

**NOTE:**

The U.S. Nuclear Regulatory Commission (NRC) is making this document publicly available concurrent with the Commission's review of SECY-18-0055, "Proposed Rule: Regulatory Improvements for Production and Utilization Facilities Transitioning to Decommissioning" (ADAMS Accession No. ML18012A019).

The NRC is not seeking public comment on this document.

If the Commission approves the publication of the proposed rule, then the *Federal Register* notice of proposed rulemaking will provide an opportunity for the public to submit formal comments on the proposed rule and draft guidance.

Docket: <https://www.regulations.gov/docket?D=NRC-2015-0070>

Any questions may be directed to Edward O'Donnell, Senior Project Manager, Regulatory Guidance and Generic Issues Branch, NRC, at [edward.odonnell@nrc.gov](mailto:edward.odonnell@nrc.gov) or 301-415-3317.

# U.S. NUCLEAR REGULATORY COMMISSION

## DRAFT REGULATORY GUIDE DG-1347



### *Proposed Revision 2 to Regulatory Guide RG 1.184*

Issue Date: **Month 20##**  
Technical Lead: Theodore Smith

## DECOMMISSIONING OF NUCLEAR POWER REACTORS

### A. INTRODUCTION

#### **Purpose**

This regulatory guide (RG) provides guidance on the actions required of U.S. Nuclear Regulatory Commission (NRC) licensees to decommission nuclear power reactors.

#### **Applicability**

This RG applies to power reactor applicants and licensees 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).

The fact that a licensee has permanently ceased operations and removed the fuel from the reactor vessel, or that a final legally effective order to permanently cease operations has come into effect, or that the licensed facility has been modified to be incapable of making use of special nuclear material without significant facility alterations necessary to restore the capability to make use of special nuclear material does not reduce or alter the requirement that the licensee comply with the applicable regulations, its NRC license, and its technical specifications. Some regulations no longer apply when the licensee is no longer authorized to operate, and some regulations no longer apply when the facility is no longer a utilization facility. If a licensee wishes to reduce its regulatory burden for those requirements that still apply, it must do so by requesting an exemption in accordance with 10 CFR 50.12, "Specific exemptions," or 10 CFR 52.7, "Specific exemptions," or a license amendment in accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," or by making changes in accordance with 10 CFR 50.59, "Changes, tests, and experiments," as appropriate.

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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-1347. Alternatively, comments may be submitted to the Rules, Announcements, and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. 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. ML17347A794. The regulatory analysis may be found in ADAMS under Accession No. ML18012A024.

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## Applicable Regulations

- 10 CFR Part 20, “Standards for Protection against Radiation” (Ref. 3), provides the radiological release criteria and radiological protection requirements that apply during decommissioning.
- 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.
  - 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, including a requirement for nuclear power reactor licensees to submit a post-shutdown decommissioning activities report (PSDAR).
  - 10 CFR 50.200, “Power reactor decommissioning emergency plans,” provides the applicable emergency planning requirements for a facility that is transitioning between operations and decommissioning.
- 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 51.53, “Postconstruction environmental reports,” provides the requirements for the content of postconstruction environmental reports.
  - 10 CFR 51.95, “Postconstruction environmental impact statements,” provides the requirements for the content of postconstruction environmental impact statements.
- 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, including a requirement for nuclear power reactors licensees to submit 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 1.159, “Assuring the Availability of Funds for Decommissioning Nuclear Reactors” (Ref. 7), provides guidance on estimating the amount of funds for decommissioning and methods acceptable for demonstrating financial assurance.
- RG 1.179, “Standard Format and Content of License Termination Plans for Nuclear Power Reactors” (Ref. 8), provides guidance on the license termination plan requirements.
- RG 1.185, “Standard Format and Content for Post-Shutdown Decommissioning Activities Report” (Ref. 9), identifies the type of information that the PSDAR must contain and establishes a standard set of contents and level of detail for the PSDAR.
- RG 1.191, “Fire Protection Program for Nuclear Power Plants During Decommissioning and Permanent Shutdown” (Ref. 10), provides guidance to licensees on a fire protection program for licensees who have certified that their nuclear power plants have permanently ceased operations and that the fuel has been permanently removed from the reactor vessels.
- RG 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning” (Ref. 11), 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. 12), provides guidance on implementation of the Decommissioning Planning Rule (DPR).
- NUREG-1713, “Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors” (Ref. 13), provides information on how the NRC staff will review site-specific decommissioning cost estimates.
- NUREG-1757, “Consolidated Decommissioning Guidance” (Ref. 14)
  - Volume 1, “Decommissioning Process for Materials Licensees,” contains guidance for decommissioning of materials facilities,
  - Volume 2, “Characterization, Survey, and Determination of Radiological Criteria,” provides guidance on compliance with the radiological criteria for license termination in 10 CFR Part 20, Subpart E, “Radiological Criteria for License Termination,”
  - Volume 3, “Financial Assurance, Recordkeeping, and Timeliness,” provides guidance on the requirements for financial assurance for decommissioning, and the recordkeeping requirements related to eventual decommissioning of material facilities.

## **Purpose of Regulatory Guides**

The NRC issues regulatory guides 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 regulatory guides 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 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 Information Services Branch, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and to the Desk Officer, 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 1.184 (Revision 2) was issued as part of a rulemaking to amend the Commission's regulations relating to decommissioning for production and utilization facilities, such as 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, 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 the review of these submittals, the NRC staff has identified common areas of decommissioning planning 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.

### **Scope of this Regulatory Guide**

This RG describes methods and procedures that are acceptable to the NRC staff for implementing the decommissioning regulations that relate to both the initial activities and major phases of the decommissioning process. It does not contain guidance on the license termination process. That process is addressed in RG 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors."

This RG also addresses the irradiated fuel management plan (IFMP) (alternatively referred to as the spent fuel management plan) requirements described in 10 CFR 50.54(bb) because a licensee's ability to properly plan and safely implement decommissioning depends, in part, on its ability to manage its spent fuel until title to, and possession of, the spent fuel is transferred to the U.S. Department of Energy. The regulations in 10 CFR Part 72 address the requirements for the licensing and decommissioning of facilities for the independent storage of spent nuclear fuel. This RG addresses aspects of decommissioning 10 CFR Part 72 general license ISFSIs because the licensees must decommission these ISFSIs in accordance with the requirements in 10 CFR 50.82 or 10 CFR 52.110. This RG does not address the shipment of these materials or disposal of low-level, high-level, or greater-than-Class-C waste. The regulations in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material" (Ref. 15), cover the shipment of the materials, and 10 CFR Part 60, "Disposal of High-Level Radioactive Wastes in Geologic Repositories" (Ref. 16), and 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste" (Ref. 17), address the disposal of waste.

This RG applies only to power reactor licensees. The decommissioning regulations for non-power production or utilization facilities and fuel reprocessing plants appear in 10 CFR 50.82(b). The NRC staff discusses the procedures for decommissioning these facilities, in part, in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors" (Ref. 18), and the Interim Staff Guidance Augmenting NUREG-1537 for licensing radioisotope production facilities and aqueous homogeneous reactors (Ref. 19).

## Background

As defined by 10 CFR 50.2, “decommission” means 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. The general requirements for decommissioning, codified in 10 CFR 50.75, 50.82, 51.53, 51.95, and 52.110 contain decommissioning technical and financial criteria including requirements for planning, timing, funding mechanisms, and environmental review. 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 decommissioning regulations establish a timeframe for completion of decommissioning, determine which types of activities require prior approval before being implemented, govern the release criteria 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.

## Risk Informed Application

Reactors that have permanently ceased operations and have no fuel in the reactor vessel present significantly reduced but different risks to public health and safety as compared to operating reactors. The NRC amended the decommissioning rule to specify applicable requirements for such facilities by eliminating, revising, or extending operating reactor requirements commensurate with their importance to the safety of permanently shutdown reactors.

## Decommissioning Phases

To facilitate understanding of the decommissioning process, the NRC staff has divided the decommissioning activities for power reactors into three general phases. The first phase of decommissioning includes the initial planning and transition activities starting on either the effective date of permanent cessation of operations or upon submittal of the PSDAR or IFMP, whichever occurs first. The first phase encompasses the activities that take place before the licensee either places the power reactor into a storage mode or begins major decommissioning activities (as defined in 10 CFR 50.2), including the transition of the licensing basis to reflect a decommissioning facility. The second decommissioning phase encompasses the conduct of activities during the storage period or the undertaking of major decommissioning activities (i.e., decontamination and dismantlement), or some combination of the two. The third phase consists of the rest of the activities that the licensee undertakes to reduce the remaining radioactivity at the site to a level that permits release of the site. The amendments to 10 CFR Part 2 (Ref. 20) and 10 CFR Part 51 in the 1996 decommissioning rule pertain to this third phase of decommissioning.

In addition, Volumes 1 and 2 of Supplement 1 to NUREG-0586, “Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities” (the Decommissioning GEIS), issued November 2002 (Ref. 21), as well as the supplemental information to the 1988 decommissioning rule (53 FR 24018; June 27, 1988), evaluate the environmental impact of the following three decommissioning methods:

- (1) DECON. The equipment, structures, and portions of the facility and site that contain radioactive contaminants are promptly removed or decontaminated to a level that permits termination of the license shortly after cessation of operations. The Decommissioning GEIS found DECON to be an acceptable decommissioning method.

- (2) SAFSTOR. The facility 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; however, 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. The Decommissioning GEIS found SAFSTOR to be an acceptable decommissioning method.
- (3) ENTOMB. Radioactive systems, structures, and components 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. Because most power reactors will have radionuclides in concentrations that exceed the limits for unrestricted use even after 100 years, this option will generally not be feasible. However, this option might be acceptable for reactor facilities that can demonstrate that radionuclide levels will decay to unrestricted use levels in about 100 years.

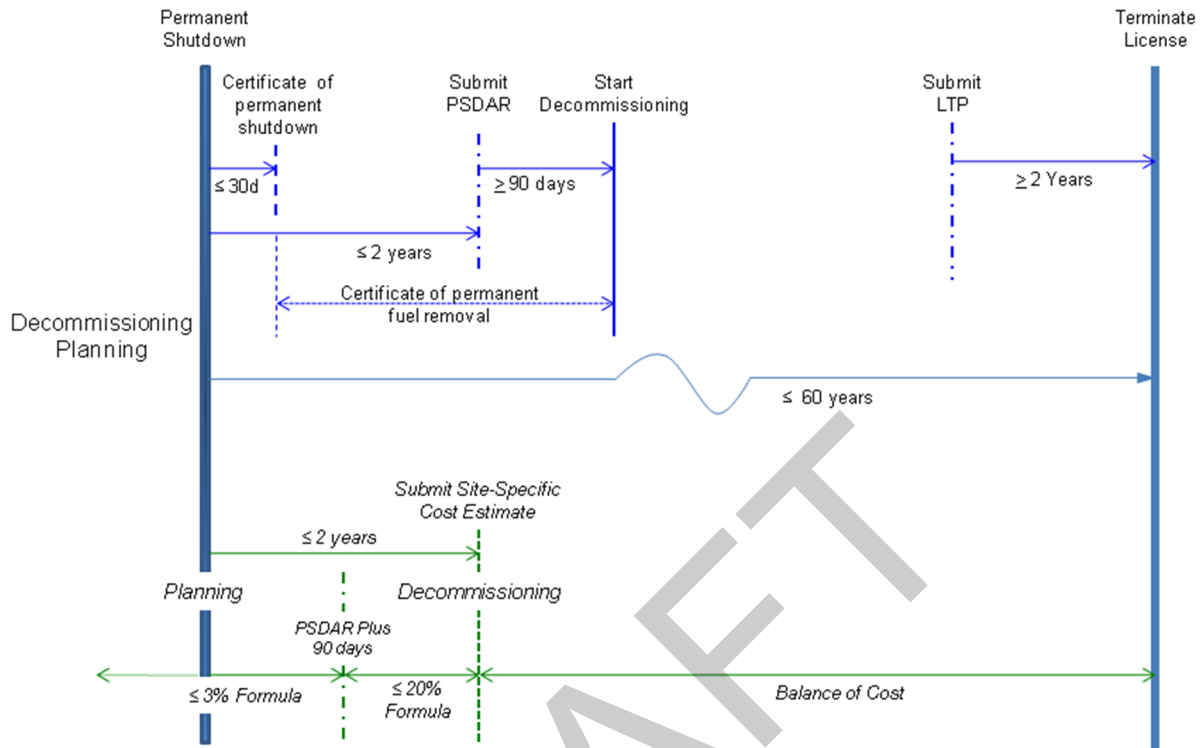
Entombment is generally considered as a last resort for decommissioning. The expectation is that licensees would select this method only under unique decommissioning circumstances. Entombment would be used only if this option provides more benefit than harm to public health and safety and the environment, and does not create a legacy situation that future generations must manage. If the ENTOMB method is used, the provisions in 10 CFR Part 20, Subpart E related to unrestricted or restricted use still apply. The Decommissioning GEIS found ENTOMB to be an acceptable decommissioning method.

Supplement 1 to NUREG-0586 recognizes that some combination of the first two methods (DECON and SAFSTOR) would also be an acceptable decommissioning approach. For example, the licensee could conduct a partial decontamination of the plant followed by a storage period and then complete the decontamination and dismantlement in preparation for license termination.

As shown in Figure 1, the decommissioning regulations require a licensee to submit written certification to the NRC within 30 days of determining to permanently shutdown a power reactor. Before or within 2 years after permanent cessation of operations, the licensee is required to submit a PSDAR. No major decommissioning activities may be performed until 90 days after the NRC has received both the PSDAR and the certification that fuel has been permanently removed from the reactor vessel. Major decommissioning activities are defined as any activity that results in permanent removal of major radioactive components that permanently modifies the structure of the containment or results in dismantling components for shipment containing greater-than-Class-C waste. Decommissioning of the site (including a general license ISFSI) must be completed within 60 years of permanent cessation of operations unless the NRC approves an extended timeline for decommissioning the facility or the general license ISFSI in accordance with 10 CFR 50.82(a)(3) when necessary to protect public health and safety.



## SIMPLE DECOMMISSIONING TIMELINE



**Figure 1. Simple decommissioning timeline**

### Decommissioning Funding

The 1996 decommissioning rule changed the licensee's ability to access the trust funds set aside for radiological decommissioning that are required by 10 CFR 50.75. The licensee's ability to use the trust funds set aside for radiological decommissioning depends on reaching certain milestones in the decommissioning process. This limitation on the accessibility of the decommissioning funds is designed to ensure that sufficient funds are always available to place the facility in a safe, stable condition that ultimately leads to decommissioning and license termination. The licensee may use up to 23 percent of the amount (specified in 10 CFR 50.75) of the decommissioning trust funds (DTFs) for decommissioning activities before submitting a site-specific decommissioning cost estimate. Included in this 23 percent is an initial 3 percent that the licensee can use, even before permanent cessation of operations, for decommissioning planning, which does not include planning for the management of irradiated fuel. The licensee may use the remaining 20 percent for active decommissioning activities (DECON) or to ready the facility for long-term storage (SAFSTOR). This 20 percent may be used only after the licensee has submitted the certifications specified by 10 CFR 50.82(a)(1) or 10 CFR 52.110(a), and after the 90-day period following submission of the PSDAR. The remaining DTFs would be available for use for decommissioning activities, consistent with 10 CFR 50.82(a)(8)(i) and 10 CFR 52.110(h)(1), after the licensee submits a site-specific decommissioning cost estimate to the NRC. In 10 CFR 50.82(a)(8)(iii) and 10 CFR 52.110(h)(3), the NRC requires the licensee to submit a site-specific decommissioning cost estimate within 2 years after permanent cessation of operations, if not already submitted.

The following is a list of documents containing information that may help licensees develop site-specific decommissioning cost estimates:

- NUREG/CR-0672, “Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station,” (including Addenda 1–4) (Ref. 22)
- NUREG/CR-0130, “Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station,” (including Addenda 1–4) (Ref. 23)
- NUREG/CR-5884, “Revised Analyses of Decommissioning for the Reference Pressurized Water Reactor Power Station” (Ref. 24)
- NUREG/CR-6174, “Revised Analyses of Decommissioning for the Reference Boiling Water Reactor Power Station” (Ref. 25)
- NUREG-0586, “Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities”

The staff recognizes that, during the planning process for decommissioning while in operation, the licensee must consider activities related to the storage of spent fuel. Accordingly, the licensee may choose to commingle the funding for spent fuel planning, maintenance, and storage required by 10 CFR 50.54(bb) in the same trust fund that it uses for radiological decommissioning. However, funds set aside for decommissioning planning must not be used for spent fuel management planning during operation; this is not allowed without an exemption and these funds must remain separate and accounted for as such unless approved otherwise. The licensee must be able to identify and track the amounts in the trust fund applicable to radiological decommissioning activities and the amounts set aside for spent fuel management and other uses.

During operation, unless otherwise approved through a regulatory exemption, funds collected and set aside in the DTF for decommissioning are exclusively for radiological decommissioning as defined in 10 CFR 50.2. Therefore, expenses that these funds can be used for include expenses directly related to removing a facility or site safely from service and reducing residual radioactivity to a level that permits license termination and release of the property for restricted or unrestricted use. These expenses may include:

- Expenses directly related to activities that satisfy the definition of “decommission” in 10 CFR 50.2;
- Expenses directly related to decommissioning planning and execution including consulting and paper studies, environmental assessments, engineering, and licensing activities;
- Expenses directly related to the decontamination and dismantling of systems, structures, and components (SSCs) (labor, materials, and equipment), including disposal of waste generated from decontamination and dismantling activities;
- Expenses directly related to the disposal of contaminated SSCs (labor, materials, and equipment);
- Expenses directly related to radiological soil remediation (labor, materials, and equipment), including disposal of this waste;

- Expenses directly related to overhead costs (i.e., emergency planning and security) and energy (e.g., electricity and fuel) used in support of decommissioning activities and to maintain the safety and security of the site;
- Expenses directly related to undistributed costs such as property taxes and nuclear insurance required while in decommissioning until the license terminated;
- Expenses directly related to improving the efficiency and effectiveness of the decommissioning process (demonstrated through a cost-benefit analysis to reduce expenses and preserve the decommissioning fund), and to improve the safety and security of the site.

While in operation, the licensee should not reallocate or use the amount set aside for radiological decommissioning, as required by 10 CFR 50.75, for (1) the maintenance and storage of spent fuel in the spent fuel pool (SFP), (2) the design, construction, or operation of spent fuel storage facilities on the reactor site, or (3) other activities not directly related to radiological decontamination or dismantlement of the facility or site.

The 2019 decommissioning rule amended the NRC's regulations to allow, as an option, licensees to use excess funds in the decommissioning trust fund (e.g., funds that are greater than those reasonably needed to complete radiological decommissioning of the facility or site) for spent fuel management and specific license ISFSI decommissioning expenses if (1) the NRC has docketed the licensee's certifications required under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) to permanently cease operations and defuel, (2) at least 90 days have passed since the NRC has received the licensee's PSDAR, and (3) the licensee continues to meet 10 CFR 50.82(a)(8)(i)(B) and (C) or 10 CFR 52.110(h)(1)(ii) and (iii). The licensee should identify the proposed use of this funding option in the site-specific decommissioning cost estimate and clearly identify any excess funds. Such excess funds are funds in the DTF that are greater than those funds reasonably needed to maintain compliance with 10 CFR 50.82(a)(8)(i)(B) and (C) or 10 CFR 52.110(h)(1)(ii) and (iii), complete radiological decommissioning, and terminate the license. In addition, licensees should identify the availability of excess funds in the annual decommissioning financial assurance status report required under 10 CFR 50.82(a)(8)(v) and 10 CFR 52.110(h)(5). Regardless of whether this option is exercised, a licensee is required to continue with a series of steps, as specified in 10 CFR 50.75(a), to comply with all decommissioning funding assurance regulations. A licensee is not relieved of the responsibility to certify that there is reasonable assurance that decommissioning funding will be available to decommission the site.

### **Harmonization with 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 standards for protecting people and the environment from harmful effects of ionizing radiation. These standards provide a system of safety fundamentals, safety requirements, and safety guides reflecting an international consensus on what constitutes a high level of safety. The following IAEA safety standards provide useful information on decommissioning. This RG contains information that is consistent with the safety principles in these publications.

- IAEA General Safety Requirements Part 6, "Decommissioning of Facilities," issued July 2014 (Ref. 26)
- IAEA Safety Guide WS-G-2.1, "Decommissioning of Nuclear Power Plants and Research Reactors," issued December 1999 (Ref. 27)

- IAEA Safety Guide WS-G-2.2, “Decommissioning of Medical, Industrial and Research Facilities,” issued December 1999 (Ref. 28)
- IAEA Safety Guide WS-G-2.4, “Decommissioning of Nuclear Fuel Cycle Facilities,” issued June 2001 (Ref. 29)
- IAEA Safety Guide WS-G-5.2, “Safety Assessment for the Decommissioning of Facilities Using Radioactive Material,” issued February 2009 (Ref. 30)

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## C. STAFF REGULATORY GUIDANCE

This section provides detailed descriptions of the methods, approaches, or data that the staff considers acceptable for meeting the requirements of 10 CFR Part 50 and 10 CFR Part 52 for decommissioning of nuclear power reactors.

### 1. Certification of Permanent Cessation of Operations

As stated in 10 CFR 50.82(a)(1)(i) and 10 CFR 52.110(a)(1), when a licensee has determined to permanently cease operations at a nuclear power reactor unit, it must submit a written certification to the NRC within 30 days of that determination. Note that the rule requires the licensee to submit certification within 30 days of the decision to cease operations rather than within 30 days of actual facility shutdown. The NRC considers that the 30-day clock starts on the day that the licensee publicly announces the date that the facility will permanently cease operations. If the facility has already been shut down, the date of permanent cessation of operations would correspond to the day that the decision is made not to seek to return to power-generation operation. If the NRC issues an order to permanently cease operations at a facility, the certification would be required within 30 days of the effective date of the order.

According to 10 CFR 50.4(b)(8) and 10 CFR 52.3(b)(8), the certification must state the date on which power-generation operations permanently ceased, or will permanently cease, and must be submitted under oath or affirmation. This certification is deemed to have already been submitted for licensees whose licenses were permanently modified before the effective date of the 1996 decommissioning rule to allow for possession, but not operation, of the facility, as stated in 10 CFR 50.82(a)(1)(iii). Following submission of the certification for permanent cessation of operations, the facility license continues in effect beyond the expiration date until the NRC notifies the licensee in writing that the license has been terminated (in accordance with 10 CFR 50.51(b) and 10 CFR 52.109). A permanently shutdown facility does not require an amendment to extend the expiration date of the operating license.

The NRC deems receipt of the certification of permanent cessation of operations as a commitment by the licensee to cease operations on the specified date. Following submission of the certification of permanent cessation of operations, or at any time during the decommissioning process, if the licensee desires to operate the facility again, it must notify the NRC of its intentions in writing. The NRC would handle review and approval activities to return the facility to operation on a case-by-case basis, and the extent of review and approval would depend on the facility status at the time that the licensee submits a request to reauthorize operation. This prohibition on continuing reactor operation does not apply to licensees that have only submitted a written notification of the intent to decommission a facility at some point in the future but have not established or certified the date by which the facility will permanently cease operations.

### 2. Certification of Permanent Removal of Fuel

Once the fuel is permanently removed from the reactor vessel, 10 CFR 50.82(a)(1)(ii) and 10 CFR 52.110(a)(2) require the licensee to submit a written certification to the NRC, consistent with the requirements in 10 CFR 50.4(b)(9) and 10 CFR 52.3(b)(9), stating the date on which the fuel was permanently removed from the reactor vessel and the disposition of the fuel. For example, the licensee should state whether the spent fuel was transferred to another 10 CFR Part 50 or 10 CFR Part 52 licensee, placed in the facility's SFP, or stored in an ISFSI. This certification must be submitted under oath or affirmation.

Although the regulations may require the licensee to submit the certification of permanent cessation of operations before it permanently shuts down the facility, the regulations require the licensee to submit the certification of permanent removal of fuel only after all the fuel has been removed from the reactor vessel. In 10 CFR 50.2, the NRC defines permanent fuel removal for a nuclear power reactor facility as “a certification by the licensee to the NRC that it has permanently removed all fuel assemblies from the reactor vessel.” This certification is deemed to have already been submitted for licensees whose licenses were permanently modified before the effective date of the 1996 decommissioning rule to allow for possession, but not operation, of the facility, as stated in 10 CFR 50.82(a)(1)(iii).

There are no requirements on the time interval between the decision to permanently cease operations and the submittal of the certification of permanent fuel removal. However, until the NRC has received the certification of permanent fuel removal, the licensee does not qualify for the removal of those regulatory requirements that are no longer necessary to protect public health and safety resulting from the nonoperational status of the facility or for a reduction in the fees required by 10 CFR 171.15, “Annual Fees: Reactor Licenses and Independent Spent Fuel Storage Licenses” (Ref. 31).

The NRC staff expects to receive the certification to permanently cease operations before the certification of permanent fuel removal, although the staff would also find it acceptable to receive a combined certification (e.g., if the core had been offloaded before the licensee decided to permanently shut down the facility). According to 10 CFR 50.82(a)(2) and 10 CFR 52.110(b), when the NRC docket both the certifications for permanent cessation of operations and permanent removal of fuel from the reactor vessel or when a final legally effective order to permanently cease operations at the facility comes into effect, the 10 CFR Part 50 or 10 CFR Part 52 license no longer authorizes the operation of the reactor or emplacement of fuel into the reactor vessel.

### **3. Irradiated Fuel Management Plan**

The regulation in 10 CFR 50.54(bb) requires the licensee to submit its plan for the management and funding for management of all spent fuel at the reactor following permanent cessation of operations until title to, and possession of, the spent fuel is transferred to the U.S. Department of Energy. This plan is referred to as the irradiated fuel management plan or, alternatively, the spent fuel management plan. The licensee must submit this plan no later than the date of submission of the PSDAR and before starting to decommission SSCs needed for moving, unloading, and shipping the spent fuel.

The IFMP must include information on how the licensee intends to manage spent fuel before decommissioning the SSCs needed for moving, unloading, and shipping the spent fuel (e.g., the SFP; fuel handling building; or fuel or cask handling systems, including cranes or lifting equipment). The purpose of the plan, in part, is to show what physical infrastructure or capabilities are needed for safely managing spent fuel at the site and to describe how the infrastructure or capabilities will be maintained for the duration of expected spent fuel storage operations.

The IFMP should discuss where the spent fuel will be stored (i.e., whether in a wet or dry storage mode). If the licensee has placed or will place the spent fuel in dry storage at a specific license or general license ISFSI under 10 CFR Part 72, the IFMP should summarize the design of the ISFSI and the dry storage system that is, or will be, used to store spent fuel. The IFMP may reference design-basis documents for the ISFSI or dry storage system (e.g., the updated final safety analysis report for a specific license ISFSI or certificate of compliance (CoC) for the applicable dry storage system design). The IFMP should specifically include information on which SSCs the facility relies on for spent fuel management during decommissioning, including SSCs needed for the following activities:

- a. ready retrieval of spent fuel, consistent with the requirements in 10 CFR 72.122(l)

- b. compliance with the applicable regulatory requirements for spent fuel storage and compliance with the ISFSI license or CoC conditions or technical specifications that involve moving or unloading a spent fuel storage system, particularly for required actions related to limiting conditions for operation
- c. compliance with the ISFSI license or CoC conditions or technical specifications associated with implementation of aging management programs for an ISFSI that is in its period of extended operation, such as inspections, maintenance or repair activities, or corrective actions associated with the aging management programs
- d. restoration of the facility to a safe condition after a design-basis ISFSI accident

The IFMP should also discuss any other spent fuel management issues considered by the licensee, including use of dry storage systems that have associated transportation certificates or any contingency planning that addresses the potential need to handle spent fuel or repair or replace casks or other spent fuel storage components before the end of ISFSI operations (e.g., potential corrective actions for repairing or replacing a canister or cask during the period of extended operation). The IFMP should discuss the physical infrastructure, expertise, or capabilities that may be necessary and explain how they would be obtained, if needed. The IFMP should also identify any actions for managing spent fuel that will require NRC authorization, such as any necessary amendments to the 10 CFR Part 50 or Part 72 licenses or the Part 72 CoC.

The regulation in 10 CFR 50.54(bb)(4) requires the IFMP to contain the projected cost of managing spent fuel and discuss how the licensee will provide funding for the management of the spent fuel following permanent cessation of operations until title to, and possession of, the spent fuel is transferred to the U.S. Department of Energy. Guidance related to funding for spent fuel management is found in NUREG/CR-5884 and NUREG/CR-6174.

The regulation at 10 CFR 50.54(bb)(5) requires the licensee to notify the NRC in writing before it performs any activities involving decommissioning of SSCs needed for moving, unloading, and shipping of the spent fuel, that are inconsistent with the discussion in the previously submitted IFMP. In addition, the regulation at 10 CFR 50.54(bb)(6) requires the licensee to retain a copy of the IFMP as a record until termination of the 10 CFR Part 50 or Part 52 operating license.

#### **4. Post-shutdown Decommissioning Activities Report**

Before or within 2 years after permanent cessation of operations, 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) require the licensee to submit a PSDAR to the NRC and to send a copy to the affected States. RG 1.185 provides additional guidance on the content and level of detail to be included in the PSDAR. The PSDAR should describe the planned decommissioning activities, include a schedule for the completion of those activities and a site-specific decommissioning cost estimate, and discuss whether the environmental impacts associated with the site-specific decommissioning activities will be bounded by appropriate federally issued environmental review documents. If the licensee identifies impacts that are not bounded by previous federally issued environmental review documents, it should state how it intends to comply with 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2).

#### **5. Public Meeting**

Once the NRC receives the PSDAR, it will docket the report and publish a notice of receipt in the *Federal Register* to solicit comments on the PSDAR and the IFMP from the public in accordance

with 10 CFR 50.82(a)(4)(ii) and 10 CFR 52.110(d)(2). A copy of the PSDAR and IFMP will be made available to the public in the Public Document Room and electronically through the NRC Library on the agency's Web site at <http://www.nrc.gov/reading-rm/adams>. The NRC will schedule a public meeting near the site to discuss the licensee's plans for decontamination and dismantlement of the facility, plans for spent fuel management, and the decommissioning timeframe, as well as to hear public comments. To the extent possible, the public meeting should be held within 90 days of the NRC's receipt of the licensee's PSDAR submittal; normally, the NRC will hold the meeting at least 30 days before the 90-day period ends.

The NRC will publish a notice of this public meeting in the *Federal Register* and in a place or places readily available to individuals near the site, such as a local newspaper. The notice will include the date, time, and location of the meeting and will briefly describe the purpose of the meeting. Comments received by the NRC staff on the PSDAR or IFMP 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. In addition, the NRC staff's standard practice for 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 PSDAR public meeting, and categorizes the stakeholder comments received on the PSDAR.

The public meeting will be informational and should be chaired by a senior member of the NRC staff involved in the decommissioning of the facility. During the public meeting, the NRC will invite the licensee to present its plans for decommissioning the facility, including plans for spent fuel management, and members of the NRC staff will discuss the regulatory and oversight process for decommissioning the facility. The NRC will offer a representative from each affected State the opportunity to discuss any State regulations or oversight roles that may apply during decommissioning. Other representatives from the affected States, local officials, and the general public will be invited to comment on the licensee's PSDAR and IFMP.

## **6. Initial Decommissioning Activities**

The licensee may not perform any major decommissioning activities, as defined in 10 CFR 50.2, until 90 days after the date that the NRC receives the licensee's PSDAR submittal and until the certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel have been submitted, as stated in 10 CFR 50.82(a)(5) and 10 CFR 52.110(e). The NRC staff may use this 90-day period to conduct any pre-decommissioning inspections necessary to verify that the licensee's programs and controls are adequate to ensure that decommissioning activities are conducted safely, and the health and safety of the public and the environment are protected. After 90 days, the licensee may proceed with the major decommissioning activities allowed under 10 CFR 50.82 and 10 CFR 52.110 unless the Commission issues an order prohibiting or otherwise prescribing any major decommissioning activities because of a deficiency in the PSDAR.

Licensees may opt to submit the PSDAR before permanent cessation of operations or permanent removal of fuel from the reactor vessel to minimize any delay in decommissioning activities resulting from the 90-day waiting period. However, licensees must submit certifications for permanent cessation of operations and permanent removal of fuel before initiating major decommissioning activities.

## **7. Major Decommissioning Activities**

As long as fuel remains in the reactor core, facility modifications under 10 CFR 50.59 and 10 CFR 52.63(b)(2) must be consistent with continued facility operation. Once the licensee certifies that



the facility has permanently ceased operations and that the fuel has been permanently removed from the reactor vessel, and the 90-day period has passed, major decommissioning activities, as that term is defined in 10 CFR 50.2, may begin (e.g., permanent removal of major radioactive components). The licensee's decommissioning activities are prescribed by the requirements of 10 CFR 50.59, 10 CFR 50.82, and 10 CFR 52.110. In addition, as stated in 10 CFR 50.82(a)(6) and 10 CFR 52.110(f), licensees of permanently shutdown reactors that may not perform any decommissioning activities that would foreclose the release of the site for possible unrestricted use, would result in significant environmental impacts not bounded by appropriate federally issued environmental review documents, or would result in there no longer being reasonable assurance that adequate funds will be available for decommissioning.

The potential environmental impacts associated with decommissioning should be evaluated against the impacts described in 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) 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. 32), (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. 33), and (7) biological assessments or biological opinions issued as part of Section 7 consultations under the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) (Ref. 34).

For most resource areas, the Decommissioning GEIS provides generic conclusions about environmental impacts during decommissioning. If relying on the Decommissioning GEIS, licensees should pay particular attention to the environmental issues 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 assessment or determine whether another federally issued environmental review document provides an adequate site-specific bounding environmental impact assessment.

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 Endangered Species Act or the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.) (Ref. 35). 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 licensee should determine whether the impacts to those species or habitats were discussed in any appropriate federally issued environmental review document. If the impacts from decommissioning or similar activities were not described or bounded by appropriate federally issued environmental review documents, the licensee should contact FWS or NMFS, as needed, to determine whether a planned decommissioning activity may result in a "take," as defined in the ESA, of federally listed species or adversely affect Essential Fish Habitat. If a "take" could occur, then the

licensee could rely upon any additional environmental reviews required by the FWS or NMFS under the ESA. Additionally, if a “take” could occur or if Essential Fish Habitat could be adversely affected, then the licensee could submit a license amendment request or an exemption request to the NRC (thus creating an agency action for the NRC to initiate consultation under the ESA or the Magnuson–Stevens Fishery Conservation and Management Act, as appropriate), or the licensee could take any other appropriate measures to ensure that impacts are bounded by environmental review documents and, therefore, that the licensee remains in compliance with 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2). The staff notes that the take of any federally listed species by any person subject to the jurisdiction of the United States is prohibited by Section 9 of the ESA.

The NRC was also unable to reach a generic conclusion for the environmental justice issue in the Decommissioning GEIS. If the licensee is unable to determine or demonstrate that the impacts for a decommissioning activity are bounded by the environmental justice impacts described in a federally issued environmental review document or for other impact issues evaluated in the Decommissioning GEIS, the licensee should consider following 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 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 unable to comply with the requirements of 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2), the licensee could take one of several actions, including the following:

- a. submit a license amendment request for prior NRC 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 environmental document, as part of its review and would complete any necessary environmental consultations to resolve any issues regarding unbounded environmental impacts before the decommissioning activity takes place.

Licensees should maintain documentation of their analyses showing compliance with 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2) for any identified environmental impacts from decommissioning activities.

For decommissioning activities that would result in significant environmental impacts not previously reviewed, failing to change the decommissioning activities prior to performing them so that they will not result in significant environmental impacts not previously reviewed 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)(2).

## **8. Technical Regulations and Requirements**

### **8.1 Technical Specifications**

The NRC regulations explicitly extend requirements for specific portions of the technical specifications that will cover decommissioning activities. Decommissioning technical specifications will be developed on a case-by-case basis, as stated in 10 CFR 50.36(c)(6). The licensee will review the operational technical specifications and determine which specifications no longer apply during decommissioning and which ones should remain in force. The licensee will make the appropriate submittals to the NRC to request changes to the technical specifications as required by the regulations.

### **8.2 Effluent Releases and Reporting**

Technical specifications for effluent releases are specified in 10 CFR 50.36a, “Technical Specifications on Effluents from Nuclear Power Reactors.” In addition to complying with the applicable provisions of 10 CFR 20.1301, “Dose Limits for Individual Members of the Public,” the licensee would develop technical specifications that require it to establish and follow operating procedures for the control of effluents as outlined in 10 CFR 50.34a(c), when applicable, and to maintain and use the radioactive waste system under 10 CFR 50.34a(a). This applies when the plant is operating as well as during decommissioning. The regulation in 10 CFR 50.36a(a)(1) requires the licensee to retain these operating procedures as a record until the NRC terminates the license and to keep all superseded revisions to the procedures for 3 years from the date they were superseded.

Licensees must continue to meet the requirements of 10 CFR 50.36a(a)(2) to submit an annual report to the NRC that specifies the quantity of each of the principal radionuclides released from the facility to unrestricted areas in liquid and gaseous effluents during the previous 12 months. The report must include any other information that the NRC may need to estimate the maximum potential annual radiation doses to the public resulting from effluent releases. The time between submittal of the reports must be no longer than 12 months. If quantities of radioactive materials released during the reporting period are significantly greater than the design objectives for the facility when it was operating or are outside the scope of what would be expected based on the ongoing decommissioning activities at the site, the report must specifically address the reasons for this variation.

The NRC will use these reports, along with any additional information provided, to require the licensee to take actions that the agency deems appropriate to control and monitor offsite liquid and gaseous effluent releases. Licensees may continue to use the values in Appendix I, “Numerical Guides for Design Objectives and Limiting Conditions for Operation To Meet the Criterion ‘As Low as is Reasonably Achievable’ for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents,” to 10 CFR Part 50. Appendix I provides numerical guidance for meeting the requirements for radioactive materials in effluents released to unrestricted areas.

### **8.3 The Maintenance Rule**

The maintenance rule (10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants”) requires licensees to monitor the performance or condition of certain SSCs that could affect safety. For licensees that have submitted the certifications for cessation of operations and permanent removal of fuel from the reactor, as specified in 10 CFR 50.82(a)(1), this requirement applies only to the extent that the licensee monitors the performance or condition of the SSCs

associated with the storage, control, and maintenance of spent fuel in a safe condition within the SFP. The monitoring activities must be sufficient to provide reasonable assurance that SSCs related to the storage of spent fuel are capable of fulfilling their intended functions, as specified in 10 CFR 50.65(a)(1).

## **8.4 Final Safety Analysis Report Content**

The final safety analysis report (FSAR), or other comparable document, provides a licensing-basis document for use in the evaluation of licensee activities under 10 CFR 50.59. The licensee must update and periodically adjust this licensing-basis document to cover decommissioning activities. According to 10 CFR 50.71(e)(4), nuclear power facilities that have submitted certifications for permanent cessation of operations and removal of fuel must file subsequent revisions that update the FSAR and its associated licensing basis with the NRC at least every 24 months. Specific sections of the FSAR that the licensee should continue to update periodically during decommissioning include those described below.

### **8.4.1 Facility Description**

The licensee must describe, primarily in the PSDAR, the facility's status at the time the facility is shut down and before any decommissioning or dismantlement activities occur and make the accompanying changes to the FSAR. The licensee should update only the descriptions of those facility SSCs that are included in the technical specifications or that directly affect the safe storage of irradiated fuel. However, during decommissioning, general updates to the FSAR to reflect the current condition of SSCs that were in the operating plant version of the FSAR are needed to maintain an overall understanding of the configuration basis of the plant. The updates should identify changes as systems are decontaminated, inactivated, mothballed for later use, or reconfigured to support changes to their previous functions. Even though SSCs may no longer have a safety function, documenting the status or design function of these SSCs while the plant is in a decommissioning phase has an overall safety benefit.

For example, a cooling water system may no longer be required to provide a safety-related heat sink. However, if the system continues to be functional, operation of a wrong valve or a system fault or breakage, or misalignment of interfaces to this system, could result in accidents such as flooding, personnel injury, or flushing of potentially radioactive material into an uncontaminated location. As a minimum, the licensee should maintain a level of detail in the FSAR that provides the status of all the operating licensing-basis SSCs until the systems are no longer mechanically or electrically active, are no longer radioactively contaminated, have no fluid content or other materials that require special handling considerations, or have been physically removed during dismantlement.

### **8.4.2 Licensee Organization**

The FSAR or comparable document should describe the licensee's corporate and site organization during decommissioning. It should describe the structure, functions, and responsibilities of the onsite organization established to decommission the facility, including the use of a decommissioning general contractor if applicable.

### **8.4.3 Radioactive Waste Management**

The scope remains the same as in the operating-phase FSAR.

### **8.4.4 Radiation Protection**

The scope remains the same as in the operating-phase FSAR.

#### **8.4.5 Conduct of Operations**

The scope remains the same as in the operating-phase FSAR.

#### **8.4.6 Site Characteristics**

The licensee should update any sections of the FSAR that discuss the site characteristics that support the safe storage of fuel or that could directly affect the design basis of the facility.

#### **8.4.7 Accident Analysis**

The licensee should evaluate any new or different design-basis accidents identified during 10 CFR 50.59 evaluations of the changes planned during decommissioning and include them in FSAR updates, if appropriate (e.g., consideration of accidents involving a newly installed gas pipeline within or near the facility). Conversely, as decommissioning progresses, the licensee may remove any design-basis accidents that are no longer possible from the FSAR or comparable document (e.g., the design basis of a facility that has transferred its spent fuel from the SFP to an ISFSI would be significantly changed; therefore, the licensee should update the FSAR to reflect this change).

### **8.5 Record Retention Requirements**

Nuclear power reactor licensees that have certified that they have ceased operations and permanently removed the fuel from the reactor vessel can eliminate records associated with SSCs that no longer serve any NRC-regulated function. This record disposal is allowed as long as appropriate change mechanisms, such as the 10 CFR 50.59 evaluation process or NRC-approved technical specification changes, are used to assess the removal of those records to determine that elimination of the records will not adversely impact public health and safety.

The records subject to removal are associated with SSCs that had been important to safety during power operation or operation of the SFP but can no longer cause an event, incident, or condition that would adversely impact public health and safety, as evidenced by their appropriate removal from the licensing-basis documents. If the SSCs no longer have the potential to cause these scenarios, it is reasonable to conclude that the records associated with these SSCs would not be necessary to assist the NRC in determining compliance and noncompliance, taking action on possible noncompliance, and examining facts following an incident. Therefore, retention of such records would not serve the underlying purpose of the recordkeeping regulations.

The following regulations ensure that records associated with SSCs will be captured, indexed, and stored in an environmentally suitable and retrievable condition: 10 CFR 50.59(d)(3); 10 CFR 50.71(c); 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion 1, "Quality Standards and Records"; and 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," Criterion XVII, "Quality Assurance Records." Although licensees will retain the records required by their license as the plant transitions from operating conditions to a fully decommissioned state, plant dismantlement will obviate the regulatory and business need for maintenance of most records.

As the SSCs already removed from the licensing basis are subsequently dismantled and as the need for the associated records is, on a practical basis, eliminated, licensees can dispose of the records associated with SSCs and historical activities that are no longer relevant and thereby eliminate the associated regulatory and economic burdens of creating alternative storage locations, relocating records,

and retaining irrelevant records. Considering the content of these records, their elimination on an advanced timetable has no reasonable potential of presenting any undue risk to public health and safety. In addition, upon dismantlement of the affected SSCs, the records have no functional purpose relative to maintaining the safe operation of the SSCs, maintaining conditions that would affect the ongoing health and safety of workers or the public, or informing decisions related to nuclear safety.

In addition, the NRC amended the decommissioning rule to change the portion of 10 CFR 72.72(d) that requires records for spent fuel in storage to be kept in duplicate for the ISFSI. The change allows such records to be stored in a single location as long as an NRC-approved quality assurance program (QAP) controls the record storage location. Specifically, 10 CFR 72.140(d) states that the NRC will accept a QAP that the agency has approved as meeting the applicable requirements of 10 CFR Part 50, Appendix B, as satisfying the requirements of 10 CFR 72.140(b) for establishing an ISFSI QAP; however, the licensee must also meet the recordkeeping provisions of 10 CFR 72.174, "Quality Assurance Records." This change will not affect the record content, retrievability, or retention requirements in 10 CFR 72.72, "Material Balance, Inventory, and Records Requirements for Stored Materials," or 10 CFR 72.174.

In making these recordkeeping changes, the NRC determined that the process and procedures that will be used to store the ISFSI records (i.e., in accordance with the QAP at a facility designed for protection against degradation mechanisms such as fire, humidity, and condensation) will help ensure that the licensee will adequately maintain the required spent fuel information. Therefore, changes that result from the duplicate record requirement of 10 CFR 72.72(d) will not affect public health and safety and will not endanger life or property. In addition, allowing the ISFSI spent fuel records to be stored in the same manner as that of other quality assurance records for the nuclear facility allows greater efficiency in the storage of all records once the facility enters the final stages of decommissioning, whereby only the ISFSI facility will remain after license termination. Requiring a separate method for the storage of certain ISFSI quality assurance records diverts resources from decommissioning activities.

## **8.6 Fire Protection Requirements**

The fire protection regulations in 10 CFR 50.48(f) require licensees that have certified the permanent cessation of operations and removal of fuel from the reactor vessel to maintain a fire protection program to address the potential for fires that could result in a radiological hazard. The objectives of the fire protection program delineated in 10 CFR 50.48(f)(1) are to (1) reasonably prevent such fires from occurring, (2) rapidly detect, control, and extinguish fires that could result in a radiological hazard, and (3) minimize the risk of fire-induced radiological hazards to the public, environment, and plant personnel.

Further, 10 CFR 50.48(f)(2) requires licensees to assess the fire protection program on a regular basis and revise it, as needed, throughout the various stages of facility decommissioning. The requirements of 10 CFR 50.48(f)(3) permit licensees to make changes to the fire protection program without NRC approval if these changes do not reduce the effectiveness of fire protection for facilities, systems, and equipment that could result in a radiological hazard, taking into account the conditions and activities of decommissioning at the facility. RG 1.191, "Fire Protection Program for Nuclear Power Plants during Decommissioning and Permanent Shutdown," presents additional guidance.

## **8.7 Certified Fuel Handler Staffing and Management Role**

The requirements of 10 CFR 50.51(b) state that each license for a facility that has permanently ceased operations continues in effect beyond the expiration date to authorize ownership and possession of the production or utilization facility, until the Commission notifies the licensee in writing that the license is terminated. During such period of continued effectiveness, 10 CFR 50.51(b) requires the licensees to

(1) take actions necessary to decommission and decontaminate the facility and continue to maintain the facility, including, where applicable, the storage, control and maintenance of the spent fuel, in a safe condition, and (2) conduct activities in accordance with all other restrictions applicable to the facility in accordance with the NRC regulations and the provisions of the specific 10 CFR part 50 license for the facility.

To comply with these requirements, licensees should designate one or more individuals to perform the following key functions during decommissioning: (1) safe conduct of decommissioning activities, (2) safe handling and storage of spent fuel, (3) response to emergencies, and (4) command and control over functions (1) – (3). To perform these key functions, the decommissioning staff should have training, knowledge, and understanding of the following:

- a. radiological safety principles and monitoring
- b. facility/system design and function
- c. facility administrative and safety procedures (i.e., normal, abnormal, and emergency procedures, accident analysis, and the facility's emergency plan), as appropriate for the current plant status
- d. facility license
- e. content, bases, and importance of the facility's technical specifications
- f. thermodynamics, heat transfer, fluid mechanics, electrical theory, and mechanical components operation as related to monitoring, handling, storage, and cooling of nuclear fuel

Furthermore, the decommissioning staff should be able to perform the following additional functions:

- a. shift turnover
- b. shift recordkeeping
- c. removal and return of equipment to service
- d. watch standing activities
- e. monitoring, handling, storage, and cooling of nuclear fuel
- f. response to emergencies

The NRC staff considers these qualifications to be met by individuals who are designated as Certified Fuel Handlers (CFHs). Such an individual can provide reasonable assurance that a licensee will meet the requirements of 10 CFR 50.51(b) for a permanently shut down and defueled reactor.

A CFH is currently defined in 10 CFR 50.2 as an NLO who has qualified in accordance with a fuel handler training program approved by the Commission, for a nuclear power reactor facility. The NRC staff has added a voluntary alternative definition that states that a CFH can also be an NLO who has qualified in accordance with a fuel handler training program that meets the requirements for non-licensed operators under 10 CFR 50.120, and is responsible for decisions regarding the key decommissioning functions described above. Use of the voluntary alternative definition provides specific requirements on the quality of the CFH training program and details the CFH's responsibilities.

### Safe Conduct of Decommissioning Activities

The training and responsibilities of the CFH support the safe conduct of decommissioning activities at a facility that has permanently ceased operations. Specifically, the NRC staff has found that use of the systems approach to training (SAT), as defined in 10 CFR 55.4, and the use of 10 CFR 50.120(b)(3) are appropriate and applicable for the training of NLOs for nuclear power reactors during the decommissioning process; this includes those NLOs who are also qualified as CFHs. A systems approach to training includes a systematic analysis of the jobs to be performed, and evaluation and revision of the training based on the performance of the trained personnel in the job setting. Accordingly, as plant conditions change (i.e., the job setting changes), training programs will be revised to reflect these changes. These revisions could include the development of new programs, such as the CFH training and retraining program, or the elimination of obsolete programs. However, the process also ensures that the modification of the program to reflect the changed environment is performed in an orderly fashion. If a decommissioning plant decides to make some or all existing training programs unnecessary, the licensee would obtain relief from these requirements by applying for an exemption eliminating or modifying the affected programs.

### Safe Handling and Storage of Spent Fuel

A CFH is also responsible for decisions related to the safe handling and storage of spent fuel at a decommissioning facility. In addition to the overall safety of any decommissioning-related activities at the facility, the CFH is intended to be the on-shift licensee representative who is responsible for safe fuel handling operations and to ensure the safe maintenance and storage of spent fuel.

### Response to Emergencies

The role of the CFH in determining actions needed in response to an emergency that could affect plant operations is significant. During emergency conditions, as discussed in 10 CFR 50.54(x) and 10 CFR 73.55(p), a licensee may take reasonable action that departs from a license condition or a technical specification to protect the public health and safety or, for severe weather emergencies, to protect the health and safety of security force personnel, when no action consistent with license conditions or technical specifications that can provide adequate or equivalent protection is immediately apparent. These regulations serve to ensure that the emergency action decisions that are necessary to protect public health and safety, or the health and safety of security force personnel, are made by an individual who has both the requisite knowledge and plant experience. For a permanently shutdown and defueled reactor, the regulations require that such actions may only be approved, at a minimum, by a licensed senior operator or a CFH, as these individuals have the requisite knowledge and plant experience to evaluate plant conditions and make such emergency decisions.

### Command and Control

At a decommissioning facility, the shift manager is often the senior technical position on site and typically has overall command and control responsibilities for the three functional capabilities discussed above. Because a CFH is also required to have training on, and is responsible for, decisions on these three functional capabilities, the shift manager is typically also qualified as a CFH. Due to the management responsibilities of the shift manager/CFH, he or she may also be one of the responsible parties to meet the communication requirements in 10 CFR 73.55(j) related to ensuring effective command and control during both normal and emergency situations, as well as to support security personnel.



## Staffing

In response to license amendment requests from decommissioning licensees, the NRC staff has approved changes to the minimum levels for staff on shift in the administrative controls section of the plant technical specifications. These amendments have each involved replacing the SRO and RO positions with one CFH and one NLO, respectively, to perform activities involving the functions discussed above. The NRC staff recognizes that these prior approvals have addressed only a limited number of staffing scenarios that could be encountered at a decommissioning reactor, and have generally been for a single unit plant with one SFP.<sup>1</sup>

As such, adequate staffing levels are expected to vary based on (1) the number of reactor units that are permanently shut down on site; (2) if any operating reactor units are on site; (3) how many active SFPs are on site; (4) whether and when all spent fuel has been relocated to an ISFSI; and/or (5) the organizational structure approved in the license. As noted in 10 CFR 50.51(b)(2), the licensee shall conduct its activities in accordance with its license. In some instances, the licensee might wish to submit a license amendment request to set appropriate staffing levels that meet 10 CFR 50.51(b).

### **8.8 Changes to Emergency Planning, Physical Security, and Quality Assurance Requirements**

The NRC does not require or expect details in the PSDAR on 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 FSAR, the QAP, the emergency plan, or other documents applicable to decommissioning. In addition, several of these areas undergo significant changes throughout the decommissioning process and may be captured under different regulatory processes such as license amendments or exemptions.

### **9. 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 a 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 changes to the milestone schedule provided in the PSDAR to schedule inspections of the licensee's activities and ensure 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 SSCs that are not contaminated or in the immediate proximity of contaminated systems that could result in a worker dose.

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<sup>1</sup> On August 1, 2014, the NRC approved the Safe Storage Shift Manager/Certified Fuel Handler Training Program for the San Onofre Nuclear Generating Station, Units 2 and 3 (ADAMS Accession No. ML13268A165).

## 10. Use of Funds

The regulation at 10 CFR 50.75(f)(3) requires licensees at or about 5 years before the projected end of operations to submit a preliminary decommissioning cost estimate that includes an up-to-date assessment of the major factors that could affect the cost to decommission. Prior to or within 2 years following permanent cessation of operations, 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) require licensees to submit a PSDAR, which must contain a site-specific decommissioning cost estimate. Additionally, 10 CFR 50.54(bb) requires licensees to submit an IFMP, including the projected cost of managing irradiated fuel, no later than the date of submission of the PSDAR.

The NRC amended its regulations to allow licensees to use excess funds in the decommissioning trust fund (e.g., funds that are greater than those reasonably needed to complete radiological decommissioning of the facility) for spent fuel management and specific license ISFSI decommissioning expenses if (1) the NRC has docketed the licensee's certifications required under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) to permanently cease operations and defuel, (2) at least 90 days have passed since the NRC has received the licensee's PSDAR, and (3) the licensee continues to meet 10 CFR 50.82(a)(8)(i)(B) and (C) or 10 CFR 52.110(h)(1)(ii) and (iii). Such excess funds are funds in the DTF that are greater than those funds reasonably needed to maintain compliance with 10 CFR 50.82(a)(8)(i)(B) and (C) or 10 CFR 52.110(h)(1)(ii) and (iii), complete radiological decommissioning, and terminate the license. Licensees should indicate their proposed use of this funding option in the site-specific decommissioning cost estimate and clearly identify any excess funds. In addition, licensees should identify the availability of excess funds in the annual decommissioning financial assurance status report required under 10 CFR 50.82(a)(8)(v) and 10 CFR 52.110(h)(5).

The regulation at 10 CFR 50.82(a)(8)(ii) and 10 CFR 52.110(h)(2) allows the licensee to use 3 percent of the generic amount of the decommissioning funds specified in 10 CFR 50.75 for decommissioning planning, and such amount may be expended during the operating life of a plant without any requirement for written notice to be made. Appropriate activities for the use of the initial 3 percent of the decommissioning funds include engineering design development, work package preparation, and licensing activities to transition the licensing basis from operations to decommissioning. Activities that would not be appropriate for the use of these planning funds include decontamination and dismantlement activities, draining of systems, removal of filters, projects designed to demonstrate the feasibility of a particular decommissioning activity, and spent fuel management planning. As an example, the decontamination of a building that is no longer in use and would ultimately have to be decontaminated before license termination is not an appropriate use of planning funds.

After the licensee has submitted the certifications required by 10 CFR 50.82(a)(1) or 10 CFR 52.110(a), and 90 days after the NRC has received the PSDAR, which includes a site-specific decommissioning cost estimate, the licensee may use an additional 20 percent of the decommissioning funds prescribed in 10 CFR 50.75. The withdrawals may not adversely affect the licensee's ability to fully fund the decommissioning trust. The licensee must ensure the availability of funds to ultimately release the site and terminate the license.

The licensee is prohibited from using the remaining 77 percent of the decommissioning funds until it submits a site-specific decommissioning cost estimate to the NRC. The licensee must submit this estimate prior to or within 2 years following permanent cessation of operations with the PSDAR. Site-specific decommissioning cost estimates should include an outline of the expected costs for activities specified in the PSDAR. See Regulatory Guide 1.185, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report," for further information on the expected level of detail. See RG 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," for guidance on

estimating the amount of funds for decommissioning and methods acceptable for demonstrating financial assurance.

Licensees may provide site-specific decommissioning cost estimates sooner than 2 years after permanent cessation of operations. For licensees that submitted a preliminary decommissioning cost estimate about 5 years before the projected end of operations, the licensee could expand and update the preliminary decommissioning cost estimate and submit it as the site-specific decommissioning cost estimate. The licensee could also submit the site-specific decommissioning cost estimate with the PSDAR. If the licensee submits the site-specific decommissioning cost estimate with the PSDAR, it should appropriately identify it as a site-specific decommissioning cost estimate. This approach would eliminate the 23-percent hold point for spending the decommissioning funds so long as the licensee has submitted the certifications required by 10 CFR 50.82(a)(1) or 10 CFR 52.110(a). Licensees that plan to begin major decommissioning activities shortly after permanent cessation of operations should consider an early submission of the site-specific decommissioning cost estimate with the PSDAR.

If the licensee's PSDAR specifies a delayed completion of decommissioning, the licensee must provide a means of adjusting cost estimates and associated funding levels over the storage or surveillance period to ensure that the appropriate amount of funding will be available to terminate the license (10 CFR 50.82(a)(8)(iv) and 10 CFR 52.110(h)(4)). NUREG-1713 provides additional guidance for site-specific decommissioning cost estimates. This guidance specifies the level of detail required for the financial plan to adjust cost estimates and associated funding levels.

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## D. IMPLEMENTATION

The purpose of this section is to provide information on how applicants and licensees<sup>2</sup> may use this guide and information regarding the NRC's plans for using this regulatory guide. In addition, it describes how the NRC staff complies with 10 CFR 50.109, "Backfitting," and any applicable finality provisions in 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

### Use by Applicants and Licensees

Applicants and licensees may voluntarily<sup>3</sup> use the guidance in this document to demonstrate compliance with the underlying NRC regulations. Methods or solutions that differ from those described in this regulatory guide may be deemed acceptable if they provide sufficient basis and information for the NRC staff to verify that the proposed alternative demonstrates compliance with the appropriate NRC regulations. Current licensees may continue to use guidance the NRC found acceptable for complying with the identified regulations as long as their current licensing basis remains unchanged.

Licensees may use the information in this regulatory guide for actions that do not require NRC review and approval, such as changes to a facility design under 10 CFR 50.59. Licensees may use the information in this regulatory guide or applicable parts to resolve regulatory or inspection issues.

### Use by NRC Staff

The NRC staff does not intend or approve any imposition or backfitting of the guidance in this regulatory guide. The NRC staff does not expect any existing licensee to use or commit to using the guidance in this regulatory guide, unless the licensee makes a change to its licensing basis. The NRC staff does not expect or plan to request licensees to voluntarily adopt this regulatory guide to resolve a generic regulatory issue. The NRC staff does not expect or plan to initiate NRC regulatory action which would require the use of this regulatory guide. Examples of such unplanned NRC regulatory actions include issuance of an order requiring the use of the regulatory guide, requests for information under 10 CFR 50.54(f) as to whether a licensee intends to commit to use of this regulatory guide, generic communication, or promulgation of a rule requiring the use of this regulatory guide without further backfit consideration.

During regulatory discussions on plant specific operational issues, the staff may discuss with licensees various actions consistent with staff positions in this regulatory guide, as one acceptable means of meeting the underlying NRC regulatory requirements. Such discussions would not ordinarily be considered backfitting even if prior versions of this regulatory guide are part of the licensing basis of the facility. However, unless this regulatory guide is part of the licensing basis for a facility, the staff may not represent to the licensee that the licensee's failure to comply with the positions in this regulatory guide constitutes a violation.

If an existing licensee voluntarily seeks a license amendment or change and (1) the NRC staff's consideration of the request involves a regulatory issue directly relevant to this new or revised regulatory guide and (2) the specific subject matter of this regulatory guide is an essential consideration in the staff's

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<sup>2</sup> In this section, "licensees" refers to licensees of nuclear power plants under 10 CFR Parts 50 and 52; and the term "applicants" refers to applicants for licenses and permits for (or relating to) nuclear power plants under 10 CFR Parts 50 and 52 and applicants for standard design approvals and standard design certifications under 10 CFR Part 52.

<sup>3</sup> In this section, "voluntary" and "voluntarily" means that the licensee is seeking the action of its own accord, without the force of a legally binding requirement or an NRC representation of further licensing or enforcement action.

determination of the acceptability of the licensee's request, then the staff may request that the licensee either follow the guidance in this regulatory guide or provide an equivalent alternative process that demonstrates compliance with the underlying NRC regulatory requirements. This is not considered backfitting as defined in 10 CFR 50.109(a)(1) or a violation of any of the issue finality provisions in 10 CFR Part 52.

Additionally, an existing applicant may be required to comply with new rules, orders, or guidance if 10 CFR 50.109(a)(3) applies.

If a licensee believes that the NRC is either using this regulatory guide or requesting or requiring the licensee to implement the methods or processes in this regulatory guide in a manner inconsistent with the discussion in the Implementation section, then the licensee may file a backfit appeal with the NRC in accordance with the guidance in Management Directive 8.4, "Management of Facility-Specific Backfitting and Information Collection" (Ref. 36), and in NUREG-1409, "Backfitting Guidelines" (Ref. 37).

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## REFERENCES<sup>4</sup>

1. *U.S. Code of Federal Regulations (CFR)*, “Domestic Licensing of Production and Utilization Facilities,” Appendix A, “General Design Criteria for Nuclear Power Plants,” Part 50, Chapter 1, Title 10, “Energy”<sup>5</sup>.”
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) 1.159, “Assuring the Availability of Funds for Decommissioning Nuclear Reactors,” Washington, DC.
8. NRC, RG 1.179, “Standard Format and Content of License Termination Plans for Nuclear Power Reactors,” Washington, DC.
9. NRC, RG 1.185, “Standard Format and Content for Post-Shutdown Decommissioning Activities Report,” Washington, DC.
10. NRC, RG 1.191, “Fire Protection Program for Nuclear Power Plants during Decommissioning and Permanent Shutdown,” Washington, DC.
11. NRC, RG 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning,” Washington, DC.
12. NRC, RG 4.22, “Decommissioning Planning during Operations,” Washington, DC.
13. NRC, NUREG-1713, “Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors, Final Report,” Washington, DC, December 2004.
14. NRC, NUREG-1757, “Consolidated Decommissioning Guidance,” Washington, DC.

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<sup>4</sup> 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](mailto:pdr.resource@nrc.gov).

<sup>5</sup> 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>

15. CFR, "Packaging and Transportation of Radioactive Material," Part 71, Chapter 1, Title 10, "Energy."
16. CFR, "Disposal of High-Level Radioactive Wastes in Geologic Repositories," Part 60, Chapter 1, Title 10, "Energy."
17. CFR, "Licensing Requirements for Land Disposal of Radioactive Waste," Part 61, Chapter 1, Title 10, "Energy."
18. NRC, NUREG-1537, Parts 1 and 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," Washington, DC, February 1996 (ADAMS Accession Nos. ML042430055 and ML042430048).
19. NRC, Interim Staff Guidance Augmenting NUREG-1537, Parts 1 and 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," for Licensing Radioisotope Production Facilities and Aqueous Homogeneous Reactors, Washington, DC, October 2012 (ADAMS Accession Nos. ML12156A069 and ML12156A075).
20. CFR, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," Part 2, Chapter 1, Title 10, "Energy."
21. NRC, NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," Supplement 1, Volumes 1 and 2, Washington, DC, November 2002 (ADAMS Accession Nos. ML023470304 and ML042430048).
22. NRC, NUREG/CR-0672, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," Pacific Northwest Laboratory, Richland, WA, June 1980 (Legacy Library Accession No. 8006250171 (including Addendum 1, July 1983, Legacy Library Accession No. 8308180441; Addendum 2, September 1984, Legacy Library Accession No. 8410170289; Addendum 3, July 1988, Legacy Library Accession No. 8808120112; and Addendum 4, February 1991, Legacy Library Accession No. 9102280246)).
23. NRC, NUREG/CR-0130, "Technology, Safety, and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," Pacific Northwest Laboratory, Richland, WA, June 1978 (Legacy Library Accession No. 79-9260338 (including Addendum 1, August 1979, Legacy Library Accession No. 7909260338; Addendum 2, July 1983, Legacy Library Accession No. 8308170163; Addendum 3, September 1984, Legacy Library Accession No. 8410170293; and Addendum 4, July 1988, Legacy Library Accession No. 8808120069)).
24. NRC, NUREG/CR-5884, Volumes 1 and 2, "Revised Analysis of Decommissioning for the Reference Pressurized Water Reactor Power Station," Pacific Northwest Laboratory, Richland, WA, November 1995 (ADAMS Accession No. ML14008A187).
25. NRC, NUREG/CR-6174, Volumes 1 and 2, "Revised Analyses of Decommissioning for the Reference Boiling Water Reactor Power Station," Pacific Northwest National Laboratory, Richland, WA, July 1996 (ADAMS Accession No. ML14008A186).

26. International Atomic Energy Agency (IAEA)<sup>6</sup> General Safety Requirements Part 6, “Decommissioning of Facilities,” Vienna, Austria, July 2014.
27. IAEA Safety Guide WS G-2.1, “Decommissioning of Nuclear Power Plants and Research Reactors,” Vienna, Austria, December 1999.
28. IAEA Safety Guide WS G-2.2, “Decommissioning of Medical, Industrial and Research Facilities,” Vienna, Austria, December 1999.
29. IAEA Safety Guide WS G-2.4, “Decommissioning of Nuclear Fuel Cycle Facilities,” Vienna, Austria, June 2001.
30. IAEA Safety Guide WS-G-5.2, “Safety Assessment for the Decommissioning of Facilities Using Radioactive Material,” Vienna, Austria, February 2009.
31. CFR, “Annual Fees for Reactor Licenses and Fuel Cycle Licenses and Materials Licenses, Including Holders of Certificates of Compliance, Registrations, and Quality Assurance Program Approvals and Government Agencies Licensed by the NRC,” Part 171, Chapter 1, Title 10, “Energy.”
32. 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).
33. National Historic Preservation Act of 1966, 54 U.S.C. 300101 et seq<sup>7</sup>.
34. Endangered Species Act of 1973, 16 U.S.C. 1531 et seq.
35. Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.).
36. NRC, Management Directive 8.4, “Management of Facility-Specific Backfitting and Information Collection,” Washington, DC, October 9, 2013.
37. NRC, NUREG-1409, “Backfitting Guidelines,” Washington, DC, July 1990.

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<sup>6</sup> Copies of International Atomic Energy Agency (IAEA) documents may be obtained through its Web site at <https://www.iaea.org/> or by writing the International Atomic Energy Agency, P.O. Box 100, Wagramer Strasse 5, A-1400 Vienna, Austria. Telephone (+431)2600-0; fax (+431) 2600-7; or e-mail [Official.Mail@IAEA.org](mailto:Official.Mail@IAEA.org).

<sup>7</sup> 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/>.