

2.0 Background Information Related to Decommissioning Regulations

This section provides background information that will assist the reader in understanding the requirements for decommissioning and license termination. The basis for the current decommissioning regulations and a summary of the current regulations are provided below. This chapter and Chapter 3, "Description of NRC Licensed Reactor Facilities and the Decommissioning Process," will give the reader a basic understanding of the overall reactor decommissioning process and environmental impact assessments used during the process.

2.1 Basis for Current Regulations

In the mid-1990s, the Commission initiated an effort to significantly change the regulations for decommissioning power reactor facilities. The new regulations were intended to make the decommissioning process more current, efficient, and uniform. On July 29, 1996, a final rule revising 10 CFR 50.82, "Decommissioning of Nuclear Power Reactors," was published in the Federal Register (61 FR 39278). This rule redefined the decommissioning process and modified the regulations written in 1988, which had required submittal of a detailed decommissioning plan before the start of decommissioning.

The regulations were revised based on experience gained from reactor decommissionings that had occurred during the 1980s and early 1990s. Review of the activities that occur during decommissioning showed that they are similar to the activities that occur during the construction, operation, maintenance, and refueling outages of a power reactor (e.g., decontamination, steam generator replacement, and pipe removal). However, the magnitude of some activities during decommissioning (e.g., removal of piping) is considerably greater than during operations. Activities associated with the decommissioning of facilities had resulted in impacts consistent with or less than those evaluated in the 1988 *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (GEIS), NUREG-0586 (NRC 1988). Based on the above reasons, the Commission determined that review and approval by the U.S. Nuclear Regulatory Commission (NRC) staff of a detailed decommissioning plan was not necessary.

2.2 Summary of Current Regulations

2.2.1 Regulations for Decommissioning Activities

The current regulations (10 CFR 50.82) specify the regulatory actions that both the NRC and the licensee must take to decommission a nuclear power facility. Once the licensee decides to permanently cease operations, it must submit, within 30 days, a written certification to the NRC.

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1 The notification must contain the date on which the power-generating operations ceased or will
2 cease. The licensee must permanently remove all fuel from the reactor and submit a written
3 certification to the NRC confirming the completion of fuel removal. Once this certification has
4 been submitted, the licensee is no longer permitted to operate the reactor, or to put fuel back
5 into the reactor vessel. After certification that the fuel is removed, the annual license fee to the
6 NRC is reduced as well as the licensee's obligation to adhere to certain requirements that are
7 needed only during reactor operations.

8
9 In addition to the certifications, the licensee must submit a post-shutdown decommissioning
10 activities report (PSDAR) to the NRC and any affected States no later than 2 years after the
11 date of permanent cessation of operations. Section 10 CFR 50.82 requires that the PSDAR
12 include

- 13 • a description of the licensee's planned major decommissioning activities
- 14 • a schedule for completing these activities
- 15 • an estimate of the expected decommissioning costs
- 16 • a discussion that provides the reasons for concluding that the environmental impacts
17 associated with site-specific decommissioning activities will be bounded by an appropriate
18 previously issued environmental impact statement (EIS).

19
20 After receiving a PSDAR, the NRC publishes a notice of receipt in the Federal Register, makes
21 the PSDAR available for public review and comment, and holds a public meeting in the vicinity
22 of the facility to discuss the licensee's plans. The NRC will examine the PSDAR to determine if
23 the required information is included and will inform the licensee in writing if there are deficien-
24 cies that must be addressed before the licensee initiates any major decommissioning activities.
25 The regulations require a 90-day waiting period after submittal of the PSDAR before the
26 licensee may commence major decommissioning activities.

27
28 The purpose of the PSDAR is to provide the NRC and the public with a general overview of the
29 licensee's proposed decommissioning activities. The PSDAR serves to inform the NRC staff of
30 the licensee's expected activities and schedule, which facilitates planning for inspections and
31 decisions regarding NRC oversight activities. The PSDAR is also a mechanism for informing
32 the public of the proposed decommissioning activities before those activities are conducted.

1 Once the PSDAR has been submitted and the 90-day period has been completed, the licensee
2 may begin major decommissioning activities, which may include the following:

- 3
- 4 • permanent removal of major radioactive components, such as the reactor vessel, steam
5 generators, or other components that are comparably radioactive
- 6
- 7 • permanent changes to the containment structure
- 8
- 9 • dismantling of components containing greater than Class C (GTCC) waste.^(a)
- 10

11 In accordance with 10 CFR 50.82(a)(6)(ii), licensees shall not perform any decommissioning
12 activities “that result in significant environmental impacts not previously reviewed.” If any
13 decommissioning activity does not meet this requirement, the licensee must submit a license-
14 amendment request before conducting the activity. The licensee also must submit a
15 supplement to its environmental report (ER) that relates to the additional impacts. The NRC will
16 review this ER and prepare an environmental assessment (EA) or EIS in conjunction with its
17 review.

18
19 The licensee can choose (1) to immediately decontaminate and dismantle the facility (DECON),
20 or (2) to place the facility in long-term storage (SAFSTOR) followed by subsequent
21 decontamination and dismantlement, or (3) to perform some incremental decontamination and
22 dismantlement activities before or during the storage period of SAFSTOR. Under the current
23 regulations, unless the licensee receives permission to the contrary, the site must be
24 decommissioned within 60 years. Chapter 3 describes in more detail the decommissioning
25 options available to the licensee. In this Supplement, the staff also evaluates another option
26 called ENTOMB, which encases the radioactive contaminants in a structurally long-lived
27 material.

(a) The NRC has adopted a waste classification system for low-level radioactive waste based on its potential hazards, and has specified disposal and waste form requirements for each of the general classes of waste: A, B, and C. The classifications are based on the key radionuclides present in the waste and their half-lives. Tables defining these three classes are contained in 10 CFR 61.55. In general, requirements for waste form, stability, and disposal methods become more stringent when going from Class A to Class C. GTCC waste exceeds the concentration limits in 10 CFR 61.55 and is generally unsuitable for near-surface disposal as LLW, even though it is legally defined as LLW. The NRC’s regulations in 10 CFR 61.55(a)(2)(iv) require that this type of waste must be disposed of in a geologic repository unless approved for an alternative disposal method on a case-specific basis by the NRC.

1 **2.2.2 Regulations for License Termination**
2

3 In order to terminate the license and allow release of the site, the licensee must submit a
4 license termination plan (LTP). In accordance with 10 CFR 50.82(a)(9), an application for
5 license termination must be accompanied or preceded by an LTP, which is subject to NRC
6 review and approval. The licensee must submit the LTP at least 2 years before the date of
7 license termination. The LTP approval process is by license amendment. By regulation, the
8 LTP must include the following:

- 9
- 10 • a site characterization
 - 11
 - 12 • identification of remaining dismantlement activities
 - 13
 - 14 • plans for site remediation
 - 15
 - 16 • detailed plans for the final survey of residual contamination
 - 17
 - 18 • a description of the end-use of the site (if restricted use is proposed)
 - 19
 - 20 • an updated site-specific estimate of remaining decommissioning costs
 - 21
 - 22 • a supplement to the ER.
 - 23

24 The licensee must submit the LTP as a supplement to its final safety analysis report or as an
25 equivalent document, thus formalizing the steps necessary to revise the document.

26

27 After receiving the LTP, the NRC will place a notice of receipt of the plan in the Federal
28 Register and will make the plan available to the public for comment. The NRC will schedule a
29 public meeting near the facility to discuss the plan’s contents and the staff’s process for
30 reviewing the submittal. The NRC will also offer an opportunity for a public hearing on the
31 license-amendment request associated with the LTP. At this stage, a site-specific EA is
32 required. Depending on the circumstances, the EA evaluation can result in the development of
33 a full EIS. If the LTP demonstrates that the remainder of decommissioning activities will be
34 performed in accordance with NRC regulations, are not detrimental to the health and safety of
35 the public, and will not have a significant adverse effect on the quality of the environment, the
36 Commission will approve the plan by a license amendment (subject to whatever conditions and
37 limitations the Commission deems appropriate and necessary).

38

39 On July 21, 1997, the NRC published (also in the Federal Register) a final rule entitled,
40 “Radiological Criteria for License Termination” (64 FR 39058) prescribing specific radiological

1 criteria for license termination. At the end of the LTP process, if the NRC determines that the
2 remaining dismantlement has been performed in accordance with the approved LTP, and if the
3 final radiation survey and associated documentation demonstrate that the facility and site are
4 suitable for release, then the Commission will terminate the license.
5

6 The radiological criteria for license termination are given in 10 CFR Part 20, Subpart E. There
7 are two broad categories of uses for the facility after the license termination: unrestricted use
8 and restricted use.
9

10 **Unrestricted use** means that there are no NRC-imposed restrictions on how the site may be
11 used. The licensee is free to continue to dismantle any remaining buildings or structures and to
12 use or sell the land for any type of application. The Commission has established a 0.25 mSv/yr
13 (25 mrem/yr) total effective dose equivalent (TEDE) to an average member of the critical
14 group^(a) as an acceptable criterion for release of any site for unrestricted use. The licensee will
15 be required to show that the site can meet this criterion before the license will be terminated for
16 unrestricted use. In addition, the licensee will need to show that the amounts of residual
17 radioactivity have been reduced to levels that are as low as reasonably achievable (ALARA).^(b)
18 For sites that have been determined to be acceptable for unrestricted use, there are no
19 requirements for further measurement of radiation levels. It is not expected that these radiation
20 levels would change (other than to be reduced over time through radioactive decay), and there
21 would be no mechanism for further contamination or radiological releases.
22

(a) The “critical group” is that group of individuals reasonably expected to receive the highest exposure to residual radioactivity within the assumptions of a particular scenario. The average dose to a member of the critical group is represented by the average of the doses for all members of the critical group, which in turn is assumed to represent the most likely exposure situation. For example, when considering whether it is appropriate to “release” a building that has been decontaminated (allow people to work in the building without restrictions), the critical group would be the group of employees that would regularly work in the building. If radiation in the soil is the concern, then the scenario used to represent the maximally exposed individual is that of a resident farmer. The assumptions used for this scenario are prudently conservative and tend to overestimate the potential doses. The added “sensitivity” of certain members of the population, such as pregnant women, infants, children, and any others who may be at higher risk from radiation exposures, are accounted for in the analysis. However, the most sensitive member may not always be the member of the population that receives the highest dose. This is especially true if the most sensitive member (e.g., an infant) does not participate in activities that provide the greatest dose or if they do not eat specific foods that cause the greatest dose.

(b) The ALARA concept means that all doses are to be reduced below required levels to the lowest reasonably achievable level considering economic and societal factors. Determination of levels that are ALARA must consider any detriments, such as deaths from transportation accidents, that are expected to potentially result from disposal of radioactive waste.

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1 **Restricted use** means that there are restrictions on the facility use after license termination. A
2 site would be considered acceptable for license termination under restricted conditions if the
3 licensee can demonstrate that further reductions in residual radioactivity necessary to meet the
4 requirements for unrestricted use would result in net public or environmental harm, or were not
5 being made because the residual levels were ALARA. In addition, the licensee must have
6 made provisions for legally enforceable institutional controls (e.g., use restrictions placed in the
7 deed for the property) that provide reasonable assurance that the radiological criteria set by the
8 NRC (0.25 mSv/yr [25 mrem/yr] TEDE to an average member of the critical group) will not be
9 exceeded. The licensee must also have provided sufficient financial assurance to an amenable
10 independent third party to assume and carry out responsibilities for any necessary control and
11 maintenance of the site. There are also regulations relating to the documentation of how the
12 advice of individuals and institutions in the community who may be affected by
13 decommissioning has been sought and incorporated in the LTP if the license is to be
14 terminated under restricted conditions.

15
16 Residual radioactivity at the site must be reduced so that if the institutional controls were no
17 longer in effect, there would be reasonable assurance that the TEDE from residual radioactivity
18 distinguishable from background to the average member of the critical group would be ALARA
19 and would not exceed either 1 mSv/yr (100 mrem/yr) or 5 mSv/yr (500 mrem/yr). In the latter
20 case, the licensee must (1) demonstrate that further reductions in residual radioactivity
21 necessary to comply with the 1 mSv/yr (100 mrem/yr) value are not technically achievable,
22 would be prohibitively expensive, or would result in net public or environmental harm, (2) make
23 provisions for durable institutional controls, and (3) provide sufficient financial assurance to
24 enable a responsible government entity or independent third party to carry out periodic checks
25 of the facility no less frequently than every 5 years to ensure that the institutional controls
26 remain in place.

27
28 Alternate release criteria may be used in specific cases. The use of alternate criteria to
29 terminate a license requires the approval of the Commission after consideration of the NRC
30 staff's recommendations that address comments provided by the U.S. Environmental Protection
31 Agency and any public comments submitted pursuant to 10 CFR 20.1405. These alternate
32 criteria are expected to be used only in very rare cases.

33
34 To date, the three NRC-licensed facilities (Shoreham, Fort St. Vrain, and Pathfinder) that have
35 completed the decommissioning process have had their licenses terminated, allowing
36 unrestricted use of the sites. License termination plans have been submitted for three other
37 facilities. The LTPs describe plans for unrestricted use of the sites following license
38 termination. No nuclear power licensees have indicated that they plan for restricted use of the
39 site after license termination.

1 A proposed rule was issued on September 4, 2001 (66 FR 46230) for partial site release prior
2 to license termination. Partial site release means release of part of a nuclear power reactor
3 facility or site for unrestricted use prior to NRC approval of the LTP. The NRC proposes to add
4 a new section to 10 CFR Part 50, separate from the existing rules for decommissioning and
5 radiological criteria for license termination, that identifies the requirements and criteria
6 necessary for partial site release. The proposed rule includes associated amendments to 10
7 CFR Part 2 and 10 CFR Part 20. The purpose of this rulemaking is to ensure that any
8 remaining residual radioactive material from licensed activities on a portion the site released for
9 unrestricted use will meet the radiological criteria for license termination.

10
11 Licensees will be required to submit information necessary to demonstrate the following:

- 12
13 • The release of radiologically impacted property complies with the radiological criteria for
14 unrestricted use in 10 CFR 20.1402 (0.25 mSv/yr [25 mrem/yr] to the average member of
15 the critical group and ALARA).
- 16
17 • The licensee will continue to comply with all other applicable regulatory requirements that
18 may be affected by the release of property and changes to the site boundary. This would
19 include, for example, requirements in 10 CFR Parts 20, 50, 72, and 100.
- 20
21 • Records of property-line changes and the radiological conditions of partial site releases are
22 being maintained to ensure that the dose from residual material associated with these
23 releases can be accounted for at the time of any subsequent partial releases and at the
24 time of license termination.

25
26 The proposed rule provides additional flexibility to licensees who are releasing property that has
27 never been radiologically impacted. While an amendment of the Part 50 operating license is
28 required to release radiologically impacted property, the proposed rule offers the opportunity for
29 a letter submittal for partial releases if the licensee can demonstrate that there is no reasonable
30 potential for residual radioactivity from license activities.

2.3 References

10 CFR 2. Code of Federal Regulations, Title 10, *Energy*, Part 2, “Rules of practice for domestic licensing proceedings and issuance of orders.”

10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, “Standards for protection against radiation.”

10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, “Domestic licensing of production and utilization facilities.”

10 CFR 61. Code of Federal Regulations, Title 10, *Energy*, Part 61, “Licensing requirements for land disposal of radioactive waste.”

10 CFR 72. Code of Federal Regulations, Title 10, *Energy*, Part 72, “Licensing requirements for the independent storage of spent nuclear fuel and high-level radioactive waste.”

10 CFR 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, “Reactor site criteria.”

61 FR 39278. “Decommissioning of Nuclear Power Reactors. Final Rule.” *Federal Register*. July 29, 1996.

64 FR 39058. “Radiological Criteria for License Termination. Final Rule.” *Federal Register*. July 21, 1997.

64 FR 8640. “10 CFR Parts 2, 19, 20, 21, 30, 40, 51, 60, 61, and 63 Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada.” *Federal Register*. February 22, 1999.

66 FR 46230. “Releasing Part of a Power Reactor Site or Facility for Unrestricted Use Before the NRC Approves the License Termination Plan. Proposed Rule.” *Federal Register*. September 4, 2001.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, NRC, Washington, D.C.