remain responsible for it (55 FR 38508; September 18, 1990).

The Commission also considered the unusual case where a utility was unable to manage its spent fuel. The NWPA had provided an Interim Storage Program (Subtitle B) which enabled a utility to enter into a contract with DOE for temporary storage of its fuel but, by 1990 (the expiration of the program), no utility had sought to take advantage of it (55 FR 38508; September 18, 1990). In a case where a utility became insolvent, NRC believed that the cognizant state public utility commission would be likely to require an orderly transfer to another entity which could be accomplished if the new entity met NRC's regulations (49 FR 34680; August 31, 1984). Further, the Commission expressed the view that, while the possibility of a need for Federal action to take over stored spent fuel from a defunct utility or from a utility that lacked technical competence to assure safe storage was remote, the authority for this type of action exists in sections 186c and 188 of the Atomic Energy Act. *Id.*

B. Evaluation of Finding 3

As explained previously, the focus of Finding 3 is on whether reactor licensees can be expected to safely store their spent fuel in the period between the cessation of reactor operations and the availability of repository capacity for their fuel. In this regard, the NRC is successfully regulating four decommissioned reactor sites that continue to hold Part 50 licenses and consist only of an ISFSI under the Part 72 general license provisions.[17] In addition, the NRC staff has discussed plans to build and operate ISFSIs under the Part 72 general license provisions with the licensees at the La Crosse and Zion plants, which are currently undergoing decommissioning. The NRC is also successfully regulating ISFSIs at two fully decommissioned reactor sites (Trojan and Ft. St. Vrain) under specific Part 72 licenses.[18]

The NRC monitors the performance of ISFSIs at decommissioned reactor sites by conducting periodic inspections that are the same as the inspections performed for ISFSIs at operating reactor sites. When conducting inspections at these ISFSIs, NRC inspectors follow the guidance in NRC Inspection Manual Chapter 2690, ''Inspection Program for Dry Storage of Spent Reactor Fuel at Independent Spent Fuel Storage Installations and for Part 71 Transportation Packages.'' At all six decommissioned reactor sites mentioned previously, all spent fuel on site has been successfully loaded into the ISFSI, so only those inspection procedures applicable to the existing storage configurations are conducted. Also, any generally licensed ISFSI where decommissioning and final survey activities related to reactor operations have been completed is treated as an ''away from reactor'' (AFR) ISFSI for inspection purposes. Therefore, those programs relied upon under the 10 CFR Part 50 license for operation of the generally licensed ISFSI are also subject to inspection.

The NRC has not encountered any management problems associated with the ISFSIs at these six decommissioned reactor sites. Further, NRC's inspection findings do not indicate unique management problems at any currently operating ISFSI. Generally, the types of issues identified through NRC inspections of ISFSIs are similar to issues identified for Part 50 licensees. Most issues are identified early in the operational phase of the dry cask storage process, during loading preparations and actual spent fuel loading activities. Once a loaded storage cask is placed on the storage pad, relatively few inspection issues are identified due to the passive nature of these facilities.

Further, NRC's regulations require that every nuclear power reactor operating license issued under 10 CFR part 50, and every COL issued under 10 CFR part 52 must contain a condition requiring licensees to submit written notification to the Commission of the licensees' plan for managing irradiated fuel between cessation of reactor operation and the time the DOE takes title to and possession of the irradiated fuel for ultimate disposal in a repository. 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 irradiated fuel. Specifically, 10 CFR 50.54(bb) requires the licensee to:

> [W]ithin 2 years following permanent cessation of operation of the reactor or 5 years before expiration of the reactor operating license, whichever occurs first, submit written notification to the Commission for its review and preliminary approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor following permanent cessation of operation of the reactor until title to the irradiated fuel and possession of the fuel is transferred to the Secretary of Energy for its ultimate disposal * * * Final Commission review will be undertaken as part of any proceeding for continued licensing under part 50 or 72 of this chapter. The licensee must demonstrate to NRC that the elected actions will be consistent with NRC requirements for licensed possession of

[16] Part 72 was, in fact, amended to provide for storage of spent fuel in NRC-certified casks pursuant to a general license (55 FR 29191; July 18, 1990).

[17] These reactor sites include Maine Yankee, Yankee Rowe, Connecticut Yankee (also known as Haddam Neck), and Big Rock Point.

[18] There are several additional sites with specific Part 72 ISFSI licenses that are in the process of decommissioning (*e.g.*, Humbolt Bay, Rancho Seco).

irradiated nuclear fuel and that the actions will be implemented on a timely basis. Where implementation of such actions requires NRC authorizations, the licensee shall verify in the notification that submittals for such actions have been or will be made to NRC and shall identify them. A copy of the notification shall be retained by the licensee as a record until expiration of the reactor operating license. The licensee shall notify the NRC of any significant changes in the proposed waste management program as described in the initial notification.

While the interim storage program under Subtitle B of the NWPA expired in 1990, in the past arrangements have been made with DOE to take possession of spent fuel in urgent or unusual circumstances, as was done for the Three Mile Island Unit 2 fuel debris. 10 CFR 50.54(bb) (2008).

To date, the NRC has also renewed three specific Part 72 ISFSI licenses. These renewals include the Part 72 specific licenses for the General Electric Morris Operation (the only wet, or pool-type ISFSI), as well as the Surry and H.B. Robinson ISFSIs. The NRC staff is also currently reviewing an application for renewal of the specific ISFSI license for the Oconee plant (ML081280084) and anticipates a renewal application for the Fort St. Vrain ISFSI sometime in 2009. Specific licenses for six additional ISFSIs will expire between 2012 and 2020. It is expected that license renewal will be requested by these licensees, unless a permanent repository or some other interim storage option is made available. Although the NRC staff's experience with renewal of ISFSI licenses is limited to these three cases, it is noteworthy that both the Surry and H.B. Robinson ISFSI licenses were renewed for a period of 40-years, instead of the 20-year renewal period currently provided for under Part 72. The Commission authorized the staff to grant exemptions to allow the 40-year renewal period after the staff reviewed the applicants' evaluations of aging effects on the structures, systems, and components important to safety. The Commission determined that the evaluations, supplemented by the licensees' aging management programs, provided reasonable assurance of continued safe storage of spent fuel in these ISFSIs. *See* SECY–04–0175, ''Options for Addressing the Surry Independent Spent Fuel Storage Installation License-Renewal Period Exemption Request,'' September 28, 2004 (ML041830697).

With regard to generally licensed ISFSIs, the NRC staff is currently working on a proposed rulemaking to clarify the processes for the renewal of ISFSIs operated under the general license provisions of 10 CFR part 72, and for renewal of the Certificates of Compliance for dry cask storage systems. *See License and Certificate of Compliance Terms* (73 FR 45173; August 4, 2008). There are currently nine sites operating generally licensed ISFSIs that will reach the prescribed 20 year limit on storage between 2013 and 2020.

The Commission concludes that the events that have occurred since the last formal review of the Waste Confidence Decision in 1990 provide support for a continued finding of reasonable assurance that HLW and spent fuel will be managed in a safe manner until sufficient repository capacity is available. Specifically, the NRC has continued its regulatory control and oversight of spent fuel storage at both operating and decommissioned reactor sites, through both specific and general Part 72 licenses. With regard to general Part 72 licenses, the NRC has successfully implemented a general licensing and cask-certification program, as envisioned by the Commission in 1990. There are currently 15 certified spent fuel storage cask designs. 10 CFR 72.214 (2008). In addition, the Commission's reliance on the license renewal process in its 1990 review has proven well placed, with two specific Part 72 ISFSI licenses having been successfully renewed for an extended 40-year renewal period, and a third having been renewed for a period of 20 years. Further, while DOE did not meet its contractual obligation to begin removing spent fuel from reactor sites in 1998, NRC licensees have continued to meet their obligation to safely store spent fuel in accordance with the requirements of 10 CFR Parts 50 and 72.[19]

On the basis of the information described previously, the Commission proposes to reaffirm Finding 3.

IV. Finding 4 (1990): The Commission Finds Reasonable Assurance That, if Necessary, Spent Fuel Generated in 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 Independent Spent Fuel Storage Installations

A. Bases for Finding 4

The focus of this finding is on the safety and environmental effects of long-term storage of spent fuel. In 1984, the Commission found that spent fuel can be stored safely and without significant environmental impacts for at least 30 years beyond the expiration of reactor operating licenses (49 FR 34660; August 31, 1984). In 1990, the Commission determined that if the reactor operating license were renewed for 30 years,[20] storage would be safe and without environmental significance for at least 30 years beyond the term of licensed operation for a total of at least 100 years (55 FR 38513; September 18, 1990). The Commission looked at four broad issues in making this finding: (1) The long-term integrity of spent fuel under water pool storage conditions; (2) the structure and component safety for extended facility operation for storage of spent fuel in water pools; (3) the safety of dry storage; and (d) the potential risks of accidents and acts of sabotage at spent fuel storage facilities (49 FR 34681; August 31, 1984; 55 FR 38509; September 18, 1990).

With respect to the safety of water pool storage, the Commission found in 1984 that research and experience in the United States and Canada and other countries confirmed that long-term storage could be safely undertaken, *e.g.*, that the cladding which encases spent fuel is highly resistant to failure (49 FR 34681–34682; August 31, 1984). In 1990, the Commission determined that experience with water storage of

[19] Section 302 of NWPA authorizes the Secretary of Energy to enter into contracts with utilities generating HLW and SNF under which the utilities are to pay statutorily imposed fees into the NWF in return for which the Secretary, ''beginning not later than January 31, 1998, will dispose of the [HLW] or [SNF] involved * * *'' 42 U.S.C. 10222(a)(5)(B). The NWPA also prohibits NRC from issuing or renewing a reactor operating license unless the prospective licensee has entered into a contract with DOE or is engaged in good-faith negotiations for such a contract. 42 U.S.C. 10222(b)(1). When it became evident that a repository would not be available in 1998, DOE took the position that it did not have an unconditional obligation to accept the HLW or SNF in the absence of a repository. *See Final Interpretation of Nuclear Waste Acceptance Issues*, (60 FR 21793; April 28, 1995). The U.S. Court of Appeals for the District of Columbia Circuit, however, held that DOE's statutory and contractual obligation to accept the waste no later than January 31, 1998 was unconditional. *Indiana Michigan Power Co.* v. *DOE*, 88 F.3d 1272 (DCDC Cir. 1996). Subsequently, the utilities have continued to safely manage the storage of SNF in reactor storage pools and in ISFSIs and have received damage awards as determined in lawsuits brought before the U.S. Federal Claims Court, *See, e.g., System Fuels Inc.* v. *U.S.*, 78 Fed. Cl. 769 (October 11, 2007).

NRC has recently become aware that DOE is in the process of developing an amendment to the standard spent fuel contract for new nuclear power plants. This amendment would include a revised commitment for removal of spent fuel from new reactor sites by DOE. *See* discussion of Finding 5, *infra.*

[20] Subsequently, the Commission limited the renewal period for power reactor licenses to 20 years beyond expiration of the operating license or combined license. 10 CFR 54.31 (56 FR 64943, 64964; December, 13, 1991).

spent fuel continued to confirm that pool storage is a benign environment for spent fuel that does not lead to significant degradation of spent 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 38510, 38511; September 18, 1990). In sum, wet storage was affirmed as a fully-developed technology with no associated major technical problems, based on both experience and scientific studies.

In 1984, the Commission based its confidence in 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 simpler and more readily maintained, (49 FR 34683–34684; August 31, 1984). By 1990, NRC and ISFSI operators had gained considerable experience with dry storage. NRC staff safety reviews of topical reports on storage system designs, the licensing and inspection of dry storage at two reactor sites under Part 72, and NRC's promulgation of an amendment to Part 72, incorporating a monitored retrievable storage installation (MRS) (a dry storage facility) into the regulations had confirmed the 1984 conclusions on the safety of dry storage. In fact, under the environmental assessment for the amendment (NUREG–1092), the Commission found confidence in the safety and environmental insignificance of dry storage at an MRS for 70 years following a period of 70 years of storage in spent fuel storage pools (55 FR 38509–38513; September 18, 1990).

The Commission also found that the risks of major accidents at spent fuel storage pools resulting in offsite consequences were remote because of the secure and stable character of the spent fuel in the storage pool environment, and the absence of reactive phenomena—''driving forces''—which might result in dispersal of radioactive material. The Commission noted that storage pools and ISFSIs are designed to safely withstand accidents caused either by natural or man-made phenomena and that human error does not have the capability to create a major radiological hazard to the public due to the absence of high temperature and pressure conditions (49 FR 34684–34685; August 31, 1984). By 1990, the NRC staff had spent several years studying in detail catastrophic loss of reactor spent fuel pool water, possibly resulting in a fuel fire in a dry pool, but concluded that because of the large inherent safety margins in the design and construction of a spent fuel pool no action was justified to further reduce the risk (55 FR 38511; September 18, 1990).

In 1984, the Commission recognized that the intentional sabotage of a storage pool was theoretically possible but found that the consequences would be limited by the realities that, except for some gaseous fission products, the radioactive content of spent fuel is in the form of solid ceramic material encapsulated in high-integrity metal cladding and stored underwater in a reinforced concrete structure (49 FR 34685; August 31, 1984). Under these conditions, the Commission noted that the radioactive content of spent fuel is relatively resistant to dispersal to the environment. Similarly, because of the weight and size of the sealed protective enclosures, dry storage of spent fuel in dry wells, vaults, silos and metal casks is also relatively resistant to sabotage and natural disruptive forces. *Id.* Although the 1990 decision examined several studies of accident risk, no considerations had arisen to affect the Commission's confidence that the possibility of a major accident or sabotage with offsite radiological impacts at a spent fuel storage facility is extremely remote (55 FR 38512; September 18, 1990).

Finally, the Commission noted that the generation and onsite storage of a greater amount of spent fuel as a result of reactor license renewals would not affect the Commission's findings on environmental impact. Finding 4 is not based on a determination of a specific number of reactors and amount of spent fuel generated. Finding 4 evaluates the safety of spent fuel storage and lack of environmental impacts overall, noting that individual license renewal actions would be subject to safety and environmental reviews (55 FR 38512; September 18, 1990).

B. Evaluation of Finding 4

As explained previously, the focus of Finding 4 is on the safety and environmental significance of long-term storage of spent fuel. Specifically, the Commission examined four broad issues in making this finding: (1) The long-term integrity of spent fuel under water pool storage conditions; (2) the structure and component safety for extended facility operation for storage of spent fuel in water pools; (3) the safety of dry storage; and (4) the potential risks of accidents and acts of sabotage at spent fuel storage facilities.

1. Storage in Spent Fuel Pools

Since 1990, the NRC has continued its periodic examination of spent fuel pool storage to assure adequate safety is maintained and that there are no adverse environmental effects of storage of spent fuel in pools. The Office of Nuclear Reactor Regulation (NRR) and the former Office for Analysis and Evaluation of Operational Data (AEOD) independently evaluated the safety of spent fuel pool storage, and the results of these evaluations were documented in a memo to the Commission dated July 26, 1996, entitled ''Resolution of Spent Fuel Storage Pool Action Plan Issues,'' (ML003706364) and a separate memo to the Commission dated October 3, 1996), entitled, ''Assessment of Spent Fuel Pool Cooling,'' (ML003706381) (later published as NUREG–1275, Vol. 12, ''Operating Experience Feedback Report: Assessment of Spent Fuel Cooling,'' February 1997), respectively. As a result of these studies, potential follow-up activities were identified. The NRR staff described NRC follow-up activities and associated industry actions in a memo to the Commission dated September 30, 1997, entitled ''Followup Activities on the Spent Fuel Pool Action Plan,'' (ML003706412). These evaluations became part of the investigation of Generic Safety Issue 173, ''Spent Fuel Pool Storage Safety,'' which found that the relative risk posed by loss of spent fuel cooling is low when compared with the risk of events not involving the SFP.

The safety and environmental effects of spent fuel pool storage were also addressed in conjunction with regulatory assessments on permanently shutdown nuclear plants and decommissioning nuclear power plants. NUREG/CR–6451, ''A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants,'' (August 1997) addressed the appropriateness of regulations (*e.g.*, requirements for emergency planning and insurance) associated with spent fuel pool storage. The study identified a number of regulations that were pertinent only to an operating reactor and not to spent fuel storage. Those regulations were not needed to ensure the safe maintenance of a permanently shutdown plant. This study also provided what are now known to be conservative bounding estimates of fuel coolability, and provided a number of conservative bounding estimates of offsite consequences for the most severe accidents that involve draining of the spent fuel pool.

More recently, the NRC issued NUREG–1738, ''Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants,'' (February 2001). This study

provided the results of the NRC staff's latest evaluation of the potential accident risk in a spent fuel pool at decommissioning plants. The report contained a discussion of fuel coolability for various types of accidents and included potential offsite consequences based on assumed radiation releases. The study demonstrated that using conservative and bounding assumptions regarding the postulated accidents, the predicted risk estimates were below that associated with reactor accidents and well below the Commission's safety goal. There was even some concern within the NRC that the level of conservatism in the analysis accompanying NUREG–1738 overstated the likelihood and severity of the more extreme spent fuel pool accidents. These concerns have proven valid, as subsequent studies (described in the following paragraph) have conclusively and consistently shown that the safety margins are much larger than indicated by previous studies, such as NUREG–1738. *See The Attorney General of Commonwealth of Massachusetts, The Attorney General of California; Denial of Petitions for Rulemaking* (73 FR 46204; August 8, 2008).

Following the terrorist attacks of September 11, 2001, the NRC undertook a complete reexamination of spent fuel pool safety and security issues. This reexamination included a significantly improved methodology, based on detailed state-of-the-art analytical modeling, for assessing the response of spent fuel assemblies during security events including those which might result in draining of the spent fuel pool. This more detailed and realistic analytical modeling was also supported by extensive testing of zirconium oxidation kinetics in an air environment and full scale coolability and ''zirc fire'' testing of spent fuel assemblies. This extensive effort resulted in both the confirmation of the conservatism of past analyses and improved, more realistic analyses of fuel coolability and potential responses during accident or security event conditions. Importantly, the new more detailed and realistic modeling led to the development of improvements in spent fuel safety, which were required to be implemented at spent fuel pools by the Commission for all operating reactor sites. *See id.*

In 2003, the U.S. Congress asked the National Academies to provide independent scientific and technical advice on the safety and security of commercial SNF storage including the potential safety and security risks of SNF presently stored in cooling pools and dry casks at commercial nuclear reactor sites. A classified report was issued by the National Academy of Sciences (NAS) in July 2004, and an unclassified summary for public distribution was issued in 2005. As part of the information gathering for the study, the NRC and Sandia National Laboratories briefed the NAS authoring committee on the ongoing work to reassess spent fuel pool safety and security issues. The NAS report contains findings and recommendations for reducing the risk of events involving spent fuel pools as well as dry casks. The NRC provided its response to the NAS in a letter to Senator Pete V. Domenici from NRC Chairman Nils J. Diaz, dated March 14, 2005 (ML050280428). In essence, the NRC concluded, as a result of its own study and subsequent regulatory actions, that it had adopted the important recommendations of the NAS report relevant to spent fuel pools. As a result of the improvements to spent fuel pool safety and security, together with the inherent safety and robustness of spent fuel pool designs, the NRC concluded that the risk associated with security events at spent fuel pools is acceptably low. Because those safety improvements to spent fuel pool storage are applicable to non-security events (randomly initiated accidents), accident risk will also have been further reduced.

While the Commission continues to have reasonable assurance that storage in spent fuel pools provides adequate protection of public health and safety and the common defense and security, and will not result in significant impacts on the environment, NRC acknowledges several incidents of groundwater contamination originating from leakage in reactor spent fuel pools and associated structures. In 1990, the Commission specifically acknowledged two incidents where radioactive water leaked from spent fuel pools, one case resulting in contamination outside of the owner controlled area. (*See* 55 FR. 38511; September 18, 1990). The Commission addressed these events stating, ''[t]he occurrence of operational events like these have been addressed by NRC staff at the plants listed. The staff has taken inspection and enforcement actions to reduce the potential for such operational occurrences in the future.'' *Id.*

On March 10, 2006, the Liquid Radioactive Release Lessons Learned Task Force was established by the NRC Executive Director for Operations in response to incidents at several plants involving unplanned, unmonitored releases of radioactive liquids into the environment. Liquid Radioactive Release Lessons Learned Task Force Final Report, September 1, 2006 (Task Force Report) (ML062650312). One of the incidents that prompted formation of the Task Force involved leakage from the Unit 1 and 2 spent fuel pools at Indian Point.[21] Task Force Report, at 1, 5–6, 11. The Task Force reviewed historical data on inadvertent releases of radioactive liquids, including four additional incidents involving leakage from spent fuel pools (Seabrook, Salem, Watts Bar, and Palo Verde). As a result of its review, the Task Force concluded that ''[b]ased on bounding dose calculations and/or actual measurements, the near-term public health impacts have been negligible for the events at NRC-licensed operating power facilities discussed in this report.'' Task Force Report, at 15. While concluding that near-term public health impacts were negligible, the Task Force made 26 specific recommendations for improvements to NRC's regulatory programs with regard to unplanned or unmonitored releases of radioactive liquids from nuclear power reactors.

The NRC staff has addressed, or is in the process of addressing, the Task Force recommendations. *See* ''Liquid Release Task Force Recommendations Implementation Status as of February 26, 2008'' (ML073230982) (Implementation Status). Actions taken in response to Task Force recommendations have included revisions to several guidance documents, development of draft regulatory guidance on implementation of the requirements of 10 CFR 20.1406 (*i.e.* DG–4012),[22] revisions to Inspection Procedure 71122.01, and an evaluation of whether further action was required to enhance the performance of SFP tell-tale drains.[23] For example, Regulatory

[21] The NRC staff recently completed an inspection at Indian Point Units 1 and 2. NRC Inspection Report Nos. 05000003/2007010 and 05000247/2007010, May 13, 2008 (ML0813404250). The purpose of the inspection was to assess Entergy's site groundwater characterization conclusions and the radiological significance of Entergy's discovery of a spent fuel pool leakage at Units 1 and 2. The NRC staff concluded that Entergy's response to the spent fuel pool leakage was reasonable and technically sound. The NRC staff stated that ''[t]he existence of on-site groundwater contamination, as well as the circumstances surrounding the causes of leakage and previous opportunities for identification and intervention, have been reviewed in detail. Our inspection determined that public health and safety has not been, nor is likely to be, adversely affected, and the dose consequence to the public that can be attributed to current on-site conditions associated with groundwater contamination is negligible.'' *Id.*

[22] DG–4012 was formally issued as Regulatory Guide 4.21, ''Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning'' in June 2008.

[23] In addition to the NRC's efforts, the nuclear industry collectively responded to these incidents

Continued

Guide 4.1 is being revised to provide guidance to industry for detecting, evaluating, and monitoring releases from operating facilities via unmonitored pathways; to ensure consistency with current industry standards and commercially available radiation detection methodology; to clarify when a licensee's radiological effluent and environmental monitoring programs should be expanded based on data or environmental conditions; and to ensure that leaks and spills will be detected before radionuclides migrate offsite via an unmonitored pathway. Also, Regulatory Guide 1.21 is being revised to provide a definition of ''significant contamination'' that should be documented in a licensee's decommissioning records under to 10 CFR 50.75(g); to clarify how to report summaries of spills and leaks in a licensee's Annual Radioactive Effluent Release Report; to provide guidance on remediation of onsite contamination; and to upgrade the capability and scope of the in-plant radiation monitoring system to include additional monitoring locations and the capability to detect lower risk radionuclides. Further, Inspection Procedure 71122.01 has been revised to provide for review of onsite contamination events, including events involving groundwater; evaluation of effluent pathways so that new pathways are identified and placed in the licensee's Offsite Dose Calculation Manual, as applicable; and inclusion of limited, defined documentation of significant radioactive releases to the environment in inspection reports for those cases where such events would not normally be documented under current inspection guidance. *See* Implementation Status (ML073230982).

In addition, on January 22, 2008; 73 FR 3812, the NRC published a proposed rule that would, in part, amend 10 CFR part 20 to clarify existing requirements by explicitly requiring licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, including subsurface soil and groundwater. This proposed rule also would include a requirement that licensees perform surveys to evaluate the concentrations and quantities of residual radioactivity and the potential radiological hazards of residual radioactivity detected. *Id.* While unmonitored, unplanned releases continue to require the NRC's and licensees' attention, the NRC staff is confident that this issue will be adequately addressed through continued regulatory oversight of operating and new nuclear reactors and enhanced through the NRC's continued implementation of the Task Force recommendations. Therefore, the NRC staff continues to have assurance that no significant environmental impacts or safety concerns will result from extended storage in spent fuel pools.

2. Storage in Dry Casks

With regard to dry cask storage, studies of the accident risk of dry storage since 1990 have focused on specific dry cask storage systems located at either a generic Pressurized Water Reactor (PWR) site or a specific Boiling Water Reactor (BWR) site. In 2004, the Electric Power Research Institute (EPRI) performed a Probabilistic Risk Assessment (PRA) of a bolted dry spent fuel storage cask at a generic PWR site. K. Canavan, ''Probabilistic Risk Assessment (PRA) of Bolted Storage Casks Updated Quantification and Analysis Report,'' Electric Power Research Institute, Palo Alto, California; EPRI Doc. No. 1009691, December 2004. In 2007, the NRC published a pilot PRA 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 BWR site. NUREG–1864, ''A Pilot Probabilistic Risk Assessment of a Dry Cask Storage System at a Nuclear Power Plant,'' March 2007. Both studies calculated the annual individual radiological risk and consequences associated with a single cask lifecycle where the lifecycle is divided into three phases: loading, onsite transfer, and onsite storage. The results of the EPRI study showed that risk is extremely low with no calculated early fatalities, a first year risk of latent cancer fatality of 5.6E–13 per cask, and subsequent year cancer risk of 1.7E–13 per cask. The NRC study also showed that risk is extremely low with no prompt fatalities expected, a first year risk of latent cancer fatality of 1.8E–12 per cask and subsequent year cancer risk of 3.2E–14 per cask. The major contributors to the low risk associated with dry cask storage are that they are passive systems, relying on natural air circulation for cooling, and are inherently robust massive structures that are highly damage resistant.

NRC and licensee experience to date with ISFSIs and with certification of casks has indicated that interim storage of spent 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. The problems that have been encountered primarily occur during cask preparation activities, after initial loading of spent fuel, but before placement on the storage pad. One issue involved the unanticipated collection and ignition of combustible gas during cask welding activities. The NRC issued generic communications in 1996 addressing the problem and providing direction for preventing its recurrence. NRC Bulletin 96–04, ''Chemical, Galvanic, or Other Reactions in Spent Fuel Storage and Transportation Casks,'' and NRC Information Notice 96–34: ''Hydrogen Gas Ignition During Closure Welding of a VSC–24 Multi-Assembly Sealed Basket.'' NRC inspection and review guidance was also revised to ensure that appropriate measures are in place to preclude these events. *See* NRC Inspection Manual, Inspection Procedure 60854 Item 60854–02 and 02.03.a.6 and SFPO Interim Staff Guidance No. 15, dated January 10, 2001.

In addition, issuance of Materials License No. SNM–2513 for the Private Fuel Storage, LLC (PFS) facility has confirmed the feasibility of licensing an AFR ISFSI under 10 CFR Part 72. While there are several issues that would have to be resolved before the PFS AFR ISFSI could be built and operated,[24] the extensive review of safety and environmental issues associated with licensing the PFS facility provides additional confidence that spent fuel may be safely stored at an AFR ISFSI for long periods, after storage at a reactor site. The PFS facility was licensed for a

of unplanned, unmonitored releases of radioactive liquids through the Industry Initiative on Groundwater Protection (Industry Initiative). The Industry Initiative has resulted in publication of voluntary industry guidance on the implementation of groundwater protection programs at nuclear power plants. *See* ''Industry Ground Water Protection Initiative-Final Guidance Document,'' NEI–07–07, August 2007 (ML072610036); ''Groundwater Protection Guidelines for Nuclear Power Plants: Public Edition, EPRI, Palo Alto, CA: EPRI Doc. No. 1016099, 2008.

[24] For example, on September 7, 2006, two separate Interior Department agencies refused PFS a lease to use tribal lands to store spent fuel and refused to grant a right-of-way to access the land. On July 17, 2007, PFS filed a complaint against the Interior Department challenging its decisions. The case has not yet been resolved. Another issue is associated with the February 2006 (NAS) Report on the transport of SNF in the United States, which concluded that while safe transport is technically viable, ''the societal risks and related institutional challenges may impinge on the successful implementation of large-quantity shipping programs.'' National Research Council 2006, ''Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States,'' Washington, DC: National Academy Press, TIC: 217588, at pp. 214. The NAS committee found that ''malevolent acts against spent fuel and high-level waste shipment are a major technical and societal concern,'' and recommended that ''an independent examination of security of spent fuel and high-level waste transportation be carried out prior to the commencement of large-quantity shipments to a federal repository or to interim storage.'' *Id.*

period of 20 years with the potential for license renewal.

In addition, as noted in its 1990 Waste Confidence Decision, the Commission has confidence in the safety and environmental insignificance of dry storage at an MRS for 70 years following a period of 70 years of storage in spent fuel storage pools (55 FR 38509–38513; September 18, 1990). Specifically, the Commission stated:

> Under the environmental assessment for the MRS rule [NUREG–1092], the Commission has found confidence in the safety and environmental insignificance of dry storage of spent fuel for 70 years following a period of 70 years of storage in spent fuel storage pools. Thus, this environmental assessment supports the proposition that spent fuel may be stored safely and without significant environmental impact for a period of up to 140 years if storage in spent fuel pools occurs first and the period of dry storage does not exceed 70 years.

Further, a commenter on the 1990 Waste Confidence Decision asserted that there was reasonable assurance that spent fuel could be stored safely and without significant environmental risk in dry casks at reactor sites for up to 100 years. The Commission responded (55 FR 38482; September 18, 1990):

> The Commission does not dispute a conclusion that dry spent fuel storage is safe and environmentally acceptable for a period of 100 years. Evidence supports safe storage for this period. A European study published in 1988 states, ''in conclusion, present-day technology allows wet or dry storage over very long periods, and up to 100 years without undue danger to workers and population (See Fettel, W., Kaspar, G., and Guntehr, H., ''Long-Term Storage of Spent Fuel from Light-Water Reactors'' (EUR 11866 EN), Executive Summary, p.v., 1988).
>
> Although spent fuel can probably be safely stored without significant environmental impact for longer periods, the Commission does not find it necessary to make a specific conclusion regarding dry cask storage in this proceeding, as suggested by the commenter, in part because the Commission's Proposed Fourth Finding states that the period of safe storage is ''at least'' 30 years after expiration of a reactor's operating license. The Commission supports timely disposal of spent fuel and high-level waste in a geologic repository, and by this decision does not intend to support storage of spent fuel for an indefinitely long period.

The Commission also explained the nature of its finding that spent fuel could be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation, stating (55 FR 38509; September 18, 1990):

> [I]n using the words ''at least'' in its revised Finding Four, the Commission is not suggesting 30 years beyond the licensed life for operation * * * represents any technical limitation for safe and environmentally benign storage. Degradation rates of spent fuel in storage, for example, are slow enough that it is hard to distinguish by degradation alone between spent fuel in storage for less than a decade and spent fuel stored for several decades.

As explained previously in this document under the discussion of Finding 3, the NRC has renewed two specific ISFSI licenses for an extended 40-year period under exemptions granted from 10 CFR part 72, which provides for 20-year renewals. In addition, NRC is considering a rulemaking which would provide a 40-year license term for an ISFSI with the possibility of renewal. *See License and Certificate of Compliance Terms,* 73 FR 45173; August 4, 2008. Continued suitability of materials is a prime consideration for ISFSI license renewals. As discussed under Finding 3 in this document, the applicants' evaluation of aging effects on the structures, systems and components important to safety, supplemented by the licensees' aging management programs, provided reasonable assurance of continued safe storage of spent fuel in these ISFSIs. Thus, these cases reaffirm the Commission's confidence in the safety of interim dry storage for an extended period. While these license renewal cases only address storage for a period of up to 60 years (20-year initial license, plus 40-year renewal), studies performed to date indicate no major issues with dry storage for up to 100 years. *See, e.g.*, NUREG/CR–6831, ''Examination of Spent PWR Fuel rods after 15 Years in Dry Storage,'' (September 2003); J. Kessler, ''Technical Bases for Extended Dry Storage of Spent Nuclear Fuel,'' Electric Power Research Institute, Palo Alto, California; EPRI Doc. No. 1003416, December 2002. (55 FR 38509; September 18, 1990).

3. Terrorism and Spent Fuel Management

The NRC has, since the 1970s, regarded spent fuel in storage as a potential terrorist target and provided for appropriate security measures. Before the tragic events of September 11, 2001, spent fuel was well protected by physical barriers, armed guards, intrusion detection systems, area surveillance systems, access controls, and access authorization requirements for persons working inside nuclear power plants and spent fuel storage facilities. Since September 11, 2001, the NRC has significantly modified its requirements, and licensees have significantly increased their resources to further enhance and improve security at spent fuel storage facilities and nuclear power plants. *See* Letter to Senator Pete V. Domenici from NRC Chairman Nils J. Diaz, dated March 14, 2005 (ML050280428) (Diaz Letter), at 20.

Consistent with the approach taken at other categories of nuclear facilities, the NRC responded to the terrorist attacks of September 11, 2001 by promptly developing and requiring security enhancements for spent fuel storage both in spent fuel pools and dry casks. In February 2002, the NRC required power reactor licensees to enhance security and improve their capabilities to respond to terrorist attack. The NRC's orders included requirements for spent fuel pool cooling to deal with the consequences of potential terrorist attacks. These enhancements to security included increased security patrols, augmented security forces, additional security posts, increased vehicle standoff distances, and improved coordination with law enforcement and intelligence communities, as well as strengthened safety-related mitigation procedures and strategies. The February 2002 orders required licensees to develop specific guidance and strategies to maintain or restore spent fuel pool cooling capabilities using existing or readily available resources (equipment and personnel) that can be effectively implemented under the circumstances associated with the loss of large areas of the plant due to large fires and explosions. The NRC issued additional orders on security, including security for spent fuel storage in January and April of 2003. The NRC subsequently inspected each facility to verify the licensee's implementation, evaluated inspection findings and, as necessary, required actions to address any noted deficiencies. The NRC's inspection activities in this area are ongoing. In 2004, the NRC reviewed and approved revised security plans submitted by licensees to reflect the implementation of new security requirements. The enhanced security at licensee facilities is routinely inspected using a revised baseline inspection program, and power reactor licensees' capabilities (including spent fuel pools) are tested in periodic (every 3 years) force-on-force exercises. Diaz Letter, at iii, 7, 9.

In 2002, the NRC 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. In the same year, the NRC required licensees transporting more than a specified amount of spent fuel to

enhance security during transport. Diaz Letter, at 7, 8.

In 2002, the NRC also initiated a classified program on the capability of nuclear facilities to withstand a terrorist attack. The early focus of the program was on power reactors, including spent fuel pools, and on dry cask storage and transportation. As the results of that classified program became available, NRC provided licensees additional guidance on the Commission's expectations regarding the implementation of the orders on the spent fuel mitigation measures. Diaz Letter, at iv.

More recently, on October 26, 2006; 71 FR 62664, the NRC issued a proposed rule to improve security measures at nuclear power reactors. The Commission is currently considering a draft final rule. In addition, 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).

i. Spent Fuel Pools

SFPs are extremely robust structures that are designed to safely contain spent fuel under a variety of normal, off-normal, and hypothetical accident conditions (*e.g.*, loss of electrical power, floods, earthquakes, tornadoes). SFPs are massive structures made of reinforced concrete with walls typically over six feet thick, lined with welded stainless steel plates to form a generally leak-tight barrier, fitted with racks to store the fuel assemblies in a controlled configuration and provided with redundant monitoring, cooling and make-up water systems. Spent fuel stored in SFPs is typically covered by about 25 feet of water that serves as both shielding and an effective protective cover against impacts directly on the stored fuel. Diaz Letter, at 2; *The Attorney General of Commonwealth of Massachusetts, The Attorney General of California; Denial of Petitions for Rulemaking,* 73 FR 46206; August 8, 2008 (*Denial of PRMs*).

The post September 11, 2001 studies noted previously confirm the effectiveness of additional mitigation strategies to maintain spent fuel cooling in the event the pool is drained and its initial water inventory is reduced or lost entirely. Based on this recent information and the implementation of additional strategies following September 11, 2001, the probability, and, accordingly, the risk of an SFP zirconium fire initiation will be less than reported in NUREG–1738 and previous studies. Given the physical robustness of SFPs, the physical security measures, and the SFP mitigation measures, and based upon NRC site evaluations of every SFP in the United States, the NRC has determined that the risk of an SFP 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 Denial of PRMs,* 73 FR 46207–08; August 8, 2008).

ii. Dry Storage Casks

Dry storage casks are massive canisters, either all metal or a combination of concrete and metal, and are inherently robust (*e.g.*, some casks weigh over 100 tons). Storage casks contain spent fuel in a sealed and chemically-inert environment. Diaz Letter, at 3.

The NRC has evaluated the results of security assessments involving large commercial aircraft attacks, which were performed on four prototypical spent fuel cask designs, and concluded that the likelihood is very low that a radioactive release from a spent fuel storage cask would be significant enough to cause adverse health consequences to nearby members of the public. While differences exist with storage cask designs, the results of the security assessments indicate that any potential radioactive releases were consistently very low.

The NRC also evaluated the results of security assessments involving vehicle bomb and ground assault attacks against these same four cask designs. The NRC concluded that while a potential radiological release was possible, the size and nature of the release did not require the Commission to immediately implement additional security compensatory measures. Accordingly, the NRC staff has recommended, and the Commission has approved, development of risk-informed, performance-based security requirements and associated guidance applicable to all ISFSI licensees (general and specific), which would enhance existing security requirements. This proposed ISFSI security rulemaking would apply to all existing and future licensees. *See* SECY–07–0148, ''Independent Spent Fuel Storage Installation Security Requirements for Radiological Sabotage,'' (August 28, 2007) (ML080250294); Staff Requirements—SECY–07–0148–Independent Spent Fuel Storage Installation Security Requirements for Radiological Sabotage, (December 18, 2007) (ML073530119). In addition, the NRC has noted that distributing spent fuel over many discrete storage casks (*e.g.*, in an ISFSI) limits the total quantity of spent fuel that could potentially be attacked at any one time, due to limits on the number of adversaries and the amount of equipment they can reasonably bring with them. Diaz Letter, at 17, 18, 22.

iii. Conclusion-Security

Today, spent fuel is better protected than ever. The results of security assessments, existing security regulations, and the additional protective and mitigative measures imposed since September 11, 2001, provide high assurance that the spent fuel in both spent fuel pools and in dry storage casks will be adequately protected. The ongoing efforts to update the ISFSI security requirements to address the current threat environment will integrate the additional protective measures imposed since September 11, 2001, into a formalized regulatory framework in a transparent manner that balances public participation against protection of exploitable information.

4. Conclusion

The Commission concludes that the events that have occurred since the last formal review of its Waste Confidence Decision in 1990 provide support for a continued finding of reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation of that reactor at its spent fuel storage basin. Specifically, NRC finds continued support for this finding in the extensive study of spent fuel pool storage that has occurred since 1990, and the continued regulatory oversight of operating plants, which has been enhanced by the recommendations of the Liquid Release Task Force.

Further, the Commission is proposing to revise Finding 2 to reflect its expectation that repository capacity will be available within 50–60 years of the licensed life for operation of any reactor. Consistent with this, the Commission is proposing to revise Finding 4 to reflect that spent fuel can be safely stored in dry casks for a period of at least 60 years without significant environmental impacts. Specifically, the inherent robustness and passive nature of dry cask storage—coupled with the operating experience and research accumulated to date, the 70 year finding in the Environmental Assessment for the MRS rule, and the renewal of two specific Part 72 licenses for an extended 40 year period (for a total ISFSI

operating life of at least 60 years)—support this finding. Further, this finding is consistent with the Commission's statements in 1990 that it did not dispute that dry spent fuel storage is safe and environmentally acceptable for a period of 100 years (55 FR 38482; September 18, 1990); that spent fuel could probably be safely stored without significant environmental impact for periods longer than 30 years (55 FR 38482; September 18, 1990); and that the 30 year finding did not represent a technical limitation for safe and environmentally benign storage (55 FR 38509; September 18, 1990).

C. Finding 4

The Commission finds reasonable assurance that, if necessary, spent 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 independent spent fuel storage installations.

V. Finding 5: The Commission Finds Reasonable Assurance That Safe Independent Onsite Spent Fuel Storage or Offsite Spent Fuel Storage Will Be Made Available if Such Storage Capacity Is Needed

A. Bases for Finding 5

The focus of this finding is on the timeliness of the availability of facilities for storage of spent fuel when the fuel can no longer be stored in the reactor's spent fuel storage pool. At the outset of the Waste Confidence proceeding there was uncertainty as to who had the responsibility for providing this storage, with the expectation that the Federal government would provide away-from-reactor facilities for this purpose. However, in 1981 DOE announced its decision to discontinue the AFR program. The Commission found that the industry's response to this change was a general commitment to do whatever was necessary to avoid shutting down reactors. The NWPA provided Federal policy on this issue by defining public and private responsibilities for spent fuel storage and by providing for an MRS program, an interim storage program at a Federal facility for utilities for whom there was no other solution, and a research, development, and demonstration program for dry storage designed to assist utilities in using dry storage methods. These NWPA provisions, together with the availability of ISFSI technology and the fact that the Part 72 regulations and licensing procedures were in place gave the Commission assurance that safe independent onsite or offsite spent fuel storage would be available when needed (49 FR 34686–34687; August 31, 1984).

In 1990, the Commission saw no need to revise this finding. It recognized that the NWPAA had undermined the ability of an MRS to provide for timely storage by linking the MRS to the siting and schedule for a repository (*e.g.*, DOE was not permitted to select an MRS site until it had recommended a site for development as a repository). However, it found that whatever the uncertainty introduced by these NWPAA provisions, it was more than compensated for by operational and planned spent fuel pool expansions and dry storage investments by the utilities themselves. The Commission also considered the fact that it seemed probable that DOE would not meet the 1998 deadline for beginning to remove spent fuel from the utilities. This did not undermine the Commission's confidence that storage capacity would be made available as needed because NRC licensees cannot abrogate their safety responsibilities and would remain responsible for the stored fuel despite any possible contractual disputes with DOE. The Commission noted that DOE's research program had successfully demonstrated the viability of dry storage technology and that the utilities had continued to add dry storage capacity at their sites. Further, the Commission believed that there would be sufficient time for construction and licensing of any additional storage capacity that might be needed due to operating license renewals (55 FR 38513–38514; September 18, 1990).

B. Evaluation of Finding 5

In 1990 the Commission reaffirmed Finding 5 despite significant uncertainties regarding DOE's MRS and repository programs, and the potential for the renewal of reactor operating licenses. Specifically, in reaffirming Finding 5 the Commission stated:

> In summary, the Commission finds no basis to change the Fifth Finding in its Waste Confidence Decision. Changes by the NWPAA, which may lessen the likelihood of an MRS facility, and the potential for some slippage in repository availability to the first quarter of the twenty-first century * * * are more than offset by the continued success of utilities in providing safe at-reactor-site storage capacity in reactor pools and their progress in providing independent onsite storage. Therefore, the Commission continues to find ''* * * reasonable assurance that safe independent onsite spent fuel storage or offsite spent fuel storage will be made available if such storage is needed.'' (55 FR 38514; September 18, 1990).

In reaching this conclusion, the Commission stressed that—regardless of the outcome of possible contractual disputes between DOE and utilities—the utilities possessing spent fuel could not abrogate their safety responsibilities. In addition, the Commission cited to three situations where dry storage had been licensed at specific reactor sites (Surry, H.B. Robinson, and Oconee), and to several additional applications for licenses permitting dry cask storage at reactor sites. *Id.*

1. Operating and Decommissioned Reactors

As in 1990, the NRC staff is not aware of any current operating reactor that has an insurmountable problem with safe storage of SNF. The options successfully being used to increase onsite storage capacity are spent fuel pool re-racking and fuel-pin consolidation, as well as onsite dry cask storage. While there are cases where a licensee's ability to use an onsite dry cask storage option may be limited by State or Public Utility Commission authorities, the NRC is successfully regulating six fully decommissioned reactor sites that contain ISFSIs licensed under either the general or specific license provisions of Part 72. The NRC has not encountered any management problems associated with the ISFSIs at these six decommissioned reactor sites and has discussed plans to build generally licensed ISFSI's with two additional licensees that are in the process of decommissioning.

In addition, since 1990, the NRC has renewed the specific Part 72 ISFSI licenses for both the Surry and H.B. Robinson plants for an extended 40-year period, instead of the 20-year renewal period currently provided for under Part 72. As discussed previously under Finding 3, the Commission authorized the staff to grant exemptions to allow the 40-year renewal period after the staff reviewed the applicants' evaluations of aging effects on the structures, systems, and components important to safety, and determined that the evaluations, supplemented by the licensees' aging management programs, provided reasonable assurance of continued safe storage of spent fuel in these ISFSIs. *See* SECY–04–0175, ''Options for Addressing the Surry Independent Spent Fuel Storage Installation License-Renewal Period Exemption Request,'' September 28, 2004 (ML041830697).

With regard to the uncertainty surrounding the contractual disputes

between DOE and the utilities referenced by the Commission in 1990, the U.S. Court of Appeals for the District of Columbia Circuit has since held that DOE's statutory and contractual obligation to accept the waste no later than January 31, 1998, was unconditional. *Indiana Michigan Power Co.* v. *DOE*, 88 F.3d 1272 (DC Cir. 1996). Subsequently, the utilities have continued to manage spent fuel safely in spent fuel pools and ISFSIs and have received damage awards as determined in lawsuits brought before the U.S. Federal Claims Court, *see, e.g., System Fuels Inc.* v. *U.S.*, 78 Fed. Cl. 769 (October 11, 2007).

In total, there are currently 51 licensed ISFSIs being managed at 47 sites across the country, under either specific or general Part 72 NRC licenses. As explained in the discussion of Finding 3, NRC's inspection findings do not indicate unique management problems at any currently operating ISFSI regulated by the NRC. Generally, the types of issues identified through NRC inspections of ISFSIs are similar to issues identified for Part 50 licensees. Most issues are identified early in the operational phase of the dry cask storage process, during loading preparations and actual spent fuel loading activities. Once an ISFSI is fully loaded with spent fuel, relatively few inspection issues are identified due to the passive nature of these facilities.

Finally, on June 3, 2008, the DOE submitted its license application for the proposed Yucca Mountain HLW repository, and on September 8, 2008, NRC Staff notified DOE that it found the application acceptable for docketing (73 FR 53284; September 15, 2008). While the Commission can express no view on the quality or acceptability of the application in this evaluation of waste confidence, its submittal is evidence of a continued Federal commitment to providing for ultimate disposal of spent fuel.

2. New Reactors

With regard to the status of contracts requiring DOE to take title to and possession of the irradiated fuel generated by utilities, the NRC staff understands that DOE has drafted language for a new amendment to the standard DOE-utility contracts. According to reports in the trade press, the revised contract will require DOE to accept spent fuel from any new nuclear power plants ten years after expiration of the operating license or any extension of the operating license. The utilities have not publicly expressed an opinion on the revised contracts to date. *See* Energy Daily, ED Vol. 36 No. 107, Thursday, June 5, 2008. In addition, before licensing a new reactor the NRC must find that the applicant has entered into a contract with DOE for removal of spent fuel from the reactor site, or receive written affirmation from DOE that the applicant is actively and in good faith negotiating with the DOE for such a contract. NWPA, Sec.302(b). This finding will be documented in the Safety Evaluation Report produced by the NRC staff in response to specific license applications for new reactors.

The near-term design certifications and existing or planned combined license applications do not undermine the Commission's confidence that spent fuel storage will become available when such storage is needed. These facilities will use the same or similar fuel assembly designs as the nuclear power plants currently operating in the United States and the spent fuel will be accommodated using existing or similar transportation and storage containers. As discussed under Finding 1, the NRC is also engaged in preliminary interactions with DOE on ''advanced reactors'' (*e.g.*, gas-cooled or liquid-metal cooled technologies). The fuel and reactor components associated with some of these advanced reactor designs would likely require different storage, transportation and disposal packages than those currently used for spent fuel from light-water reactors. The possible need for further assessment of performance and storage capability for new and different fuels would depend on the number and types of reactors actually licensed and operated. There is currently a high uncertainty regarding the growth of advanced reactors in the U.S. In addition, the need to consider waste disposal as part of the overall research and development activities for advanced reactors is recognized and included in the activities of DOE, designers, and the NRC (see, for example, ''A Technology Roadmap for Generation IV Nuclear Energy Systems,'' issued by the U.S. DOE Nuclear Energy Research Advisory Committee and the Generation IV International Forum, December 2002).

Nonetheless, the addition of new plants will undoubtedly add to the amount of spent fuel requiring disposal. This fact does not affect the Commission's confidence that safe storage options will be available when needed because, as the Commission stated in 1990—utilities have sought to meet storage capacity needs at their respective reactor sites (55 FR 38514; September 18, 1990). Specifically, as discussed under Finding 3, NRC licensees have successfully and safely used onsite storage capacity in spent fuel pools and, more recently, in onsite ISFSIs licensed under 10 CFR part 72. In addition, while construction and operation of an MRS facility by DOE is uncertain, the NRC has promulgated regulations that provide a framework for licensing such a facility. *See* 10 CFR part 72 (53 FR 31651; August 19, 1988). Further, while there are unresolved issues that prevent construction and operation of the PFS facility, the extensive safety and environmental reviews that supported issuance of an NRC license for PFS provide added confidence that licensing of a private AFR facility is technically feasible.

The Commission concludes that the events that have occurred since the last formal review of the Waste Confidence Decision in 1990, provide support for a continued finding of reasonable assurance that safe independent onsite spent fuel storage or offsite spent fuel storage will be made available if such storage capacity is needed. Specifically, since 1990, NRC licensees have continued to develop and successfully use onsite storage capacity in the form of pool and dry cask storage in a safe and environmentally sound fashion. With regard to offsite storage, the Commission licensed the PFS facility after an extensive safety and environmental review process, and a protracted adjudicatory hearing that resulted in over 70 ASLB and Commission decisions. The Commission also has a regulatory framework in place for licensing an MRS facility, should the need arise. In addition, based on discussions with the DOE and recent reports in the trade press, the NRC understands that a new standard contract providing for disposal of spent fuel by DOE is currently being prepared. This, coupled with the recent submission of a license application for the proposed Yucca Mountain repository, provides the NRC with continued confidence in the Federal commitment to providing for the ultimate disposal of spent fuel.

For all the above reasons, the Commission proposes to reaffirm Finding 5.

Dated at Rockville, Maryland, this 29th day of September 2008.

For the Nuclear Regulatory Commission.

Annette Vietti-Cook,

Secretary of the Commission.

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