



U.S. NUCLEAR REGULATORY COMMISSION

DRAFT REGULATORY GUIDE DG-1349

Revision 1

Proposed Revision 2 to Regulatory Guide RG 1.185

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STANDARD FORMAT AND CONTENT FOR POST-SHUTDOWN DECOMMISSIONING ACTIVITIES REPORT

A. INTRODUCTION

Purpose

This regulatory guide (RG) identifies the type of information that the post-shutdown decommissioning activities report (PSDAR) must contain and establishes a standard format for the PSDAR that the U.S. Nuclear Regulatory Commission (NRC) staff considers acceptable.

Applicability

This guide applies to holders of operating licenses for nuclear power reactors subject to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities” (Ref. 1), and 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants” (Ref. 2).

Applicable Regulations

- 10 CFR Part 20, “Standards for Protection against Radiation” (Ref. 3), provides the radiological release criteria and radiological protection requirements applicable during decommissioning, specifically in Subpart E, “Radiological Criteria for License Termination.”
- 10 CFR Part 50 provides the regulations for licensing production and utilization facilities.
 - 10 CFR 50.2, “Definitions,” provides definitions.
 - 10 CFR 50.4, “Written communications,” provides the requirements for written communications.
 - 10 CFR 50.47, “Emergency plans,” provides emergency planning requirements.

This RG is being issued in draft form to involve the public in the development of regulatory guidance in this area. It has not received final staff review or approval and does not represent an NRC final staff position. Public comments are being solicited on this DG and its associated regulatory analysis. Comments should be accompanied by appropriate supporting data. Comments may be submitted through the Federal rulemaking Web site, <http://www.regulations.gov>, by searching for draft regulatory guide DG-1349. Alternatively, comments may be submitted to Office of the Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff. Comments must be submitted by the date indicated in the *Federal Register* notice.

Electronic copies of this DG, previous versions of DGs, and other recently issued guides are available through the NRC’s public Web site under the Regulatory Guides document collection of the NRC Library at <https://nrcweb.nrc.gov/reading-rm/doc-collections/reg-guides/>. The DG is also available through the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>, under Accession No. ML21347A138. The regulatory analysis is associated with a rulemaking and may be found in ADAMS under Accession No. ML22019A132.

- 10 CFR 50.54, “Conditions of licenses,” provides the conditions for a license.
- 10 CFR 50.59, “Changes, tests, and experiments,” provides the requirements for making changes to a facility without prior NRC approval under certain circumstances.
- 10 CFR 50.71, “Maintenance of records, making of reports,” provides the requirements for the maintenance of records and for making reports.
- 10 CFR 50.75, “Reporting and recordkeeping for decommissioning planning,” provides the requirements for reporting and recordkeeping for decommissioning planning.
- 10 CFR 50.82, “Termination of license,” provides the requirements for termination of a license.
 - 10 CFR 50.82(a)(4)(i) requires submission of a PSDAR.
- 10 CFR 50.200, “Power reactor decommissioning emergency plans,” provides emergency planning requirements for a nuclear power reactor after permanent cessation of operations and removal of fuel from the reactor vessel.
- 10 CFR Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions” (Ref. 4), provides the requirements for environmental protection regulations for the NRC’s domestic licensing and related regulatory functions.
- 10 CFR Part 52 governs the issuance of early site permits, standard design certifications, combined licenses, standard design approvals, and manufacturing licenses for nuclear power facilities.
 - 10 CFR 52.110, “Termination of license” provides the requirements for termination of a license.
 - 10 CFR 52.110(d)(1) requires submission of a PSDAR.
- 10 CFR Part 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste” (Ref. 5), provides, in part, the regulatory requirements for licensing independent spent fuel storage installations (ISFSIs).
- 10 CFR Part 140, “Financial Protection Requirements and Indemnity Agreements” (Ref. 6), provides, in part, the financial protection requirements for decommissioning facilities.

Related Guidance

- RG 1.184, “Decommissioning of Nuclear Power Reactors” (Ref. 7), provides overall guidance on the process involved with the decommissioning of power reactors.
- RG 1.202, “Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors” (Ref. 8), provides guidance on submittal of decommissioning cost estimates for nuclear power reactors.

- RG 1.159, “Assuring the Availability of Funds for Decommissioning Nuclear Reactors” (Ref. 9), provides guidance on estimating the amount of funds for decommissioning and methods acceptable for demonstrating financial assurance.
- RG 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning” (Ref. 10), provides guidance to licensees on the steps they can take to minimize contamination and facilitate decommissioning using a risk-informed approach.
- RG 4.22, “Decommissioning Planning During Operations” (Ref. 11), provides guidance on determining if changes to operations or monitoring programs are needed to comply with 10 CFR Part 20, conducting appropriate radiological surveys including of the subsurface, and providing adequate funding to complete decommissioning.
- NUREG-1713, “Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors” (Ref. 12), provides information on how the NRC staff will review site-specific decommissioning cost estimates.

Purpose of Regulatory Guides

The NRC issues RGs to describe to the public methods that the staff considers acceptable for use in implementing specific parts of the agency’s regulations, to explain techniques that the staff uses in evaluating specific problems or postulated events, and to provide guidance to applicants. Regulatory guides are not substitutes for regulations and compliance with them is not required. Methods and solutions that differ from those set forth in RGs will be deemed acceptable if they provide a basis for the findings required for the issuance or continuance of a permit or license by the Commission.

Paperwork Reduction Act

This RG provides voluntary guidance for implementing mandatory information collections covered by 10 CFR 20, 50, 51, 52, 72, and 140 that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et. seq.). These information collections were approved by the Office of Management and Budget (OMB), under control numbers 3150-0014, 3150-0011, 3150-0021, 3150-0151, 3150-0132, and 3150-0039 respectively. Send comments regarding this information collection to the FOIA, Library, and Information Collections Branch, (T6-A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the OMB reviewer at OMB Office of Information and Regulatory Affairs, NEOB-10202 (3150-0014, 3150-0011, 3150-0021, 3150-0151, 3150-0132, and 3150-0039), Office of Management and Budget, Washington, DC 20503.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

B. DISCUSSION

Reason for Revision

This revision of RG 1.185 (Revision 2) was issued as part of a rulemaking to amend the Commission's regulations relating to decommissioning for nuclear power reactors. The rulemaking, titled "Regulatory Improvements for Production and Utilization Facilities Transitioning to Decommissioning" (RIN No: 3150-AJ59; NRC Docket ID: NRC-2015-0070), amended 10 CFR 50.82, along with numerous other regulations, to provide for a more efficient process for transitioning to decommissioning, to reduce the need for exemptions from existing regulations and license amendment requests, and to address other decommissioning issues identified by the NRC staff that could streamline and improve the overall decommissioning process.

Since the issuance of Revision 1 of this RG, several licensees have submitted PSDARs for the NRC's review as well as license amendment requests with proposed changes to the technical specifications for NRC approval. As a result of its review of these submittals, the NRC staff has identified common areas of decommissioning that frequently require clarification or that could be enhanced as part of the overall process, including the need for early communication, insufficient information in environmental reports, the need for early detection of spills, discussions involving the decommissioning strategy and timeline, plans for public involvement opportunities during decommissioning, discussions involving the plans for storage of spent fuel, and estimates of decommissioning costs.

Background

After a licensee permanently shuts down a power reactor facility and the facility enters decommissioning, there is a transition period to reconfigure the licensing basis and operational approach to reflect the differences between an operating power reactor facility and a power reactor facility in decommissioning. The termination of license regulations in 10 CFR 50.82 and 10 CFR 52.110 govern decommissioning. These regulations establish a timeframe for the completion of decommissioning, determine which types of activities require prior approval before being implemented, govern the release criteria that the site must meet to qualify for license termination, outline the appropriate use of decommissioning funds, and set up the enveloping environmental considerations for decommissioning, among other items. The NRC initially updated the termination of license regulations in 1996 (Volume 61 of the *Federal Register* (FR), page 39278 (61 FR 39278); July 29, 1996) (Ref. 13) and made additional changes to the decommissioning regulations in 1997 (62 FR 39091) (Ref. 14), 2003 (68 FR 19727) (Ref. 15), and 2014 (79 FR 66603) (Ref. 16).

The 1996 rulemaking changed 10 CFR 50.82 to provide licensees with simplicity and flexibility in implementing the decommissioning process. The changes removed the requirement that the NRC approve a decommissioning plan before a licensee initiates the decommissioning process. The changes were also intended to clarify ambiguities in the previous decommissioning regulations, codify procedures and terminology that had been used in a number of specific cases, and increase opportunities for the public to learn about licensees' decommissioning activities. The changes were designed to establish a level of NRC oversight commensurate with the level of safety concerns expected during decommissioning activities.

In addition to the regulations in 10 CFR 50.82, on June 17, 2011, the NRC issued the Decommissioning Planning Rule (DPR) (76 FR 35512) (Ref. 17). The DPR requires all licensees to establish operational practices to minimize site radiological contamination and perform reasonable subsurface radiological surveys, and it also sets forth new financial assurance requirements that require

more detail in the site-specific decommissioning cost estimate submitted with the PSDAR than the estimates done in accordance with the financial assurance requirements of 10 CFR 50.75. The ultimate goal of the DPR is for licensees to have sufficient funds to conduct radiological decommissioning and thus, complete decommissioning effectively and efficiently.

For any licensees that submitted a decommissioning plan before August 28, 1996, the NRC considers the decommissioning plan and the associated environmental review to be the PSDAR submittal. Decommissioning plans normally contain sufficient information to satisfy the requirements of the PSDAR. Licensees that have an approved decommissioning plan must submit an update for activities that they had not considered in their original decommissioning plans to comply with 10 CFR 50.82(a)(7). The NRC encourages licensees to replace their decommissioning plans with a PSDAR update that uses the content and level of detail specified in this document.

Description of the PSDAR and Submittal Process

The purpose of the PSDAR is to provide the NRC and the public with a general overview of the licensee's proposed decommissioning activities before they take place, and to inform the NRC staff of the licensee's expected schedule for decommissioning activities so that the staff can plan for inspections and the application of other staff resources, as well as make decisions about its overall oversight activities. The PSDAR is also a mechanism through which licensees demonstrate that they have considered all the costs of the planned decommissioning activities, addressed the funding necessary for the decommissioning process, and evaluated the environmental impacts of the planned decommissioning activities before they take place.

The regulations at 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) require licensees to submit a PSDAR to the NRC, and a copy to the affected State(s), before or within 2 years following permanent cessation of operations. The report must include a description of the licensee's planned decommissioning activities, along with a schedule for their accomplishment, and an estimate of all expected costs. The PSDAR must also document the results of the licensee's evaluation of the environmental impacts associated with the site-specific decommissioning activities. The PSDAR must contain a discussion whether the site-specific environmental impacts of the proposed decommissioning activities will be bounded by appropriate federally issued environmental review documents, such as (1) the final environmental statement (FES) for the plant's construction permit or operating license (as supplemented), (2) the environmental impact statement (EIS) for a combined operating license, (3) NUREG-0586, Supplement 1, "Generic Environmental Impact Statement [GEIS] on Decommissioning of Nuclear Facilities Regarding the Decommissioning of Nuclear Power Reactors," issued November 2002 (Ref. 18) (the Decommissioning GEIS) and NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," issued July 1997 (Ref. 19), (4) supplemental EISs for license renewal or subsequent license renewal, (5) site-specific environmental assessments for extended power uprates or other license amendments, (6) Programmatic Agreements developed during consultations under Section 106 of the National Historic Preservation Act of 1996, as amended (NHPA) (54 United States Code (U.S.C.) 300101 et seq.) (Ref.20), and (7) Biological Assessments or Biological Opinions issued as part of Section 7 consultations under the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.) (Ref. 21). The report must describe any decommissioning activities whose environmental impacts will not be so bounded and that will be evaluated prior to the performance of the activities. The report must also include a site-specific decommissioning cost estimate.

Once the NRC receives the PSDAR, it will docket the report and publish a notice of receipt in the *Federal Register* to solicit comments from the public on the PSDAR in accordance with 10 CFR 50.82(a)(4)(ii) and 10 CFR 52.110(d)(2). Additional considerations related to the IFMP are

discussed in RG 1.184. A copy of the PSDAR will be made available to the electronically through the NRC Library on the NRC's Web site at <http://www.nrc.gov/reading-rm/adams>. The NRC will schedule a public meeting in the vicinity of the site to discuss the licensee's plans for decontamination and dismantlement of the facility, and the decommissioning timeframe, as well as to hear public comments. Comments received by the NRC staff on the PSDAR will be addressed at the public meeting, and a question and answer period will follow the presentations. The NRC will prepare a written transcript of the meeting and make it available to the public through the Public Document Room and electronically through the NRC Library. To the extent possible, the public meeting should take place within 90 days of the NRC's receipt of the licensee's PSDAR submittal. It normally would occur at least 30 days before the 90-day period ends. In addition, the standard practice of the NRC staff when reviewing the PSDAR is to provide an acknowledgment letter to the licensee that summarizes the staff's understanding of the PSDAR, provides highlights from the public meeting, and categorizes the stakeholder comments received on the PSDAR.

The regulations at 10 CFR 50.82(a)(5) and 10 CFR 52.110(e) prohibit a licensee from performing any major decommissioning activities, as defined in 10 CFR 50.2, until 90 days after the NRC has received its PSDAR submission and until the licensee has submitted the certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel. Although the NRC will assess the PSDAR to determine whether the information is consistent with the requirements in the decommissioning regulations, NRC approval of the PSDAR is not required. However, should the NRC determine that the PSDAR does not satisfy the information requirements of 10 CFR 50.82(a)(4)(i) or 10 CFR 52.110(d)(1), the agency would inform the licensee in writing, in a request for additional information (RAI), of such deficiencies. The NRC reviews the response to the RAIs to ensure that the updated information meets the regulatory requirements for PSDAR content. As necessary, the NRC will raise any further deficiencies with the licensee in subsequent interactions, including additional letters, public meetings, or onsite inspections. Section C.6 of this guide lists factors that could cause the NRC to find the PSDAR deficient. In addition, the 1996 rulemaking's Statement of Considerations states that the PSDAR submittal and public information process must be completed before a licensee may use the 10 CFR 50.59, "Changes, tests, and experiments," process to perform major decommissioning activities (61 FR 39283).

After the PSDAR is submitted, licensees must remain in compliance with 10 CFR 50.82(a)(6) or 10 CFR 52.110(f), which prohibit the licensee from performing any decommissioning activities that could foreclose release of the site for possible unrestricted use, result in there no longer being reasonable assurance that adequate funds will be available for decommissioning or result in significant environmental impacts not bounded by appropriate federally issued environmental review documents. The NRC will monitor such compliance through routine oversight and inspection activities. If a licensee wants to pursue a decommissioning activity that would be inconsistent with 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2) because a potential significant environmental impact is not bounded by an appropriate federally issued environmental review document, then in order to avoid any such inconsistency, the licensee must submit for prior NRC approval a license amendment request to perform the proposed activity. Such a submittal would trigger the NRC's obligation to perform an environmental review of the license amendment request, as well as provide an opportunity for stakeholders to comment and request a public hearing in accordance with 10 CFR 50.91, "Notice for public comment; State consultation." Completion of the NRC's environmental review would result in the proposed activity being bounded by an appropriate federally issued environmental review document. Alternatively, the licensee could request an exemption from 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2), which would also trigger an environmental review, decide not to perform the proposed activity, or modify the proposed activity so that the unbounded environmental impact does not occur.

Consideration of International Standards

The International Atomic Energy Agency (IAEA) works with member states and other partners to promote the safe, secure, and peaceful use of nuclear technologies. The IAEA develops Safety Requirements and Safety Guides for protecting people and the environment from harmful effects of ionizing radiation. This system of safety fundamentals, safety requirements, safety guides, and other relevant reports, reflects an international perspective on what constitutes a high level of safety. To inform its development of this RG, the NRC considered IAEA Safety Requirements and Safety Guides pursuant to the Commission's International Policy Statement (Ref. 22) and Management Directive and Handbook 6.6, "Regulatory Guides" (Ref. 23). The following IAEA Safety Requirements and Guides were considered in the update of this RG:

- IAEA General Safety Requirements Part 6, "Decommissioning of Facilities," issued July 2014 (Ref. 24)
- IAEA Safety Guide WG-G-2.1, "Decommissioning of Nuclear Power Plants and Research Reactors," issued December 1999 (Ref. 25)
- IAEA Safety Guide WG-G-2.2, "Decommissioning of Medical, Industrial and Research Facilities," issued December 1999 (Ref. 26)
- IAEA Safety Guide WG-G-2.4, "Decommissioning of Nuclear Fuel Cycle Facilities," issued June 2001 (Ref. 27)
- IAEA Safety Guide WG-G-5.2, "Safety Assessment for the Decommissioning of Facilities Using Radioactive Material," issued February 2009 (Ref. 28)

C. STAFF REGULATORY GUIDANCE

1. Description of Planned Decommissioning Activities

The PSDAR should describe the licensee's planned activities for decommissioning. The purpose of the description is to inform the NRC and the public of the planned decommissioning scope and timeframe by providing a general overview of the proposed decommissioning activities and by identifying specific activities to be accomplished or performed.

The licensee should describe, in general terms, the method or combination of methods selected for decommissioning. The available methods include (1) long-term storage (SAFSTOR) followed by decontamination and dismantlement, (2) prompt decontamination and dismantlement (DECON), and (3) partial decontamination and dismantlement followed by long-term storage and then final decontamination and dismantlement. In addition, the licensee should list and describe the major activities and tasks related to decommissioning and radiological site remediation and should identify and discuss them briefly in the order in which they will occur.

This guide provides the activities listed below as examples; they are not meant to be all inclusive or to imply that a given licensee should include each of the activities in the decommissioning process. The description of the licensee's planned decommissioning activities should provide a site-specific overview of all the activities that occur from the time of certification of permanent removal of the fuel to the anticipated termination of the license. General topics of interest that licensees could describe in the PSDAR, regardless of the decommissioning method or timeframe chosen, include the following:

- a. Site modifications planned for the first 5 years after entering decommissioning, which should include any plans for the construction and operation of an ISFSI, as well as the associated schedules and timelines for such activities.
- b. The reasons for selecting a particular decommissioning strategy and timeline.
- c. The expected changes in management and staffing in response to the selected decommissioning strategy.
- d. A summary description of the long-term spent fuel management plans at the site. Detailed spent fuel management planning information is more appropriately included in the irradiated fuel management plan, as described more fully in RG 1.184 and the regulations in 10 CFR 50.54(bb).
- e. Any site characterization information and potential dismantlement, decontamination, and remediation activities that will be undertaken, including a discussion of the results of any preliminary surveys or other environmental characterization activities carried out before the submission of the PSDAR, as well as a proposed plan for final site status and uses (e.g., industrial use, "green field").
- f. A description, to the extent known, of activities related to the final dismantlement and decontamination of the facility in order to complete decommissioning.
- g. If applicable, the plans for Tribal, State, and local government and community involvement in the decommissioning process. This involvement might take the form of an advisory panel, community outreach committee, or similar group constituted from the stakeholders most affected by the decommissioning activities at the facility. The PSDAR could include a discussion of how

this group, if the licensee intends to create one, would participate throughout the decommissioning process.

- h. The licensee should include an evaluation of the environmental impacts of the site-specific decommissioning activities (e.g., remediation activities, removal of large components) and planned site modifications, as well as provide a summary of this analysis and its results.
- i. The licensee should identify the decommissioning activities whose environmental impacts are not bounded by previous environmental reviews and which will be addressed in the future. The PSDAR should provide a description of any unbounded impacts and contributing activities. The PSDAR should discuss the anticipated schedule for any activities that the licensee has identified as unbounded environmental impacts.

The level of detail of the description provided for each of the decommissioning activities will depend, in part, on the nature of the activity. The licensee should describe activities that are unique to the facility, and thus may result in additional NRC staff oversight during decommissioning, in greater detail than that for routine activities. For example, a chemical decontamination of a slightly radiologically contaminated system using a mild acid would need only a short description of the process in the PSDAR. However, to allow the staff to determine the proper level of oversight, the NRC expects that the use of a unique chemical decontamination method on a system containing large amounts of contamination (e.g., the primary coolant system) would result in a more detailed description of the process. Likewise, the licensee should discuss in greater detail an activity that could result in a significant environmental impact that may be outside the bounds of those impacts considered in appropriate federally issued environmental review documents, including the Decommissioning GEIS, such as the removal, processing, and storage of fuel debris contained in a system or in the spent fuel pool. For those activities that will occur in the future such that licensees may not be able to make the definitive conclusion that impacts will be bounded at the PSDAR stage, identify those activities that have unbounded environmental impacts that will be addressed closer to, but still prior to, the decommissioning activity being undertaken.

In addition to the above general considerations, for prompt decontamination and dismantlement undertaken under the DECON strategy, the licensee should describe activities such as the following:

- a. removal of the reactor vessel and internals
- b. removal of other large facility components, including major radioactive components
- c. removal of the balance of the primary system (e.g., the charging and boron control systems)
- d. general dismantlement activities related to the removal of other significant radioactive components and any associated structures
- e. methods for decontaminating radioactive components, including the use of chemical decontamination techniques
- f. decontamination of structures or buildings, such as the auxiliary and fuel handling buildings
- g. conduct of activities related to special or unusual programs (e.g., the removal and processing of fuel debris from the spent fuel pool) that might result in significant environmental impacts not bounded by the Decommissioning GEIS or other appropriate federally issued environmental review documents (activities that would need to be described in greater detail)

- h. storage of radiologically contaminated components on site
- i. plans for shipping and processing low-level radioactive waste, including any anticipated compaction, minimization, or incineration of the waste
- j. location of the ultimate disposal site (if known) for low-level radioactive waste and plans for interim storage, if necessary
- k. storage or removal of the spent fuel and greater-than-Class-C (GTCC) waste, including the use (if planned) of an ISFSI or wet storage facility
- l. removal of hazardous radioactive (mixed) wastes

If long-term storage (longer than approximately 5 years) followed by dismantlement is selected as a decommissioning option for the facility, the licensee should list and describe activities related to preparing the facility and site for storage (i.e., SAFSTOR). It should also discuss activities and tasks for maintaining the facility and site in SAFSTOR in preparation for eventual decontamination and dismantlement. The description of the SAFSTOR preparation process and the storage phase should specifically identify activities such as the following:

- a. draining of specific systems and removal of resins from ion exchangers
- b. decontamination of specific high-dose areas
- c. removal of low-level waste that is ready for shipment
- d. shipping and processing or storage of the fuel and GTCC waste
- e. re-energizing or deactivating specific systems
- f. reconfiguring ventilation systems and fire protection systems for use during the storage period
- g. plans to inspect and monitor during the storage period
- h. maintenance of any systems critical to final dismantlement during the storage period
- i. management of any systems that remain connected to operating units on the site

The NRC does not require or expect details in the PSDAR describing the radiation protection plan, the emergency plan, the security plan, or the quality assurance plan related to decommissioning; however, this information may be required in periodic updates to the final safety analysis report, the quality assurance program, the emergency plan, or other documents applicable to decommissioning.

2. Schedule of Planned Decommissioning Activities

The regulations at 10 CFR 50.82(a)(3) and 10 CFR 52.110(c) require a licensee to complete decommissioning within 60 years of permanent cessation of operations, unless the NRC approves an extended timeline for decommissioning the facility when necessary to protect public health and safety. Factors that will be considered by the NRC in evaluating an alternative that provides for completion of decommissioning beyond 60 years of permanent cessation of operations include the unavailability of waste disposal capacity and other site-specific factors affecting the licensee's capability to carry out decommissioning, such as other nuclear facilities at the site that share systems with the permanently

shutdown facility. The 60-year requirement to complete decommissioning also applies to an onsite ISFSI licensed under the general license provisions in 10 CFR Part 72, as a general license ISFSI is part of the Part 50 or Part 52 site and must be decommissioned consistent with the requirements in 10 CFR 50.82 or 10 CFR 52.110, respectively.

One purpose of including the decommissioning schedule in the PSDAR is to inform the NRC and the public of the anticipated timing of decommissioning events and to allow the NRC to schedule the inspection and technical review resources necessary for appropriate oversight activities. The schedule should show the relationship between the major decommissioning activities described in Section C.1 of this guide so that the reader understands the sequence and timing of the events. In addition, general decommissioning timing topics of interest that licensees could describe in the PSDAR, regardless of the decommissioning method or timeframe chosen, include the following:

- a. A description of the decision-making process behind the selection of SAFSTOR or DECON as the decommissioning method and the proposed timeline to decommission the facility, including the dismantlement of any components, as well as the considerations for entering SAFSTOR and an overview of the conditions under which DECON will begin at the facility, if applicable.
- b. A determination of the cost over time of the decommissioning strategy selected, specifically in regard to the decision to delay active dismantlement of all or parts of the deenergized components or the facility as a whole during the SAFSTOR period.
- c. For the DECON method, an indication of how the licensee would minimize the offsite migration of contamination and optimize worker safety, institutional knowledge, and cost in accordance with the DPR. This information may be more appropriately included in the site-specific decommissioning cost estimate that is required to accompany the PSDAR in accordance with 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1).
- d. If available, an estimation of the possibility of early release of parts of the site or facility from the license so that they can be more quickly made available for other uses (e.g., use of warehouse space for other industrial purposes, repurposing of administrative buildings for other uses).
- e. If known, a description of the potential future uses of the site and the overall plan for final disposition of the structures and other components at the facility (i.e., whether parts of the site will be released early in accordance with 10 CFR 50.83, "Release of part of a power reactor facility or site for unrestricted use," whether the site will be made available for industrial use, whether the buildings and other structures will be left in place, or whether the site will become a "green field"), as well as the associated timelines.
- f. An explanation of how the decommissioning timeline chosen affects the spent fuel management plan, including spent fuel storage in an onsite general license ISFSI and the plans for future decommissioning of the ISFSI after the spent fuel is removed from the site.

Schedules or diagrams provided in the PSDAR should clearly indicate the estimated dates of the initiation and completion of major decommissioning activities, especially those with the potential for increased risk to workers, members of the public, or the environment, or those activities that are unique to the facility. The licensee should also identify any planned decommissioning activities that will require a significant NRC licensing effort, including the estimated start and end dates for these activities, such as a proposed decommissioning activity that the licensee knows will not likely pass the 10 CFR 50.59 screening criteria or would violate 10 CFR 50.82(a)(6) or 10 CFR 52.110(f). Other licensing activities whose schedules should be described in the PSDAR, if available, include the submission of defueled

technical specifications; requests for the approval and licensing of an ISFSI, if applicable; any licensing activities associated with a certificate of compliance for the transportation of major components; the planned submission of license amendments related to an “ISFSI-only” site configuration and licensing basis; and the planned submission of the license termination plan (LTP). Section C.7 of this guide addresses changes to the schedule following submission of the PSDAR.

The PSDAR schedule’s level of detail will depend on the timing of the activities being described and will assist the NRC in determining the degree of oversight required throughout the decommissioning process. The schedule included in the PSDAR for major decommissioning activities in the near term (about five years) should provide the nearest month and year. The licensee may schedule decommissioning activities that will follow a storage period of at least five years to the closest year.

3. Estimate of Expected Decommissioning Costs and Associated Funding

The regulations at 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) require the licensee to submit, as part of the PSDAR, a site-specific decommissioning cost estimate, including the projected cost of managing irradiated fuel. The site-specific decommissioning cost estimate should be based on the latest annual update to the amount to be provided for decommissioning (as required by 10 CFR 50.75(b)(2)), and should include the cost of remediating any radiological contamination identified during site surveys. Licensees must ensure that the site-specific decommissioning cost estimate is greater than the minimum amount of decommissioning funds estimated to be required under 10 CFR 50.75(b) and (c), as reported to the NRC in accordance with 10 CFR 50.75(f)(1). The cost of remediating known radiological contamination must be included (e.g., soil, ground water, surface water).

For decommissioning activities that delay completion of decommissioning by including a period of storage, the PSDAR must provide a discussion of a means of adjusting cost estimates and associated funding levels over the duration of the storage period to ensure that the appropriate amount of funding will be available in accordance with 10 CFR 50.82(a)(8)(iv) and 10 CFR 52.110(h)(4). Detailed guidance for the preparation and submittal of a site-specific decommissioning cost estimate can be found in RG 1.202, “Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors.”

4. Environmental Impacts

The regulations at 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) require a licensee’s PSDAR to discuss whether the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate federally issued environmental review documents and describe any decommissioning activities whose environmental impacts will not be so bounded and will be evaluated prior to the performance of the activities. Specifically, before preparing the PSDAR, the licensee should evaluate the potential environmental impacts associated with the site-specific decommissioning activities, including those activities listed in Sections C.1 and C.2 of this guide. The potential environmental impacts associated with decommissioning should be evaluated against the impacts described in appropriate federally issued environmental review documents, as described previously.

The comparison to impacts in other appropriate federally issued environmental review documents should recognize the unique nature of the site and any changes to the site that might have occurred since the previous environmental document was issued. For example, the listed species that may occur or the demographic composition of minority and low-income populations living near the site might have changed since the publication of the previous documents. If the potential environmental impact has already been reviewed or bounded by previous analyses in another federally issued environmental review document, the licensee should state this in the PSDAR (in accordance with 10 CFR 50.82(a)(4)(i) or 10 CFR 52.110(d)(1)).

Potential environmental impacts include both radiological and non-radiological impacts, as described in the Decommissioning GEIS. Examples of potential environmental impacts that should be examined to ensure that they are within the bounds of impacts reviewed by applicable federally issued environmental review documents, along with a discussion of the reasons for concluding that the proposed activities are bounded by existing analyses of environmental impacts, include occupational dose; public dose; environmental releases to air, water, and soil; climate change; quantity of low-level radioactive waste generated; transportation impacts; impacts from non-radiological hazards, such as dust, noise, water use, and hazardous (non-radiological) waste; socioeconomic impacts; impacts to cultural and historic resources; impacts to aquatic and terrestrial ecology, including special status species and habitats; and environmental justice impacts. The licensee's dose estimates should be for total effective dose equivalent to workers and the public, including that from releases and transportation. The licensee should briefly describe how these estimates of total effective dose equivalent compare to, or are different from, the estimates in other federally issued environmental review documents.

For most resource areas, the Decommissioning GEIS provides generic conclusions about environmental impacts during decommissioning. Licensees should ensure that the predicted site-specific environmental impacts of the proposed decommissioning activities are within the bounding estimates, descriptions, and assumptions stated in the Decommissioning GEIS or are otherwise considered in and bounded by other appropriate federally issued environmental review documents. Licensees should provide adequate justification and discussion to support its conclusions that site-specific decommissioning impacts are bounded by previous environmental review documents. Licensees should pay particular attention to the environmental issues in the Decommissioning GEIS for which the NRC staff was unable to reach a generic impact conclusion. For these environmental issues, the licensee would need to either conduct a site-specific environmental impact assessment or determine whether another federally issued environmental review document provides an adequate site-specific bounding environmental impact assessment. For those activities that will occur in the future such that licensees are not able to make a definitive conclusion that impacts will be bounded at the PSDAR stage, identify those unbounded environmental impacts that will be addressed closer to, but still prior to, the decommissioning activity being undertaken.

For example, the NRC staff was unable to reach a generic environmental impact determination for threatened and endangered species in the Decommissioning GEIS. For this resource area, the licensee can obtain a current list of threatened, endangered, proposed, and candidate species that could occur on the site from the U.S. Fish and Wildlife Service's (FWS's) online database, "Information for Planning and Consultation: Environmental Conservation Online System," and, if appropriate, by coordinating with the appropriate FWS or National Marine Fisheries Service (NMFS) office. In addition, the licensee should determine if any protected habitats, such as designated critical habitat or Essential Fish Habitat, occur at or near the site.

In many cases, the federally listed species, designated critical habitat, and Essential Fish Habitat would have changed since the NRC staff engaged in the last consultation under the ESA or the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.) (Ref. 29). For any federally listed species, designated critical habitat, or Essential Fish Habitat on or near the site, the licensee should determine what the impacts from planned decommissioning activities would be to those species and habitats, coordinating, as appropriate, with FWS and NMFS. If planned decommissioning activities may affect any federally listed species, designated critical habitat, or Essential Fish Habitat, the PSDAR should discuss those potential impacts. As described in 10 CFR 50.82(a)(4)(i) or 10 CFR 52.110(d)(1), the licensee should determine whether the impacts to these federally protected species and habitats are bounded by other appropriate federally issued environmental review documents, such as biological opinions or biological assessments developed under the ESA. If other appropriate federally

issued environmental review documents have not bounded the impacts to these federally protected species or habitats, the licensee should follow the guidance discussed below on what to do if unable to comply with the requirement in 10 CFR 50.82(a)(6)(ii) or 10 CFR 51.110(f)(2).

The NRC was also unable to reach a generic conclusion for the environmental justice issue in the Decommissioning GEIS. For environmental justice considerations, the PSDAR should describe the current general demographic composition of minority and low-income populations and communities (by race and ethnicity) residing in the immediate vicinity of the plant site that could be affected by the planned decommissioning activities. The geographic scale should be commensurate with the potential impact area and include a sample of the surrounding population to facilitate the evaluation of the communities, neighborhoods, and areas that may be disproportionately affected. This discussion should cover areas with actual, or any reasonably foreseeable physical, social, cultural, and health impacts as a result of decommissioning activities. To the extent that information is available, licensees should also describe any observed subsistence consumption behavior patterns, specifically fish and wildlife consumption, by minority and low-income populations in the vicinity of the plant.

Any planned decommissioning activity using a method not considered in the Decommissioning GEIS could cause an environmental impact that has not previously been considered and should, therefore, be specifically examined. For example, the explosive destruction of buildings could result in environmental impacts not considered in the Decommissioning GEIS or in the site-specific FES. If significant environmental impacts are identified that are not bounded by appropriate federally issued environmental review documents, before undertaking the associated decommissioning activity, the licensee should state in the PSDAR how it intends to comply with 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2), which prohibit the licensee from undertaking a decommissioning activity that would result in such a significant impact not previously bounded by appropriate federally issued environmental review documents.

If the licensee is unable to comply with the requirements of 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2), it could take one of several actions, including the following:

- a. Submit a license amendment request for prior NRC review and approval of the decommissioning activity to address those impacts that are not bounded by appropriate federally issued environmental review documents.
- b. Submit an exemption request under 10 CFR 50.12 or 10 CFR 52.7 from 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2), respectively, to request that the regulation not apply in certain circumstances.
- c. Change its plans to avoid the decommissioning activities that would likely result in significant environmental impacts not bounded by appropriate federally issued environmental review documents.

If a licensee chooses to submit a license amendment or exemption request, the NRC would prepare an environmental assessment, or other appropriate National Environmental Policy Act (NEPA) document, as part of its review, and would complete any necessary environmental consultations, thus resolving any issues regarding unbounded environmental impacts before the decommissioning activity takes place.

5. Public Involvement during the Decommissioning Process

Although the NRC does not have the authority to direct governmental and nongovernmental

entities (other than NRC licensees) to participate in the decommissioning of a facility, NRC regulations currently offer the public an opportunity to review licensee submittals and provide input after the licensee has submitted its PSDAR and after the licensee has submitted its LTP. Specifically, 10 CFR 50.82(a)(4)(ii) and 10 CFR 52.110(d)(2), with respect to the PSDAR, and 10 CFR 50.82(a)(9)(iii) and 10 CFR 52.110(i)(3), with respect to the LTP, require the NRC to publish a notice of receipt, make the PSDAR or LTP, as appropriate, available for public comment, schedule public meetings in the vicinity of the licensed facility to discuss the PSDAR or the LTP, and publish a notice of the meetings in the *Federal Register* and another forum readily accessible to individuals in the vicinity of the site. The NRC staff also routinely engages with State and local government stakeholders by participating, as requested, in meetings or through other interactions with these governmental bodies (e.g., the public utility commission, the coastal commission, environmental and radiological control boards).

In addition, for many years, the NRC has recommended that licensees involved in decommissioning activities form a community committee or other advisory organization aimed at fostering communication and information exchange between the licensee and members of the community that decommissioning may affect. By actively engaging the community and obtaining local citizen views and concerns about the decommissioning process and spent fuel storage issues, licensees can better understand and consider these views, improve relations with the local citizens, and keep local communities informed of the licensee's decommissioning activities in a timely manner. Although not an NRC regulatory requirement, many power reactor decommissioning licensees, or the applicable state or local governments, have created some mechanism for community outreach commensurate with the overall level of interest by the local community in the decommissioning activities at the facility.

To help establish best practices for creating a community advisory board at decommissioning facilities where licensees choose to create or participate in such an organization, these licensees could consider adding detail to the PSDAR on the creation of the community advisory board, the proposed membership of that board, and the ways in which the board will be used to promote stakeholder involvement in the decommissioning and decision-making process. Alternatively, the PSDAR could discuss why the licensee did not consider a community advisory board necessary or prudent for the site (e.g., an advisory board has already been established by the State or local government and includes broad participation) and under what conditions it would reconsider such an advisory board as decommissioning progresses (e.g., whether the licensee would consider implementing an advisory board when the facility moves from SAFSTOR to DECON). Specifically, the PSDAR could include additional details in the following areas to help stakeholders better understand the application of a community advisory board:

- a. A discussion of the composition of the proposed community advisory board to potentially include members from the licensee staff, representatives from appropriate State, tribal, and local government agencies, officials or their designees from host communities and counties and communities within the surrounding emergency planning zone, and representatives from citizen groups or other stakeholder interest groups (e.g., the Sierra Club, Riverkeeper).
- b. An estimation of the time when the community advisory board would be convened and the frequency at which meetings would take place.
- c. A description of the topics that would be brought before the community advisory board; how the board's input would be used to inform the decision-making process for various decommissioning activities; and what interaction, if any, the board would have with the NRC or other Federal regulatory bodies (e.g., the U.S. Environmental Protection Agency or U.S. Department of Energy) to support the board members' overall understanding of the decommissioning process and promote dialogue between the affected stakeholders and the decommissioning licensee.

- d. An explanation of how the community advisory board would be formed and implemented, including whether the State, licensee, or some other party would take charge of finding members for the board; who would be responsible for the logistics required to support the board's meetings and other routine activities (e.g., coordinating logistics, securing conference space and audiovisual equipment for presentations to the public); and the expected term of board members.

As discussed previously, the suggestions listed above are examples; they are not meant to be all inclusive or to imply that a given licensee should include or implement each of these activities during the decommissioning process. The suggestions for a licensee's prospective community advisory board are intended to provide the flexibility necessary to support decommissioning sites in various stages of the process while adding transparency to the overall decommissioning process.

6. Factors that Could Cause the NRC to Find the PSDAR Deficient

A number of factors could cause the NRC to find the PSDAR deficient. These factors are directly related to the topics required to be included in the PSDAR, in accordance with 10 CFR 50.82 and 10 CFR 52.110, as discussed above. The NRC could find the PSDAR deficient under one or more of the following circumstances:

- a. The licensee could not complete its plan for decommissioning as described (e.g., if the plan called for immediate decontamination and dismantlement of the facility but no waste disposal facilities were available for use by the facility at that time).
- b. The schedule includes a decommissioning process that the licensee could not complete within 60 years of the permanent cessation of operations as required by 10 CFR 50.82(a)(3), unless the NRC approves decommissioning beyond 60 years when necessary to protect public health and safety. The NRC would consider such actions on a case-by-case basis.
- c. The licensee's decommissioning plans, as presented in the PSDAR, include a decommissioning process that could not be completed for the estimated cost using the generic guidelines in the Decommissioning GEIS and previous site-specific decommissioning cost estimates, or that could not be completed if the estimated costs were less than the minimum amount in 10 CFR 50.75(c).
- d. The PSDAR includes activities that would endanger public health and safety by proposing activities that do not comply with the NRC's regulations.
- e. The PSDAR does not provide an adequate basis for whether the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate federally issued environmental review documents or does not include a description of any decommissioning activities whose environmental impacts will not be so bounded and will be evaluated prior to the performance of the activities.
- f. The licensee fails to state how it intends to comply with 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2) in the future, with respect to a proposed decommissioning activity identified in the PSDAR, if any unbounded environmental impacts are identified.

7. Changes to the PSDAR

The regulation at 10 CFR 50.82(a)(7) or 10 CFR 52.110(g), as appropriate, requires the licensee to notify the NRC, in writing with a copy to the affected states, before it performs any decommissioning activity that could be considered inconsistent with, or making any significant schedule change from, the

planned decommissioning activities or schedules described in the PSDAR, including changes that significantly increase the decommissioning cost. Changes to the PSDAR may be in the form of a written letter to the NRC describing the change or may be an actual revision to the PSDAR. .

The NRC staff will use notifications of changes to the schedule provided in the PSDAR to schedule inspections of the licensee's activities and to provide assurance that the licensee is conducting decommissioning safely and in accordance with the applicable regulatory requirements. Examples of changes in activities and schedule include, but are not limited to, changing from long-term storage (SAFSTOR) to active dismantlement (DECON), changing the method used to remove the reactor vessel or steam generators from cutting and segmenting to intact removal, or changing the schedule to affect major milestones such as shortening the overall term to complete decommissioning. Licensees do not need to report changes related to the removal of structures, systems, or components that are not contaminated or in the immediate proximity of contaminated systems that could result in a worker dose.

Examples of significant increases in cost associated with decommissioning the facility include (1) a revised cost estimate that is more than 20 percent greater than the site-specific decommissioning cost estimate or the PSDAR cost estimate, or (2) a 25-percent increase in the cost needed to complete any major milestone. For any significant increase in cost, the licensee must provide written notification to the NRC. Notification should be made only if cost changes occur as a result of changes in the timing of activities, or if the change in planned decommissioning activities results in a significant increase in decommissioning costs. Notification of increased decommissioning costs is not necessary if the increases are simply because of higher estimated costs caused by inflation. However, the licensee should include this information in the annual report submitted in accordance with 10 CFR 50.82(a)(8)(v) or 10 CFR 52.110(h)(5), as appropriate.

The licensee should evaluate changes in the decommissioning activities with regard to their potential environmental impact to comply with 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2). If the expected impact is greater than that predicted in appropriate federally issued environmental review documents, or if it is outside the bounds of these documents, the licensee must either submit a license amendment request or an exemption request or change its decommissioning plans to avoid the activity that would result in the unbounded impact. If the licensee chooses to submit a license amendment request or exemption request, it would need to provide the NRC with the necessary environmental information, in accordance with 10 CFR 51.41, "Requirement to submit environmental information," addressing the unbounded impacts. The NRC would then prepare an environmental assessment or other appropriate NEPA document as part of the review and would complete any necessary environmental consultations, thus resolving any issues related to unbounded environmental impacts. Failing to change the decommissioning activities prior to performing them so that they will not result in significant environmental impacts not bounded by appropriate federally issued environmental review documents, or failing to submit, and have approved, either a license amendment request or an exemption request prior to performing the decommissioning activities, may potentially constitute a violation of 10 CFR 50.82(a)(6) or 10 CFR 52.110(f), as appropriate. Additionally, the take¹ of any federally listed species is prohibited by Section 9 of the ESA.

For facilities with approved decommissioning plans issued before the 1996 decommissioning rulemaking implemented the requirement for a PSDAR, decommissioning can proceed under the associated decommissioning order. For facilities that either have an approved decommissioning plan or submitted a decommissioning plan before the effective date of the 1996 decommissioning rule (August 28, 1996), the decommissioning plan is considered to be the PSDAR submittal in accordance

¹ The ESA prohibits the take of any federally listed species and states that the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

with 10 CFR 50.82. This is appropriate because the decommissioning plan was required to contain all of the information required by the PSDAR but in greater detail. As such, in accordance with 10 CFR 50.82(a)(7), significant changes in major milestones, schedules, or cost estimates in approved decommissioning plans also require written notification to the NRC.

Written notifications of changes to the PSDAR to the NRC that are made under 10 CFR 50.82(a)(7) do not require a 90-day waiting period before the initiation of activities. Typically, the staff would not hold a public meeting to discuss the proposed changes. However, if the licensee proposes changing the method of decommissioning (e.g., from long-term storage followed by decontamination and dismantlement to prompt decontamination and dismantlement), the NRC may elect to conduct a public meeting if there is sufficient interest from affected stakeholders.

D. IMPLEMENTATION

The NRC staff may use this regulatory guide as a reference in its regulatory processes, such as licensing, inspection, or enforcement. However, the NRC staff does not intend to use the guidance in this regulatory guide to support NRC staff actions in a manner that would constitute backfitting as that term is defined in 10 CFR 50.109, “Backfitting,” and 10 CFR 72.62, “Backfitting,” and as described in NRC Management Directive 8.4, “Management of Backfitting, Forward Fitting, Issue Finality, and Information Requests,” (Ref. 30), nor does the NRC staff intend to use the guidance to affect the issue finality of an approval under 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants.” The staff also does not intend to use the guidance to support NRC staff actions in a manner that constitutes forward fitting as that term is defined and described in Management Directive 8.4. If a licensee believes that the NRC is using this regulatory guide in a manner inconsistent with the discussion in this Implementation section, then the licensee may file a backfitting or forward fitting appeal with the NRC in accordance with the process in Management Directive 8.4.

GLOSSARY

decommission	As stated in 10 CFR 50.2, to remove a facility or site safely from service and reduce residual radioactivity to a level that permits (1) release of the property for unrestricted use and termination of the license; or (2) release of the property under restricted conditions and termination of the license.
major decommissioning activity	As stated in 10 CFR 50.2, any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components for shipment containing greater than class C waste.
major radioactive components	As stated in 10 CFR 50.2, the reactor vessel and internals, steam generators, pressurizers, large-bore reactor coolant system piping, and other large components that are radioactive to a comparable degree.
DECON	The equipment, structures, and portions of the facility and site that contain radioactive contaminants that are promptly removed or decontaminated to a level that permits termination of the license shortly after cessation of operations.
SAFSTOR	A facility that is placed in a safe, stable condition and maintained in that state (safe storage) until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel, and radioactive liquids have been drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the quantity of contaminated and radioactive material that must be disposed of during decontamination and dismantlement. The definition of SAFSTOR also includes the decontamination and dismantlement of the facility at the end of the storage period.
ENTOMB	Radioactive systems, structures, and components that are encased in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained and kept under continued surveillance until the radioactivity decays to a level that permits termination of the license.

REFERENCES²

1. *U.S. Code of Federal Regulations*³ (CFR), “Domestic Licensing of Production and Utilization Facilities,” Part 50, Chapter 1, Title 10, “Energy.”
2. CFR, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” Part 52, Chapter 1, Title 10, “Energy.”
3. CFR, “Standards for Protection against Radiation,” Part 20, Chapter 1, Title 10, “Energy.”
4. CFR, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions,” Part 51, Chapter 1, Title 10, “Energy.”
5. CFR, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste,” Part 72, Chapter 1, Title 10, “Energy.”
6. CFR, “Financial Protection Requirements and Indemnity Agreements,” Part 140, Chapter 1, Title 10, “Energy.”
7. U.S. Nuclear Regulatory Commission (NRC), Regulatory Guide (RG) 1.184, “Decommissioning of Nuclear Power Reactors,” Washington, DC.
8. NRC, RG 1.202, “Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors,” Washington, DC.
9. NRC, RG 1.159, “Assuring the Availability of Funds for Decommissioning Nuclear Reactors,” Washington, DC.
10. NRC, RG 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning,” Washington, DC.
11. NRC, RG 4.22, “Decommissioning Planning During Operations,” Washington, DC.
12. NRC, NUREG-1713, “Final Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors,” Washington, DC, December 2004 (ADAMS Accession No. ML043510113).
13. NRC, “Decommissioning of Nuclear Power Reactors,” *Federal Register*, Vol. 61, No. 146, July 29, 1996, pp 39278-39304.

² Publicly available NRC published documents are available electronically through the NRC Library under Document Collections on the NRC’s public Web site at <http://www.nrc.gov/reading-rm/doc-collections/> and through the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>. The documents can also be viewed online or printed for a fee in the NRC’s Public Document Room (PDR) at 11555 Rockville Pike, Rockville, MD. For problems with ADAMS, contact the PDR staff at 301-415-4737 or (800) 397-4209; fax (301) 415-3548; or e-mail pdr.resource@nrc.gov.

³ The Code of Federal Regulations may be obtained electronically from the U.S. Government Printing Office at: <http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR>

14. NRC, "Radiological Criteria for License Termination," *Federal Register*, Vol. 62, No. 139, July 21, 1997, pp 39058-39092.
15. NRC, "Releasing Part of a Power Reactor Site or Facility for Unrestricted Use Before the NRC Approves the License Termination Plan," *Federal Register*, Vol. 68, No. 77, April 22, 2003, pp 19711-19728.
16. NRC, "Miscellaneous Corrections," *Federal Register*, Vol. 79, No. 217, November 10, 2014, pp 66598-66606.
17. NRC, "Decommissioning Planning," *Federal Register*, Vol. 76, No. 117, June 17, 2011, pp 35512-35575.
18. NRC, NUREG-0586, Supplement 1, Volumes 1 and 2, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Regarding the Decommissioning of Nuclear Power Reactors," Washington, DC, November 2002 (ADAMS Accession Nos. ML023470327 and ML023500310).
19. NRC, NUREG-1496, Volume 1, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," Washington, DC, July 1997 (ADAMS Accession No. ML042310492).
20. National Historic Preservation Act of 1966, as amended (54 U.S.C. 300101 et seq.)⁴.
21. Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.).
22. NRC, "Nuclear Regulatory Commission International Policy Statement," *Federal Register*, Vol. 79, No. 132, July 10, 2014, pp. 39415-39418.
23. NRC, Management Directive (MD) 6.6, "Regulatory Guides, Washington, DC, May 2, 2016 (ADAMS Accession No. ML18073A170).
24. International Atomic Energy Agency (IAEA)⁵ General Safety Requirements Part 6, "Decommissioning of Facilities," Vienna, Austria, July 2014.
25. IAEA Safety Guide WS-G-2.1, "Decommissioning of Nuclear Power Plants and Research Reactors," Vienna, Austria, December 1999.
26. IAEA Safety Guide WS-G-2.2, "Decommissioning of Medical, Industrial and Research Facilities," Vienna, Austria, December 1999.
27. IAEA Safety Guide WS-G-2.4, "Decommissioning of Nuclear Fuel Cycle Facilities," Vienna, Austria, June 2001.

4 The United States Code (USC) can be obtained electronically from the Office of the Law Revision Counsel of the House of Representatives at <http://uscode.house.gov/>.

5 Copies of International Atomic Energy Agency (IAEA) documents may be obtained through their Web site: <https://www.iaea.org/> or by writing the International Atomic Energy Agency, P.O. Box 100 Wagramer Strasse 5, A-1400, Vienna, Austria.

28. IAEA Safety Guide WS-G-5.2, "Safety Assessment for the Decommissioning of Facilities Using Radioactive Material," Vienna, Austria, February 2009.
29. Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.).
30. NRC, Management Directive 8.4, "Management of Facility-Specific Backfitting and Information Collection," Washington, DC.