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DRAFT REGULATORY GUIDE

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DRAFT REGULATORY GUIDE DG-1271

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DECOMMISSIONING OF NUCLEAR POWER REACTORS

A. INTRODUCTION

Background

"Decommission" means to remove a nuclear facility 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 U.S. Nuclear Regulatory Commission (NRC) license. On June 27, 1988, the NRC issued in the *Federal Register* general requirements for decommissioning that contained technical and financial criteria and dealt with planning needs, timing, funding mechanisms, and environmental review requirements (53 FR 24018). These requirements were codified in Title 10 of the *Code of Federal Regulations* (10 CFR), Sections 50.75, 50.82, 51.53, and 51.95.

On July 29, 1996, a final rule amending the regulations on decommissioning procedures was published in the *Federal Register* (61 FR 39278). The rule amended 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders"; 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities"; and 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." This rule clarified the regulations for decommissioning nuclear power facilities. The rule reflected the experience and knowledge gained during actual facility decommissioning, industry- and Government-sponsored workshops, and conferences on decommissioning. The rule clarified ambiguities in the previous regulations, reduced unnecessary requirements, provided additional flexibility, and codified procedures and terminology that have been used on a case-by-case basis. In addition, the rule increased the opportunities for the public to learn about a licensee's decommissioning activities. The 1996 rule established a level of NRC oversight commensurate with the level of NRC-regulated activities expected during decommissioning. Subsequent revisions (72 FR 49493, August 28, 2007; 73 FR 22787, April, 28, 2008) specified environmental reporting requirements. The 1996 rule extended the use of 10 CFR 50.59, "Changes, Tests, and Experiments," to allow licensees to make changes to facilities undergoing decommissioning by using the process described in that regulation.

This regulatory guide is being issued in draft form to involve the public in the early stages of the development of a regulatory position in this area. It has not received final staff review or approval and does not represent an official NRC final staff position. Public comments are being solicited on this draft guide (including any implementation schedule) and its associated regulatory analysis or value/impact statement. Comments should be accompanied by appropriate supporting data. Written comments may be submitted to the Rules, Announcements, and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; submitted through the NRC's interactive rulemaking Web page at http://www.nrc.gov; or faxed to (301) 492-3446. Copies of comments received may be examined at the NRC's Public Document Room, 11555 Rockville Pike, Rockville, MD. Comments will be most helpful if received by April 16, 2012.

Electronic copies of this draft regulatory guide are available through the NRC's interactive rulemaking Web page (see above); the NRC's public Web site under Draft Regulatory Guides in the Regulatory Guides document collection of the NRC Library at http://www.nrc.gov/reading-rm/doc-collections/; and the NRC's Agencywide Documents Access and Management System (ADAMS) at http://www.nrc.gov/reading-rm/adams.html, under Accession No. ML111360054. The regulatory analysis may be found in ADAMS under Accession No. ML111360063.

To facilitate understanding of the decommissioning process, the NRC staff has divided the decommissioning activities for power reactors into three phases. The first phase of decommissioning includes the initial activities, starting on the effective date of permanent cessation of operations and encompassing the activities before the licensee either places the power reactor in a storage mode or begins major decommissioning activities. The second phase encompasses activities during the storage period or during 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 terminate the license. The amendments to 10 CFR Part 2 and 10 CFR Part 51 in the 1996 rule pertain to this third phase of decommissioning.

Supplement 1 to NUREG-0586, "Final Generic Environmental Impact Statement [GEIS] on Decommissioning of Nuclear Facilities," issued November 2002 (Ref. 1), evaluates the environmental impact of three methods for decommissioning. The supplemental information to the 1988 decommissioning rule (53 FR 24019) also discusses the three decommissioning methods. A summary of the three methods follows:

1. **DECON**: The equipment, structures, and portions of the facility and site that contain radioactive contaminants are removed or decontaminated to a level that permits termination of the license after cessation of operations. The 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 until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel has been removed from the reactor vessel and radioactive liquids have been drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the levels of radioactivity in and on the material and, potentially, the quantity of material that must be disposed of during decontamination and dismantlement. The GEIS found SAFSTOR to be an acceptable decommissioning method.

3. **ENTOMB**: ENTOMB involves encasing radioactive structures, systems, and components (SSCs) in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license. Because most power reactors will have radionuclides in concentrations exceeding 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. If the ENTOMB method is used, the provisions in Subpart E, "Radiological Criteria for License Termination," of 10 CFR Part 20, "Standards for Protection against Radiation," related to unrestricted or restricted use still apply. The GEIS found ENTOMB to be an acceptable decommissioning method.

The NRC recognizes that some combination of the first two methods would also be acceptable. For example, the licensee could conduct a partial decontamination of the plant followed by a storage period, followed by the completion of the decontamination and dismantlement.

The revised regulations require power reactor licensees that were engaged in decommissioning at the time the 1996 rule became effective to convert to and comply with the rule. All licensees are required to comply with the decommissioning procedures specified in the rule, and no "grandfathering" considerations are applicable.

This regulatory guide, in conjunction with others, describes methods and procedures that are acceptable to the NRC staff for implementing the requirements of the 1996 rule that relate to the initial activities and the major phases of the decommissioning process. This regulatory guide does not contain guidance on the license termination process. Guidance on the license termination plan requirements in 10 CFR 50.82(a)(9) is provided in Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Ref. 2), and related information is found in NUREG-1700, "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans" (Ref. 3). This regulatory guide does not contain guidance on the management or funding for the storage of spent reactor fuel during the decommissioning period. Requirements for the storage and management of spent fuel during the decommissioning period (before the spent fuel is transferred to the Secretary of Energy) and for financial assurance are separate from site decommissioning activities and are contained in 10 CFR 50.54(bb). Requirements for the licensing of independent storage of spent nuclear fuel at a facility are likewise separate from site decommissioning activities and are addressed in 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." This regulatory guide does not address the shipment of these materials or disposal of low-level, high-level, or greater-than-Class-C waste; shipment is covered in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," and disposal is addressed in 10 CFR Part 60, "Disposal of High-Level Radioactive Wastes in Geologic Repositories," and Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

This regulatory guide applies only to power reactor licensees. The regulations for nonpower reactor licensees appear in 10 CFR 50.82(b). The NRC staff discusses the procedures for decommissioning nonpower reactors in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," issued February 1996 (Ref. 4), which will be updated to reflect the changes in the regulation in a future revision.

This regulatory guide contains information collection requirements covered by 10 CFR Part 50 and 10 CFR Part 52 that the Office of Management and Budget (OMB) approved under OMB control number 3150 0011 and 3150-0151, respectively. The NRC may neither conduct nor sponsor, and a person is not required to respond to, an information collection request or requirement unless the requesting document displays a currently valid OMB control number. This regulatory guide is a rule as designated in the Congressional Review Act (5 U.S.C. 801–808). However, OMB has not found it to be a major rule as designated in the Congressional Review Act.

Harmonization with International Standards

IAEA Safety Standards WS-R-5 "Decommissioning of Facilities Using Radioactive Material," and WS-G-2.1 "Decommissioning of Nuclear Power Plants and Research Reactors" provide useful information on decommissioning and their principles have been incorporated into this guide. The difference between this guide and the IAEA safety standards is that the latter are generic in nature whereas this guide provides direct linkage to NRC regulations.

B. DISCUSSION

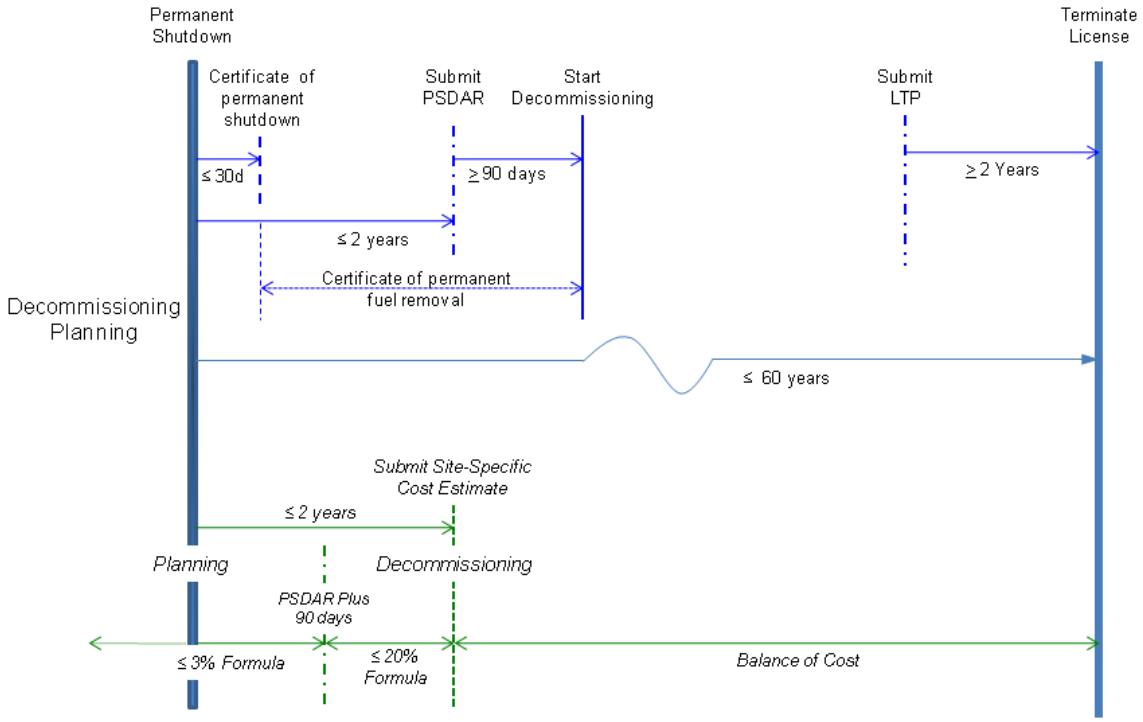
Reactors that are permanently shut down and have no fuel in the reactor vessel present a significantly reduced risk to public health and safety than operating reactors. The July 29, 1996, decommissioning rule specifies applicable requirements for such facilities by eliminating, revising, or

extending operating reactor requirements commensurate with their importance to the safety of permanently shutdown reactors.

Decommissioning activities (those activities that occur in support of decommissioning as defined in 10 CFR 50.2) for power reactors may be divided into three phases: (1) initial activities, (2) major decommissioning and storage activities, and (3) license termination activities. Figure 1 is a general timeline for the decommissioning of power facilities, emphasizing the activities occurring during the first two phases of decommissioning.

Figure 1

SIMPLE DECOMMISSIONING TIMELINE



In accordance with 10 CFR 50.82(a)(1)(i), a licensee that has decided to permanently cease operations is required to submit written certification to the NRC within 30 days of the decision or requirement to permanently cease operations. The certification must state the date that the licensee permanently ceased, or will cease, power generation operations (see 10 CFR 50.4(b)(8)). Once the fuel has been permanently removed from the reactor vessel to the spent fuel pool in conformance with the facility's technical specifications, the licensee submits a certification of this event to be docketed by the NRC (see 10 CFR 50.4(b)(9) and 10 CFR 50.82(a)(1)(ii)). Thereafter, the 10 CFR Part 50 license will no longer authorize operation of the reactor or allow the movement of fuel into the reactor vessel (see 10 CFR 50.82(a)(2)). This would entitle the licensee to a fee reduction and would eliminate the obligation to adhere to certain regulatory requirements needed only during reactor operation.

For power reactor licensees, 10 CFR 50.82(a)(3) states that decommissioning must be completed within 60 years of permanent cessation of operations. The NRC will approve completion of decommissioning beyond 60 years only when necessary to protect public health and safety. NUREG-0586 (Ref. 1) describes alternative methods for decommissioning (DECON, SAFSTOR, and ENTOMB) and the environmental impacts associated with the decommissioning of reactors. The licensee may elect to use a combination of DECON and SAFSTOR, such as a partial decontamination of the

facility before a storage period followed by the completion of the decontamination. The ENTOMB option is not currently used. During the decommissioning process, the licensee must comply with all other applicable rules and regulations.

In accordance with 10 CFR 50.82(a)(4)(i), before or within 2 years after permanent cessation of operations, the licensee is required to submit a post-shutdown decommissioning activities report (PSDAR). The PSDAR should be prepared in accordance with the guidelines in Regulatory Guide 1.185, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report" (Ref. 5). The PSDAR will include a description of the licensee's planned decommissioning activities, with a schedule for the accomplishment of significant milestones and an estimate of expected costs. The licensee will also evaluate the environmental impacts associated with the site-specific decommissioning activities. If the postulated impacts have already been considered in previously approved environmental assessments and environmental impact statements (EISs), the licensee will document this in the PSDAR. The analysis of the specific environmental impacts associated with the decommissioning activities need not be included in the PSDAR. If environmental impacts are identified that have not been considered in existing environmental assessments, the licensee must address the environmental impacts of the activities and must submit a supplement to the environmental report that addresses the additional impacts (see 10 CFR 50.82(a)(6)(ii) and 10 CFR 51.53(b)).

Although activities in support of decommissioning may occur, no major decommissioning activities as defined in 10 CFR 50.2 may be performed until 90 days after the NRC receives the PSDAR. The purpose of the 90-day period is to allow sufficient time for the NRC staff to examine the PSDAR, to publish notification of receipt of the PSDAR in the *Federal Register*, to hold a public meeting in the vicinity of the facility to discuss the licensee's plans for decommissioning, and to conduct any necessary safety inspections before the initiation of major decommissioning activities.

Ninety days after the NRC receives the PSDAR, and after certification of permanent cessation of operations and permanent removal of fuel from the reactor vessel, the licensee could begin to perform major decommissioning activities without specific NRC approval using the process described in 10 CFR 50.59. Major decommissioning activities are defined in 10 CFR 50.2 as "any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components for shipment containing greater than class C waste…." Major radioactive components are defined in 10 CFR 50.2 as "the reactor vessel and internals, steam generators, pressurizers, large bore reactor coolant system piping, and other large components that are radioactive to a comparable degree."

The regulation in 10 CFR 50.82(a)(6) states that the licensee must not perform any decommissioning activity that (1) forecloses release of the site for possible unrestricted use, (2) results in any significant environmental impact not previously reviewed, or (3) results in there no longer being reasonable assurance that adequate funds will be available for decommissioning. During 10 CFR 50.59 inspections, the NRC staff will evaluate the licensee's procedures for ensuring that these three restrictions are part of the screening criteria for changes made to the facility.

An application for termination of a 10 CFR Part 50 license must include a license termination plan. The license termination plan must be a supplement to the final safety analysis report (FSAR), or equivalent, and must be submitted at least 2 years before the expected termination of the license as scheduled in the PSDAR. Regulatory guidance on the license termination process is found in Regulatory Guide 1.179 (Ref. 6), and further information is in NUREG-1700, Revision 1, issued April 2003 (Ref. 3).

Part 50 of the Commission's regulations does not require a licensee to submit a preliminary decommissioning plan. However, 10 CFR 50.75(f)(2) does require the licensee to submit, 5 years before the projected end of operation, a preliminary cost estimate for decommissioning, including an up-to-date assessment of major factors that could affect the cost of decommissioning.

The decommissioning rule of July 1996 changes the licensee's ability to access the trust funds set aside for radiological decommissioning as required by 10 CFR 50.75, "Reporting and Recordkeeping for Decommissioning Planning." The licensee's ability to use these funds depends on reaching certain milestones in the decommissioning process. This limitation on the accessibility of the decommissioning funds is designed to ensure that sufficient trust 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 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 operation, for planning the decommissioning. The licensee may use the remaining 20 percent for actual decommissioning or readying the facility for long-term storage. This 20 percent may be used only after the licensee has submitted the certifications specified by 10 CFR 50.82(a)(1) and after the 90-day period following the submission of the PSDAR. The remaining decommissioning trust funds would be available for decommissioning activities after the licensee submits a site-specific decommissioning cost estimate to the NRC. In 10 CFR 50.82(a)(8)(iii) the NRC requires the licensee to submit the site-specific cost estimate no later than 2 years after permanent cessation of operation.

Information in the following documents may be helpful in developing the site-specific cost estimate: NUREG/CR-0672, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station" (including Addenda 1 through 4) (Ref. 7); NUREG/CR-0130, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station" (including Addenda 1 through 4) (Ref. 8); NUREG/CR-5884, "Revised Analyses of Decommissioning for the Reference Pressurized Water Reactor Power Station" (Ref. 9); and NUREG/CR-6174, "Revised Analyses of Decommissioning for the Reference Boiling Water Reactor Power Station" (Ref. 10).

The staff recognizes that during planning for decommissioning, it is necessary to consider activities leading to license termination and the storage of spent fuel; therefore, the staff's interpretation of the appropriate use of these planning funds will permit planning for all issues related to the decommissioning of the facility. Funding for spent fuel maintenance and storage required by 10 CFR 50.54(bb) may be commingled in the same trust fund that is used for decommissioning but the licensee must be able to identify and track the amounts in the trust fund applicable for decommissioning activities and the amounts set aside for spent fuel management and other uses. This is because funds collected and set aside in the decommissioning trust for decommissioning are exclusively for radiological decommissioning as defined in 10 CFR 50.2. Therefore, the amounts set aside for radiological decommissioning as required by 10 CFR 50.75 should not be used for the maintenance and storage of spent fuel in the spent fuel pool, nor for the design or construction of spent fuel dry storage facilities directly related to permanent disposal, nor for other activities not directly related to, radiological decontamination, or dismantlement of the facility or site.

C. STAFF REGULATORY GUIDANCE

1. Applicability

This regulatory guide applies to all power reactor licensees, including those that have submitted a decommissioning plan for approval or that possess an NRC-approved decommissioning plan, on the effective date of the rule, August 28, 1996. The approved decommissioning plan and the associated environmental review are considered to be the PSDAR submittal. If a licensee has submitted a decommissioning plan and the staff has not taken final action on the plan, the staff will deem the decommissioning plan to be the PSDAR submittal.

2. Certification of Permanent Cessation of Operations

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

According to 10 CFR 50.4(b)(8), the certification must state the date on which power generation operations permanently ceased, or will permanently cease. The signed and notarized certification must be submitted by the licensee to the Document Control Desk, Nuclear Regulatory Commission, Washington, DC 20555-0001. This certification will be deemed to have already been submitted for licensees whose licenses were permanently modified before the effective date of the rule to allow 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 (10 CFR 50.51(b)). No amendment to extend the expiration date of the license is required for a permanently shutdown facility.

The NRC deems receipt of the certification of permanent cessation of operation 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, the licensee must notify the NRC of its intentions in writing. The NRC would handle approval to return the facility to operation on a case-by-case basis, and the approval would depend on the facility status at the time of the request to reauthorize operation.

3. Certification of Permanent Removal of Fuel

Once the licensee has permanently removed the fuel from the reactor vessel, 10 CFR 50.82(a)(1)(ii) requires the licensee to submit written certification to the NRC, consistent with the requirements in 10 CFR 50.4(b)(9), stating the date that the fuel was permanently removed from the reactor vessel and stating the disposition of the fuel. For example, the licensee should state whether the spent fuel was transferred to another 10 CFR Part 50 licensee, or placed in the facility's spent fuel pool, or stored in an independent spent fuel storage installation. This certification should be signed and notarized, and the original submitted to the Document Control Desk, Nuclear Regulatory Commission, Washington, DC 20555-0001.

Although the certification for permanent cessation of operation can be submitted before the facility has ceased operation, the certification of permanent removal of fuel can be submitted only after all the fuel has been removed from the reactor. In 10 CFR 50.2, permanent fuel removal for a nuclear power reactor facility is defined as "a certification by the licensee to the NRC that it has permanently removed all fuel assemblies from the reactor vessel."

This certification will be deemed to have already been submitted for licensees whose licenses were permanently modified before the effective date of the 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 as a result of 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."

The NRC staff expects to receive the certification to permanently cease operations before the certification of permanent fuel removal, although it would also be acceptable to the NRC staff to receive a combined certification, for instance, if the core had been offloaded before the licensee decided to permanently cease operations. According to 10 CFR 50.82(a)(2), upon docketing of both the certifications for permanent cessation of operations and permanent removal of fuel from the reactor vessel, or when a legally effective order to permanently cease operations has come into effect, the 10 CFR Part 50 license no longer authorizes the operation of the reactor or placement of fuel into the reactor vessel.

4. Post-Shutdown Decommissioning Activities Report

Before or within 2 years after permanent cessation of operations, 10 CFR 50.82(a)(4)(i) requires the licensee to submit a PSDAR to the NRC and to send a copy to the affected States. The affected States should include those within 8 kilometers (5 miles) of the facility. The purpose of notifying the affected States is to give them the opportunity to be actively involved in the decommissioning process.

To meet the requirements of 10 CFR 50.82(a)(4)(i), licensees may submit the PSDAR before cessation of operations or at the declaration of cessation of operations. Submitting the PSDAR before cessation of operations would minimize any delay in major decommissioning activities caused by the 90-day waiting period specified in 10 CFR 50.82(a)(5) and discussed in Issue 6 of 61 FR 39278. For example, a licensee chooses to provide a PSDAR to the NRC and the affected States 1 year before the permanent cessation of operations. The NRC staff would docket the PSDAR and hold a public meeting. Because the 90-day period would have elapsed, the licensee could begin major decommissioning activities immediately after reactor shutdown and defueling, provided that it had submitted the certifications required by 10 CFR 50.82(a)(1)(i) and (ii) to the NRC.

For a multireactor site, the PSDAR can address the activities for all the reactors at the site if the decommissioning of each is to be part of the same project.

According to 10 CFR 50.82(a)(4)(i), the PSDAR will include a description of the planned decommissioning activities, a schedule for the completion of these activities, an estimate of expected costs, and a discussion of the reasons for concluding that the environmental impacts associated with the site-specific decommissioning activities will be bounded by appropriate, previously issued EISs. These

could include site-specific environmental assessments or EISs and the GEIS (Ref. 1). Licensees that did not perform an environmental review for initial licensing, or that do not have a final EIS issued by the NRC, and do not have an adequate environmental assessment, may need to submit an environmental report for their decommissioning activities before major decommissioning activities may occur.

Regulatory Guide 1.185 (Ref. 5) provides guidance on the contents of the PSDAR, with examples of appropriate levels of detail for the document, including the bases for the estimation of the expected cost. Any background information or analyses required for the discussion of environmental impacts should be documented and made available for onsite inspection by the NRC. A licensee will not be allowed to proceed with major decommissioning activities if there is an environmental impact that is not bounded by a previously issued environmental assessment or impact statement (i.e., if the environmental consequences of a particular decommissioning activity are expected to be greater than the consequences predicted in previously issued environmental assessments). The licensee would be required to submit an update to the environmental report to provide an assessment of the environmental impacts of the particular decommissioning activity. The NRC staff would review the environmental report and prepare an environmental assessment or EIS of the action.

The NRC will determine whether the licensee's PSDAR contains the information required by the regulation. Although NRC review and approval of the PSDAR are not required, if the NRC determines that the information provided by the licensee in the PSDAR does not comply with the requirements in 10 CFR 50.82(a)(4)(i), the NRC will inform the licensee in writing of the additional information required by the regulations before the NRC staff holds the PSDAR public meeting and major decommissioning activities begin. If the NRC does not notify the licensee of any deficiencies in the PSDAR, the licensee may initiate major decommissioning activities 90 days after the NRC receives the PSDAR and after certification of permanent cessation of operations and permanent removal of fuel from the reactor vessel.

Several factors could cause the NRC to determine that the PSDAR is deficient. These factors are directly related to the topics to be included in the contents of the PSDAR, as discussed above. Four examples follow:

(1) The NRC could find that the PSDAR is deficient if the licensee's plan for decommissioning **could not be completed as described** (e.g., if the plan called for an immediate decontamination and dismantlement of the facility and there were no waste disposal facilities available for the facility to use).

(2) The NRC could find that the PSDAR is deficient if the schedule included a decommissioning process that **could not be completed within 60 years** of the permanent cessation of operations (as required by 10 CFR 50.82(a)(3)) unless the licensee demonstrated that this action is necessary to protect public health and safety. The NRC would approve such actions on a case-by-case basis. Factors that should be considered for an extended decommissioning process include the unavailability of low-level waste disposal capacity and other site-specific factors affecting the licensee's capability to carry out decommissioning in the given time period, including the presence of other operating nuclear facilities at the site.

(3) The NRC could find that the PSDAR is deficient if the licensee's decommissioning plan, as presented in the PSDAR, included a decommissioning process that obviously **could not be completed for the estimated cost** (the NRC staff would base this decision on the generic guidelines and on previous facility decommissioning costs) or if the estimated cost is below the guidelines given in 10 CFR 50.75(c).

(4) The NRC would also find that a PSDAR is deficient if it included activities that would **endanger the health and safety of the public** by being outside the NRC's health and safety regulations or would **result in a major detrimental impact to the environment** that is not bounded by the current EISs.

5. Public Meeting

The NRC will place a notice of receipt of the PSDAR in the *Federal Register* and make the PSDAR available for public comment on the agency Web site, http://www.nrc.gov, through the NRC Library, and in the Public Document Room. The NRC will also schedule a public meeting in the vicinity of the licensee's facility, pursuant to the requirements in 10 CFR 50.82(a)(4)(ii). 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 meeting will be held at least 30 days before the 90-day period ends. The NRC will publish 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, as well as a brief description of the purpose of the meeting.

The public meeting will be informational and is expected to be chaired by a local official. During the public meeting, the licensee will be invited to present its plans for decommissioning. NRC staff will discuss the regulatory process for decommissioning the facility. A representative from each affected State will be offered the opportunity to discuss any State regulations or oversight roles. Other representatives from the affected States, local officials, and the general public will be invited to comment on the licensee's PSDAR. Comments received by the NRC staff on the PSDAR will be addressed at the public meeting, and a question and answer period will follow the presentations. A written transcript of the meeting will be prepared and made available to the public through the Electronic Reading Room and in the Public Document Room.

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). 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 environment is protected. After 90 days, the licensee may proceed with major decommissioning activities allowed under 10 CFR 50.82 unless the NRC formally notifies the licensee of any deficiency in the PSDAR within the initial 90-day period.

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

7. Major Decommissioning Activities

As long as fuel remains in the reactor core, facility modifications pursuant to 10 CFR 50.59 must be consistent with continued facility operation. Once the licensee certifies that the facility has permanently ceased operation and the fuel has been permanently removed from the reactor vessel, and the 90-day period has passed, decontamination and dismantlement under the provisions of 10 CFR 50.59 and

10 CFR 50.82 may commence. In addition, as stated in 10 CFR 50.82(a)(6), licensees of permanently shutdown reactors may not perform any decommissioning activities that would foreclose the release of the site for possible unrestricted use, would result in significant environmental impacts that have not previously been reviewed, or would result in there no longer being reasonable assurance that adequate funding is available for decommissioning.

8. Technical Regulations

The July 1996 regulation explicitly extends requirements for specific parts 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 are no longer applicable and which should remain in force. The licensee will make the appropriate submittals to request changes to the technical specifications as required by the regulations.

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 requiring that operating procedures be established and followed for the control of effluents as given in 10 CFR 50.34a(c) and would maintain and use the radioactive waste system pursuant to 10 CFR 50.34a(a). 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 to unrestricted areas in liquid and gaseous effluents during the previous 12 months. The report must include any other information that the NRC may require to estimate 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, the report must specifically address the reasons for this variation. The NRC will use these reports, along with additional information, to require the licensee to take actions the NRC deems appropriate. 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, which provides numerical guidance for meeting the requirements for radioactive materials in effluents released to unrestricted areas.

Additional requirements for the licensee during the period of major decommissioning activities include those described below.

8.1 The Maintenance Rule

The maintenance rule, 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," requires monitoring the performance or condition of certain SSCs that could affect safety. For licensees that have submitted the certifications for cessation of operation and for permanent fuel removal specified in 10 CFR 50.82(a)(1), this section applies only to the extent the

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

8.2 Keep the Final Safety Analysis Report Current

The FSAR, or other comparable document, provides a licensing-basis document for the evaluation of licensee activities under 10 CFR 50.59. This licensing basis will have to be updated to cover decommissioning activities. According to 10 CFR 50.71(e)(4), subsequent revisions updating the licensing basis must be filed with the NRC at least every 24 months by nuclear power facilities that have submitted certifications for permanently ceasing operations and for permanent removal of fuel.

Specific sections of the FSAR that the licensee should continue to update periodically include those described below.

8.2.1 Facility Description

The facility status will be described at the time the facility is shut down, before any decommissioning or dismantlement activities occur. Only the descriptions of those facility SSCs that are included in the technical specifications or that directly affect the safe storage of irradiated fuel should be updated in detail. 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, there is an overall safety benefit to documenting the status or design function of these SSCs while the plant is in a decommissioning phase. 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, it is entirely possible that by operating the wrong valve, or by system fault or breakage, or misalignment of interfaces to this system, accidents such as flooding, personnel injury, or flushing of potentially radioactive material into an uncontaminated location could result. As a minimum, the FSAR should be maintained at a level of detail 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 the dismantlement process.

8.2.2 Licensee Organization

The FSAR or comparable document should include a description of 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.

8.2.3 Radioactive Waste Management

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

8.2.4 Radiation Protection

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

8.2.5 Conduct of Operations

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

8.2.6 Site Characteristics

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

8.2.7 Accident Analysis

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

8.3 Fire Protection Requirements

The fire protection regulations in 10 CFR 50.48(f) require licensees that have certified the permanent cessation of operations and the 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.

Regulatory Guide 1.191, "Fire Protection Program for Nuclear Power Plants During Decommissioning and Permanent Shutdown," issued May 2001 (Ref. 11), presents additional guidance.

8.4 Actions by Certified Fuel Handlers

For nuclear power reactor licensees that have certified that they have ceased operations and permanently removed the fuel from the reactor vessel, and upon the NRC's review and approval of a licensee's certified fuel handler training program, 10 CFR 50.54(y) states that either a certified fuel handler or a licensed senior operator may, in an emergency, take reasonable actions that may depart from a license condition or technical specification.

9. Eliminated Regulatory Requirements

From the time the certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel are docketed by the NRC, the 10 CFR Part 50 license no longer authorizes the operation of the reactor or emplacement of the fuel into the reactor vessel (10 CFR 50.82(a)(2)). This nonoperating status also provides the basis for removing regulatory requirements that are no longer

necessary to protect public health and safety at the facility. Regulatory requirements that would no longer be applicable include the following:

(1) combustible gas control requirements (10 CFR 50.44, "Combustible Gas Control for Nuclear Power Reactors");
(2) emergency core cooling systems acceptance criteria (10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors"; Appendix K, "ECCS Evaluation Models," to 10 CFR Part 50);
(3) environmental qualification of electrical equipment (10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants");
(4) containment leakage testing (10 CFR 50.54(o); Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," to 10 CFR Part 50);
(5) fracture prevention measures (10 CFR 50.60, "Acceptance Criteria for Fracture Prevention Measures for Lightwater Nuclear Power Reactors for Normal Operation"; Appendix G, "Fracture Toughness Requirements," and Appendix H, "Reactor Vessel Material Surveillance Program Requirements," to 10 CFR Part 50);
(6) fracture toughness requirements for protection against pressurized thermal shock events (10 CFR 50.61, "Fracture Toughness Requirements for Protection against Pressurized Thermal Shock Events");
(7) anticipated transient without scram requirements (10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants"); and
(8) requirements for thermal annealing of the reactor pressure vessel (10 CFR 50.66, "Requirements for Thermal Annealing of the Reactor Pressure Vessel").

Notifying the NRC of the termination of these programs is not required.

10. Changes to the PSDAR

Following submission of the PSDAR, and after the 90-day waiting period, the licensee may begin major decommissioning activities, provided that the actions comply with the requirements in 10 CFR 50.82(a)(5) and (6), as discussed in Issue 7 of the final rule (61 FR 39278). However, before performance of any decommissioning activity that is not consistent with or could be considered to be a change from the actions or schedules described in the PSDAR, 10 CFR 50.82(a)(7) requires the licensee to notify the NRC in writing and send a copy to the affected States. The NRC staff will use the PSDAR, and any written notification of changes required of a licensee, to schedule inspections and provide regulatory oversight of decommissioning activities. Licensees must also notify the NRC of changes that would significantly increase the decommissioning costs and send a copy of this notification to the affected States.

Changes to the PSDAR should be handled as follows. The licensee is required to provide written notification to the NRC for changes in major milestones, scheduling, resources, or environmental impacts not bounded by EISs or assessments, or by the GEIS on decommissioning (NUREG-0586, Ref. 1), or by the "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities" (NUREG-1496), Ref. 12). The NRC staff will use the licensee's milestones to schedule NRC inspections of licensee activities, as necessary, to provide assurance that decommissioning is conducted safely and in accordance with regulatory requirements. Examples of changes in activities and schedule include, but are not limited to, changing from long-term storage to active dismantlement, changing the method used to remove the reactor vessel or steam generators from cutting and segmenting to intact removal, and changing the schedule to affect major

milestones of any duration. Examples of significant increases in cost associated with decommissioning the facility would include a new estimated cost greater than 20 percent above the site-specific total cost estimate or the PSDAR cost estimate, or a 25-percent increase in cost above any milestone estimate. A significant increase in cost requires written notification to the NRC. Environmental impacts requiring written notification to the NRC would include any environmental impact outside the scope of the final environmental statement for the facility (as supplemented), any site-specific environmental assessments, or the GEISs on decommissioning or radiological criteria for license termination.

If the licensee's PSDAR was formerly an NRC-approved decommissioning plan and does not address dismantlement in sufficient detail (addresses only long-term storage of the facility), the licensee should submit an update before initiating major decommissioning activities.

Written notifications to the NRC made under 10 CFR 50.82(a)(7) do not require the 90-day waiting period before initiation of activities. The staff would not normally require a public meeting to discuss the proposed changes.

11. Use of Funds

For a power reactor facility that is not prematurely shut down and is nearing the expiration of its license, 10 CFR 50.75(f)(2) requires that, at or about 5 years before the projected end of operations, licensees submit a preliminary decommissioning cost estimate that includes an up-to-date assessment of the major factors that could affect the cost to decommission. For prematurely shutdown facilities, 10 CFR 50.82(a)(8)(iii)) requires licensees to submit a site-specific decommissioning cost estimate within 2 years after permanent cessation of operations if such an estimate has not previously been submitted.

The use of decommissioning trust funds is specified in 10 CFR 50.82(a)(8). Funding for spent fuel maintenance and storage required by 10 CFR 50.54(bb) may be commingled in the same trust fund that is used for decommissioning, but the licensee must be able to identify and track the amount in the trust fund applicable for decommissioning activities and the amounts set aside for spent fuel management and other uses. This is because funds collected and set aside in the decommissioning trust for decommissioning are exclusively for decommissioning activities as currently defined in 10 CFR 50.2. The amounts of the decommissioning trust funds that the licensee can use are limited during the initial phase of decommissioning—prior to the PSDAR—to provide reasonable assurance that adequate funding will remain to fully decommission the facility. The expenditures should not reduce the value of the decommissioning trust fund to below the amount necessary to place and maintain the reactor in safe storage. Because interest on the fund can be used to meet the required value of the trust fund, withdrawals from the trust fund should not adversely affect the licensee's ability to fully fund the decommissioning trust. Funds must be available to ultimately release the site and terminate the license.

The licensee is allowed by 10 CFR 50.82(a)(8)(ii) to use 3 percent of the generic amount of the decommissioning funds specified in 10 CFR 50.75 for decommissioning planning, including that which occurs while a facility is still operating. Appropriate activities for the use of the initial 3 percent of the decommissioning funds include engineering designs, work package preparation, and licensing activities. Activities that would not be appropriate uses for these planning funds include decontamination, draining of systems, removal of filters, and projects designed to demonstrate the feasibility of a particular decommissioning activity. Likewise, 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), and 90 days after the NRC has received the PSDAR, 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 generic decommissioning funds until it submits a site-specific decommissioning cost estimate to the NRC. This estimate must be submitted within 2 years following permanent cessation of operations (10 CFR 50.82(a)(8)(iii)). Site-specific cost estimates should include an outline of the expected costs for activities specified in the PSDAR. As an example of the appropriate level of detail, the licensee would be expected to include costs for radiological decommissioning (planning, large-component removal, decontamination activities, low-level radioactive waste disposal, final radiological survey, and decommissioning finance costs).

Licensees may provide site-specific cost estimates sooner than 2 years after permanent cessation of operations. For facilities that submitted a preliminary cost estimate about 5 years before the projected end of operations, the licensee could expand and update the preliminary cost estimate and submit it as the site-specific cost estimate. The site-specific cost estimate could also be submitted with the PSDAR. If submitted with the PSDAR, it should be appropriately identified as a site-specific cost estimate. This approach would eliminate the 23-percent hold point for spending the decommissioning funds. Licensees that plan to begin major decommissioning activities shortly after permanent cessation of operations should consider an early submission of the site-specific cost estimates 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)). Additional guidance for decommissioning cost estimates is in NUREG-1713 (Ref. 13), "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors." This guidance specifies the level of detail required for the financial plan to adjust cost estimates and associated funding levels.

D. IMPLEMENTATION

The purpose of this section is to provide information on how applicants and licensees[1] 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 the Backfit Rule (10 CFR 50.109) and any applicable finality provisions in 10 CFR Part 52.

Use by Applicants and Licensees

Applicants and licensees may voluntarily[2] 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**.**

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[1] 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.

[2] 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.

Licensees may use the information in this regulatory guide for actions which 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

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 requirement. 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 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.

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.

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

Conclusion

This regulatory guide is not being imposed upon current licensees and may be voluntarily used by existing licensees. In addition, this regulatory guide is issued in conformance with all applicable internal NRC policies and procedures governing backfitting. Accordingly, the NRC staff issuance of this regulatory guide is not considered backfitting, as defined in 10 CFR 50.109(a)(1), nor is it deemed to be in conflict with any of the issue finality provisions in 10 CFR Part 52.

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 this Implementation section, then the licensee may file a backfit appeal with the NRC in accordance with the guidance in NUREG-1409 and NRC Management Directive 8.4.

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[3] Publicly available NRC published documents are available electronically through the NRC Library on the NRC's public Web site at: http://www.nrc.gov/reading-rm/doc-collections/. The documents can also be viewed on-line or printed for a fee in the NRC's Public Document Room (PDR) at 11555 Rockville Pike, Rockville, MD; the mailing address is USNRC PDR, Washington, DC 20555; telephone (301) 415-4737 or (800) 397-4209; fax (301) 415-3548; and e-mail pdr.resource@nrc.gov.

10. U. S. Nuclear Regulatory Commission, "Revised Analyses of Decommissioning for the Reference Boiling Water Reactor Power Station," NUREG/CR-6174, Prepared for the U.S. Nuclear Regulatory Commission by R.I. Smith et al., Pacific Northwest National Laboratory, Richland, WA, July 1996, Legacy Library Accession No. 9608210240.

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13. U. S. Nuclear Regulatory Commission, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors," NUREG-1713, Washington, DC, December 2004, ADAMS Accession No.ML043510113.