



REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 1.184

(Draft was DG-1067)

DECOMMISSIONING OF NUCLEAR POWER REACTORS

A. INTRODUCTION

Decommissioning means permanently removing a nuclear facility from service and reducing radioactive material on the licensed site to levels that would permit termination of the NRC license. On June 27, 1988, the NRC issued general requirements on 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 10 CFR 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"; Part 50, "Domestic Licensing of Production and Utilization Facilities"; and Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." This rule clarified the regulations for decommissioning nuclear power facilities. The rule reflects the experience and knowledge gained during actual facility decommissionings, industry- and government-sponsored workshops, and conferences on decommissioning. The rule clarifies ambiguities in the previous regulations, reduces unnecessary requirements, provides additional flexibility, and codifies procedures and terminology that have been used on a case-by-case basis. In addition, the rule increases the opportunities for the public to become informed about a licensee's decommissioning activities. The 1996 rule is designed to establish a level of NRC oversight commensurate with the level of NRC-regulated activities expected during decommissioning.

The 1996 rule extends the use of 10 CFR 50.59, "Changes, Tests, and Experiments," to allow licensees to make changes to facilities undergoing decommissioning using the process described in 10 CFR 50.59. Prior to the rule of July 29, 1996, decommissioning activities were authorized only if they

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This guide was issued after consideration of comments received from the public. Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. Written comments may be submitted to the Rules and Directives Branch, ADM, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Regulatory guides are issued in ten broad divisions: 1, Power Reactors; 2, Research and Test Reactors; 3, Fuels and Materials Facilities; 4, Environmental and Siting; 5, Materials and Plant Protection; 6, Products; 7, Transportation; 8, Occupational Health; 9, Antitrust and Financial Review; and 10, General.

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were consistent with an NRC-approved decommissioning plan. Significant deviations from the decommissioning plan required prior approval from the NRC staff.

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 the licensee undertakes to terminate the license. The amendments to 10 CFR Parts 2 and 51 in the rule pertain to this third phase of decommissioning.

The “Final Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities,” NUREG-0586 (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 short summary of the three methods follows.

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.

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.

ENTOMB: ENTOMB involves encasing radioactive structures, systems, and components 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 of 10 CFR Part 20 related to unrestricted or restricted use still apply.

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 will not contain guidance on the license termination process. Guidance on the requirements in 10 CFR 50.82(a)(9), on the license termination plan, is provided in Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Ref. 3), and related information was published for public comment in December 1998 in a Draft Standard Review Plan, Draft NUREG-1700 (Ref. 4). 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 and High-Level Radioactive Waste." This regulatory guide does not address the shipment or disposal of low-level, high-level, or greater-than-Class-C waste, which are covered in 10 CFR Part 71 (shipment) and 10 CFR Parts 60 and 61 (disposal).

This regulatory guide applies only to power reactor licensees. The regulations for non-power reactor licensees are given in 10 CFR 50.82(b). The NRC staff discusses the procedures for decommissioning non-power reactors in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors" (Ref. 2), which will be updated to reflect the changes in the regulation in a future revision.

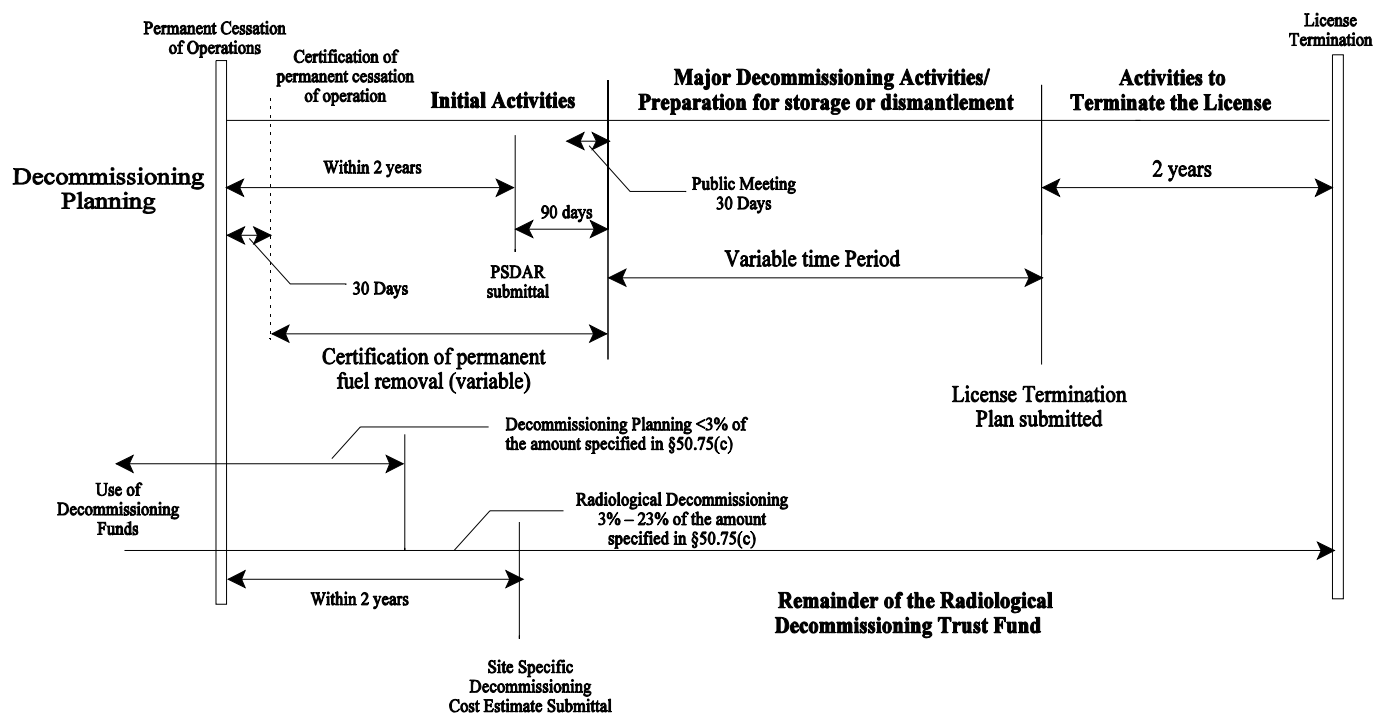
The information collections referenced in this regulatory guide are covered by the requirements of 10 CFR Parts 50 and 51, which were approved by the Office of Management and Budget, approval numbers 3150-0011 and 3150-0021. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

B. DISCUSSION

Reactors that are permanently shut down and have no fuel in the reactor vessel present a significantly different risk to public health and safety. 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 safety.

Figure 1

DECOMMISSIONING TIMELINE



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.

In accordance with 10 CFR 50.82(a)(1)(i), a licensee who has determined 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 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, and a certification of this event has been received and docketed by the NRC (see 10 CFR 50.4(b)(9) and 10 CFR 50.82(a)(1)(ii)), the 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. Completion of decommissioning beyond 60 years will be approved by the NRC only when necessary to protect public health and safety. The "Final Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities," NUREG-0586 (Ref. 1), describes alternative methods for decommissioning (DECON, SAFSTOR, and ENTOMB) and the environmental impacts associated with 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. 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), prior to or within 2 years following permanent cessation of operations, the licensee is required to submit a post-shutdown decommissioning activities report (PSDAR). The PSDAR would be prepared in accordance with the guidelines provided in the 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, 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 regarding the activities and must submit a supplement to the environmental report relating to the additional impacts. See 10 CFR 50.82(a)(6)(ii) and 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 prior to 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 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. The NRC staff will, during 50.59 inspections, 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 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 prior to the expected termination of the license as scheduled in the PSDAR. Regulatory guidance on the license termination process was developed and issued in January 1999 as Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Ref. 3), and further information is being developed in a draft Standard Review Plan, Draft NUREG-1700, which was published for comment in December 1998 (Ref. 4).

Part 50 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 prior to 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 1999 changes the licensee's ability to access the trust funds set aside for radiological decommissioning required by 10 CFR 50.75. The licensee's ability to use these funds is dependent on reaching certain milestones in the decommissioning process. This limitation on the accessibility of the decommissioning funds is designed to ensure there are always sufficient trust funds 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 prior to submitting a site-specific decommissioning cost estimate. Included in this 23 percent is an initial 3 percent that can be used by the licensee, even prior to permanent cessation of operation, for planning the decommissioning. The remaining 20 percent may be used 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. Section 50.82 requires the licensee to submit the site-specific cost estimate no later than 2 years after permanent cessation of operation.

Information in NUREG/CR-0672, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station" (including Addenda 1 through 4) (Ref. 6); NUREG/CR-0130, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station" (including Addenda 1 through 4) (Ref. 7); NUREG/CR-5884, "Revised Analysis of Decommissioning for the Reference Pressurized Water Reactor Power Station" (Ref. 8); and NUREG/CR-6174, "Revised Analysis of Decommissioning for the Reference Boiling Water Reactor Power Station" (Ref. 9), may be helpful in developing the site-specific cost estimate.

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. The staff also recognizes that many licensees have chosen to accumulate funding for spent fuel maintenance and storage (as required by 10 CFR 50.54(bb)) as part of the decommissioning trust fund. However, 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, or for the design or construction of spent fuel dry storage facilities, or for other activities not directly related to the long-term storage, radiological decontamination or dismantlement of the facility, or decontamination of the site.

C. REGULATORY POSITION

1. APPLICABILITY

This regulatory guide applies to all power reactor licensees, including those who have submitted a decommissioning plan for approval or who possess an NRC-approved decommissioning plan on the effective date of the amendment, 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 determined 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 determination 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 period of 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 an order is issued by the NRC 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 have permanently ceased, or will permanently cease, and 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.

Receipt by the NRC of the certification of permanent cessation of operation will be viewed as a commitment by the licensee to cease operations on that date. Following submission of the certification of permanent cessation of operations, or at any time during the decommissioning process, if the licensee desires to again operate the facility, the licensee must notify the NRC of its intentions in writing. Approval to return the facility to operation would be handled on a case-by-case basis, and the approval would depend on the facility status at the time of the request to re-authorize 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 given in 10 CFR 50.4(b)(9), stating the date 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 Part 50 licensee, or placed in the facility's spent fuel pool, or stored in an independent spent fuel storage installation (ISFSI). 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 only be submitted 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 duration between the decision to permanently cease operations and the certification of permanent fuel removal. However, until the certification of permanent fuel removal has been received by the NRC, the licensee will 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 non-operational status of the facility or for a reduction in the fees required by 10 CFR 171.15.

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 off-loaded before the decision was made 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

Prior to or within 2 years after permanent cessation of operations, the licensee is required by 10 CFR 50.82(a)(4)(i) to submit a Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC and to send a copy to the affected States. It is suggested the affected States should include those within 8 kilometers [5 miles] of the facility. The purpose of notifying the affected States is to actively involve the States in the decommissioning process if they choose to participate.

The PSDAR may be submitted before cessation of operations or at the declaration of cessation of operations. Submission of the PSDAR before cessation of operations would minimize any delay in major decommissioning activities caused by a 90-day waiting period specified in 10 CFR 50.82(a)(5) and discussed in Issue 6 of 61 FR 39278. For example, if a licensee chose to provide a PSDAR to the NRC and the affected States 1 year prior to the permanent cessation of operations, the NRC staff docketed the PSDAR and held a public meeting, and the 90-day period elapsed, major decommissioning activities could begin immediately after reactor shutdown and defueling provided the certifications required by 10 CFR 50.82(a)(1)(i) and 10 CFR 50.82(a)(1)(ii) had been submitted to the NRC.

For a multi-reactor site, the PSDAR could address the activities for all the reactors at the site if decommissioning of each will be undertaken at the same time.

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 that provides the reasons for concluding that the environmental impacts associated with the site-specific decommissioning activities will be bounded by appropriate, previously issued environmental impact statements. These could include site-specific environmental assessments or environmental impact statements and the “Final Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities,” NUREG-0586 (Ref. 1). Licensees who did not perform an environmental review for initial licensing, or who do not have a Final Environmental Impact Statement 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, “Standard Format and Content for Post-shutdown Decommissioning Activities Report” (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, that is, 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 Environmental Impact Statement (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 is 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 are begun. If the NRC does not notify the licensee of any deficiencies to 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.

A number of factors could cause the NRC to find the PSDAR deficient. These factors are directly related to the topics to be included in the contents of the PSDAR, as discussed above. The NRC could find the PSDAR deficient if the licensee's plan for decommissioning could not be completed as described (for example, 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). The NRC could find the PSDAR 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 it were shown that this action is necessary to protect public health and safety; if so, approval would be made 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. The NRC could find the PSDAR 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 will 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). The NRC would also find a PSDAR 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 environmental impact statements.

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 their web site, <WWW.NRC.GOV>, through the Electronic Reading Room, 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. A notice of this public meeting will be published by the NRC

in the *Federal Register* and in a place or places readily available to individuals in the vicinity of the site, such as a local newspaper. The notice will provide 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 to be followed 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 ACTIVITIES

The licensee may not perform any major decommissioning activities, as defined in 10 CFR 50.2, until 90 days after the date 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 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. Technical specifications (as discussed in 10 CFR 50.36) will be developed on a case-by-case basis. 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 on effluent releases will be required as specified in 10 CFR 50.36a. In addition to technical specifications that require compliance with the applicable provisions of 10 CFR 20.1301, technical specifications would be developed that would require that operating procedures for the control of effluents be established and followed as given in 10 CFR 50.34a(c) and that the radioactive waste system, pursuant to 10 CFR 50.34a(a), be maintained and used. The licensee is required by 10 CFR 50.36a(a)(1) to retain these operating procedures as a record until the NRC terminates the license. The licensee is required to keep all superseded revisions to the procedures for 3 years from the date they were superseded.

Licensees will still be required by 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, including any other information that may be required by the NRC to estimate maximum potential annual radiation doses to the public resulting from effluent releases. The time between submission of the reports must be no longer than 12 months. If quantities of radioactive materials released during the reporting period are significantly above 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 set out 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.

Other requirements for the licensee during the period of major decommissioning activities include the following:

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 structures, systems, or components (SSCs). For licensees who 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 and in a manner sufficient to provide reasonable assurance that such SSCs are capable of fulfilling their intended functions (see 10 CFR 50.65(a)(1)).

8.2 Maintenance of the Final Safety Analysis Report

The Final Safety Analysis Report (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 should continue to be updated periodically include the following.

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 as systems are decontaminated, inactivated, moth-balled 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 document 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, such accidents 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 status of all the operating licensing-basis SSCs until the systems are no longer mechanically or electrically active, 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. The structure, functions, and responsibilities of the onsite organization established to decommission the facility should be described.

8.2.3 Radioactive Waste Management

The scope remains the same as the current FSAR requirements.

8.2.4 Radiation Protection

The scope remains the same as the current FSAR requirements.

8.2.5 Conduct of Operations

The scope remains the same as the current FSAR requirements.

8.2.6 Site Characteristics

Any sections of the FSAR that could affect the safe storage of fuel or could directly affect the design basis of the facility should be updated.

8.2.7 Accident Analysis

Any new or different design-basis accidents identified during a 10 CFR 50.59 evaluation of a planned change should be evaluated and included if appropriate (for example, consideration of accidents involving a newly installed gas pipeline). 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 ISFSI would be significantly changed and the FSAR should reflect this).

8.3 Fire Protection Requirements

The fire protection requirements of 10 CFR 50.48(f) have been revised to require licensees who 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 cause the release or spread of radioactive materials, which could result in a radiological hazard. The current regulations do not contain requirements for decommissioning plants to ensure the safe shutdown of the facility.

The fire protection regulation, 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. However, 10 CFR 50.48(f)(3) also permits the licensee 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. 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.

Additional regulatory guidance is being developed and was issued for public comment in Draft Regulatory Guide DG-1069, "Fire Protection Program for Nuclear Power Plants During Decommissioning and Permanent Shutdown," which was published in July 1998 (Ref. 10).

8.4 Actions by Certified Fuel Handlers

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

9. ELIMINATED REGULATORY REQUIREMENTS

From the time the certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel are submitted to the NRC, the 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.

- Combustible gas control requirements (10 CFR 50.44)
- Emergency core cooling systems acceptance criteria (10 CFR 50.46, Appendix K to 10 CFR Part 50)
- Environmental qualification of electrical equipment (10 CFR 50.49)
- Containment leakage testing (10 CFR 50.54(o), Appendix J to 10 CFR Part 50)
- Fracture prevention measures (10 CFR 50.60, Appendix G and H to 10 CFR Part 50)
- Fracture toughness requirements for protection against pressurized thermal shock events (10 CFR 50.61)
- Anticipated transient without scram (ATWS) requirements (10 CFR 50.62)

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 the actions comply with the requirements in 10 CFR 50.82(a)(5) and (6) as discussed in Issue 7 of 61 FR 39278. However, 10 CFR 50.82(a)(7) requires the licensee to notify the NRC, in writing with a copy sent to the affected States, before performing 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. The PSDAR and any written notification of changes required of a licensee will be used by the NRC staff to schedule inspections and provide regulatory oversight of decommissioning activities. Changes that would significantly increase the decommissioning costs would also require notification of the NRC with a copy sent to the affected States.

Changes to the PSDAR should be handled as follows. Changes in major milestones, scheduling, resources, or environmental impacts not bounded by environmental impact statements or assessments, or by the GEIS on decommissioning (NUREG-0586) (Ref. 1), or the GEIS in “Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities” (NUREG-1496) (Ref. 11), require written notification to the NRC. The licensee’s milestone schedule will be used by the NRC staff to schedule NRC inspections of licensee activities, as necessary, to provide assurance that decommissioning is being 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 cost estimate or the PSDAR cost estimate, or a 25-percent increase in cost above a milestone estimate. The significant increase in cost would require 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 (only addresses 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 prior to 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 the license, a licensee must submit, at or about 5 years prior to the projected end of operations, a preliminary decommissioning cost estimate that includes an up-to-date assessment of the major factors that could affect the cost to decommission (10 CFR 50.75(f)(2)). For prematurely shutdown facilities, the cost estimate required by the PSDAR can either be a site-specific cost estimate or a cost estimate that relies on generic industry estimates. Licensees must submit a site-specific decommissioning cost estimate within 2 years after permanent cessation of operations if such an estimate has not previously been submitted (10 CFR 50.82(a)(8)(iii)).

The use of decommissioning trust funds is covered in 10 CFR 50.82(a)(8). Although many licensees have chosen to accumulate funding for spent fuel maintenance and storage (as required by 10 CFR 50.54(bb)) as part of the same trust fund that is used for decommissioning, the references in this regulatory guide to the "decommissioning trust fund" include only those amounts set aside for radiological decommissioning as required by 10 CFR 50.75. The amounts of the decommissioning trust funds that can be used by the licensee are controlled during the initial phase of decommissioning in order to provide reasonable assurance that adequate funding will remain to decommission the facility. Expenditures from the decommissioning trust fund are allowed for decommissioning as currently defined in 10 CFR 50.2. 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. The 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, in 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 decommissioning planning that occurs even while a facility is still operating. Expenditures made or committed prior to the effective date of the rule (August 28, 1996) are excluded from the percent limitation. 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 considered appropriate uses for these planning funds include decontamination, draining of systems, removal of filters, projects designed to demonstrate the feasibility of a particular decommissioning activity, or the decontamination of a building that is no longer required and would ultimately have to be decontaminated before license termination.

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 be allowed to adversely affect the licensee's ability to fully fund the decommissioning trust; the availability of funds to ultimately release the site and terminate the license must be ensured.

The licensee is prohibited from using the remaining 77 percent of the generic decommissioning funds until a site-specific decommissioning cost estimate is submitted 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).

Site-specific cost estimates may be provided 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 holdpoint for spending the decommissioning funds. Licensees who 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 is being developed for decommissioning cost estimates. This guidance will specify 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 to licensees regarding the NRC staff's plans for using this regulatory guide.

Except in those cases in which a licensee proposes an acceptable alternative method for complying with the specified portions of the NRC's regulations, the methods described in this regulatory guide that reflects public comments will be used by the NRC staff in the evaluation of decommissioning activities before the licensee submits its license termination plan.

REFERENCES

1. USNRC, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, August 1988.
2. USNRC, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," NUREG-1537, February 1996.
3. USNRC, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," Regulatory Guide 1.179, January 1999.
4. USNRC, "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans," Draft for Comment. Draft NUREG-1700, December 1998.
5. USNRC, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report," Regulatory Guide 1.185, July 2000.
6. H.D. Oak et al., "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672 (Prepared for the U.S. NRC by Pacific Northwest Laboratory, Richland, Washington), June 1980 (Addendum 1, July 1983; Addendum 2, September 1984; Addendum 3, July 1988; Addendum 4, December 1990).
7. R.I. Smith, G.J. Konzek, and W.E. Kennedy, Jr., "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130 (Prepared for the U.S. NRC by Pacific Northwest Laboratory, Richland, Washington), June 1978 (Addendum 1, July 1979; Addendum 2, July 1983; Addendum 3, September 1984; Addendum 4, July 1988).
8. G.J. Konzek et al., "Revised Analysis of Decommissioning for the Reference Pressurized Water Reactor Power Station," NUREG/CR-5884 (Prepared for the U.S. NRC by Pacific Northwest Laboratory, Richland, Washington), November 1995.

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9. R.I. Smith et al., "Revised Analyses of Decommissioning for the Reference Boiling Water Reactor Power Station," NUREG/CR-6174 (Prepared for the U.S. NRC by Pacific Northwest National Laboratory, Richland, Washington), July 1996.
10. USNRC, "Fire Protection Program for Nuclear Power Plants During Decommissioning and Permanent Shutdown," Draft Regulatory Guide DG-1069, July 1998.
11. USNRC, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," NUREG-1496, Volume 1, July 1997.

REGULATORY ANALYSIS

A separate regulatory analysis was not prepared for this regulatory guide. The regulatory analysis prepared for the amendments to Parts 2, 50, and 51, "Decommissioning of Nuclear Power Reactors," which was issued on July 29, 1996 (61 FR 39278), provides the regulatory basis for this guide and examines the costs and benefits of the rule as implemented by the guide. A copy of this regulatory analysis is available for inspection or copying for a fee in the NRC Public Document Room, 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202)634-3273; fax (202)634-3343.