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U.S. Nuclear Regulatory Commission
REGULATORY GUIDE
Office of Nuclear Regulatory Research

Regulatory Guide 1.179
Standard Format and Content of License Termination Plans for Nuclear Power Reactors

(Draft was issued as DG-1078)

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Publication Information

A. INTRODUCTION

On July 29, 1996, the NRC published amendments to its regulations in 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" (61 FR 39278) (Ref. 1). These amendments prescribe specific criteria for decommissioning nuclear power reactors; they were effective August 28, 1996. This rule, by eliminating, revising, or extending operating reactor requirements commensurate with their importance to safety, specifies requirements for reactors that are permanently shut down and have no fuel in the reactor vessel. Reactors that are permanently shut down with no fuel in the vessel present a significantly reduced risk to the public.

Decommissioning activities for power reactors may be divided into three phases: (1) initial activities, (2) major decommissioning and storage activities, and (3) license termination activities. Draft Regulatory Guide DG-1067, "Decommissioning of Nuclear Power Reactors" (Ref. 2), is being developed to describe methods and procedures that are acceptable to the NRC staff for implementing the rules that relate to the initial activities and the major phases of decommissioning.

For Phase 3, 10 CFR 50.82(a)(9) specifies that an application for license termination must be accompanied or preceded by a license termination plan (LTP), which is subject to NRC review and approval. According to 10 CFR 50.82(a)(9)(i), the licensee must submit an LTP at least two years before termination of the license. The LTP is approved by license amendment. A public meeting must be held near the site; any

hearing held in relation to the LTP would fall under either Subpart G or Subpart L of Part 2. If the fuel has been permanently removed from the Part 50 facility to an authorized facility, a hearing for the proposed LTP would be in accordance with Subpart L. Conversely, if an LTP were submitted while the spent fuel was stored under the Part 50 license, Subpart G of 10 CFR Part 2 would apply.

Even after the LTP has been approved, 10 CFR 50.59 continues to apply to allow the licensee to make certain changes that do not result in an unreviewed safety question or changes to the technical specifications, and the changes must meet the requirements of 10 CFR 50.82(a)(6).

On July 21, 1997, the Commission amended its regulations in 10 CFR Part 20, "Standards for Protection Against Radiation"; 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of By-product Material"; 10 CFR Part 40, "Domestic Licensing of Source Material"; 10 CFR Parts 50 and 51; 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material"; and 10 CFR Part 71, "Packaging and Transportation of Radioactive Material" (62 FR 39058, Ref. 3), prescribing specific radiological criteria for license termination. Draft Regulatory Guide DG-4006, "Demonstrating Compliance With the Radiological Criteria for License Termination" (Ref. 4), is being developed to provide additional guidance on demonstrating compliance with the unrestricted release, restricted release, and alternative criteria for license termination in accordance with Subpart E of 10 CFR Part 20.

Under the new regulations, in the LTP a licensee could propose either release of the facility and site for unrestricted use or release of the facility and site under restricted use conditions.

For the most part, the LTP will contain a final site characterization, dose assessment, identification of the remaining remediation activities and supporting plan, and final survey plan. The LTP must be submitted as a supplement to the licensee's final safety analysis report (FSAR) or as an equivalent document. A licensee might submit the LTP concurrently with the post-shutdown decommissioning activities report (PSDAR). Guidance is being developed on the content of the PSDAR and is proposed in draft Regulatory Guide DG-1071, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report" (Ref. 5).

This regulatory guide provides guidance on developing LTPs for nuclear power reactor licensees who wish to terminate their licenses and release their sites.

The information collections contained 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. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

B. CONTENT OF LICENSE TERMINATION PLAN

1. GENERAL INFORMATION

The licensee's name, address, license number, and docket number should agree with the most recent license. The LTP should address each of the criteria below from 10 CFR 50.82(a)(9), 10 CFR 50.82(a)(10), and the related radiological criteria from Subpart E of 10 CFR Part 20 for unrestricted or restricted release of the site. The LTP should include any supporting information necessary to address the criteria, such as:

- Site characterization
- Identification of remaining site dismantlement activities

- Plans for site remediation
- Detailed plans for the final radiation survey for release of the site
- Method for demonstrating compliance with the radiological criteria for license termination. For restricted release, the LTP should include a description of the site's end use, documentation on public consultation, institutional controls, and financial assurance needed to comply with the requirements for license termination for restricted release or alternative criteria
- Updated site-specific estimate of remaining decommissioning costs
- Supplement to the environmental report, pursuant to 10 CFR 51.53, that describes any new information or significant environmental changes associated with the licensee's proposed termination activities.

2. SITE CHARACTERIZATION

The purpose of providing information on site characterization is to ensure that final radiation surveys are conducted to cover all areas where contamination existed, remains, or has the potential to exist or remain.

The licensee can submit the entire site characterization package separately at any time prior to submittal of the LTP and reference it in the LTP, or the site characterization can be submitted as an integral part of the LTP.

The LTP site characterization should be sufficiently detailed to allow NRC to determine the extent and range of radiological contamination of structures, systems (including sewer systems, waste plumbing systems, floor drains, ventilation ducts, piping and embedded piping), rubble, paved parking lots (both on and beneath), ground water and surface water, components, residues, and the environment, including the maximum and average contamination levels and ambient exposure rate measurements of all relevant areas (structures, equipment, and soils) of the site. The site characterization should be sufficiently detailed to provide data for planning further decommissioning activities as well as the final survey program.

The LTP should describe historic events (including dates, types of occurrences, locations in and outside of the facility), such as radiological spills, disposals, or other radiological accidents or incidents, that resulted or could have resulted in contamination of structures, equipment, laydown areas, or soils (subfloor and outside area).

The LTP should describe the survey instruments and supporting quality assurance practices used in the site characterization program. The LTP should discuss how the data quality objectives discussed in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (Ref. 6) were applied during site characterization.

MARSSIM (Ref. 6) provides guidance on developing a site characterization program, and further guidance is being developed in NRC's "Draft Branch Technical Position on Site Characterization for Decommissioning" (Ref. 7).

3. IDENTIFICATION OF REMAINING SITE DISMANTLEMENT ACTIVITIES

The LTP should contain a discussion of the remaining tasks associated with the decontamination and dismantlement, an estimate of the quantity of radioactive material to be released to unrestricted areas, and

the proposed control mechanisms, person-rem estimates, and radioactive waste characterization. The LTP should also identify any decommissioning tasks that require coordination with any other Federal or State regulatory agency.

In the LTP, the areas and equipment that need further remediation should be described in sufficient detail to allow the reviewer to prdict the radiological conditions that will be encountered during remedi ati on. The details in this section should be sufficient for the NRC to identify any inspection or technical resources needed during the remaining dismantlement activities.

The LTP should include a list of the remaining activities that do not involve unreviewed safety questions or changes in a facility's technical specifications, and this list should be sufficiently detailed for the staff to confirm that remedial activities may in fact be carried out under 10 CFR 50.59.

4. REMEDIATION PLANS

The LTP should summarize any changes from the previously approved radiological control program that will be used for the control of radiological contamination associated with the remaining decommissioning and remediation activities. Details regarding changes to the radiation protection program are not required in the LTP, but would be included in periodic updates to the Final Safety Analysis Report.

The LTP should discuss in detail the remediation methods and techniques that will be used to demonstrate that the facility and site areas meet the NRC criteria for license termination in Subpart E of 10 CFR Part 20 (Ref. 3).

5. FINAL RADIATION SURVEY PLAN

The LTP should describe the final survey plan for confirming that the plant and site will meet the restricted or unrestricted release criteria in Subpart E of 10 CFR Part 20 (Ref. 3) for license termination, as applicable. The NRC's regulations applicable to radiological surveys are found at 10 CFR 50.82(a)(9)(ii)(D) and 10 CFR 20.1501(a) and (b). The final status survey is the radiation survey performed after an area has been fully characterized, remediation has been completed, and the licensee believes that the area is ready to be released. The purpose of the final status survey is to demonstrate that the area meets the radiological criteria for license termination. The final status survey is not conducted for the purpose of locating residual radioactivity; the historical site assessment and the characterization survey perform that function. MARRSIM (Ref. 6) provides guidance on final survey methods and on developing a final survey plan for demonstrating compliance with Subpart E of 10 CFR Part 20; further guidance is proposed in Regulatory Position 2 of Draft Regulatory Guide DG-4006, "Demonstrating Compliance with the Radiological Criteria for License Termination" (Ref. 4). The following items, which are not meant to be all-inclusive, should be included in the final radiation survey plan.

- The methods proposed for surveying all equipment, systems, structures, and soils (diagrams, plot plans, and facility layout drawings should be used to facilitate presentation), as well as a method for ensuring that sufficient data are included for a meaningful statistical survey.
- A description of the methods to be used to establish background radiation levels (variances in background radiation can be expected between structures constructed of different materials) (Ref. 8).
- A description of the quality assurance (QA) program to support both field survey work and laboratory analysis that addresses the QA organization; training and qualification requirements; survey instructions and procedures including water, air, and soil sampling procedures; document control; control of purchased items; inspections; control of survey equipment; handling, storage, and response checks; shipping of survey equipment and laboratory samples; nonconformance items; corrective

action; QA records; and survey audits, including methods to be used for reviewing, analyzing, and auditing data.

- Verification surveys and evaluations used to support delineation of radiologically affected (contaminated) areas and unaffected (uncontaminated) areas.
- Identification of the major radiological contaminants.
- Methods used for addressing hard-to-detect radionuclides.
- Access control procedures to control recontamination of clean areas.
- Identification of survey units having the same area classification.
- Scanning performed to locate small areas of elevated concentrations of residual radioactivity.
- Levels established for investigating significantly elevated concentrations of residual radioactivity.
- Reference coordinate system established for the site areas.

6. COMPLIANCE WITH THE RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION

If a licensee requests unrestricted release of the site per Subpart F of 10 CFR Part 20, the LTP should demonstrate that the dose from residual radioactivity that is distinguishable from background radiation does not ex ceed 25 mrem (0.25 mSv) per year to an average member of the critical group over a 1000-year period, in cluding from drinking water. The LTP should also demonstrate that residual radioactivity has been reduced to levels that are as low as reasonably achievable (10 CFR 20.1402). The LTP should describe in detail the methods and assumptions used to demonstrate compliance with the 25-mrem per year criterion. Draft Regulatory Guide DG-4006, "Demonstrating Compliance With the Radiological Criteria for License Termination" (ReL 4), provides additional interim guidance on how to demonstrate compliance with the unrestricted release, restricted release, and alternative criteria for license termination. Draft NUREG-1549 "Using Decision Methods for Dose Assessment To Comply With Radiological Criteria for License Termination" (Ref. 9), is being developed to provide interim guidance on an acceptable methodology for calculating dose.

If a licensee requests license termination under the restricted release criteria per Subpart E of 10 CFR Part 20 (Ref. 3), the LTP should describe in detail the methods and assumptions that will be used to demonstrate that the licensee will provide reasonable assurance that the dose from residual radioactivity distinguishable from background will not exceed 25 mrem per year to a member of the critical group over a 1000-year period with the restrictions in place (10 CFR 20.1401(d) and 10 CFR 20.1403(1,)). The LTP should discuss site end use, the institutional controls to be put in place, and the maintenance required for the controls (including financial assurance for any necessary control and maintenance of the site) until the residual radio-activity meets unrestricted release criteria. The LTP should demonstrate that further reductions in residual radioactivity necessary to release the site for unrestricted use (1) would result in net public or environmental harm or (2) were not being made because the residual levels are as low as reasonably achievable (ALARA) (10 CFR 20.1403(a)). The LTP should also describe in detail how the requirements of 10 CFR 20. 1403(e)(1) or (2) will be met when the restrictions fail. If a licensee requests license termination under the restricted release criteria of 10 CFR 20.1403, the LTP should document how the public consultation requirements of 10 CFR 20.1403(d) were met.

If a licensee requests license termination under the alternative radiological criteria in 10 CFR 20.1404, the LTP should describe in detail the methods and assumptions used to demonstrate that public health and safety would continue to be protected. Specifically, the LTP should demonstrate that the dose from all man-made sources combined, other than medical, would be unlikely to exceed the 100 mrem annual value set forth in 10 CFR 20.1301(a)(1) and 10 CFR 20.1404(a)(1); that the licensee has employed, to the extent practicable, restrictions on site use to minimize exposures at the site; and that doses have been reduced to ALARA levels, taking into consideration any detriments, such as traffic accidents, that might result from

decontamination or waste disposal. The LTP should discuss site end use, the institutional controls to be put in place, and the maintenance required for the controls (including financial assurance for any necessary control and maintenance of the site) until the residual radioactivity meets unrestricted release criteria. If a licensee requests license termination under the alternative criteria under 10 CFR 20.1404, the LTP should document how the public consultation requirements of 10 CFR 20. 1404(a)(4) were met.

7. UPDATE THE SITE-SPECIFIC DECOMMISSIONING COSTS

The license termination plan must:

- Provide an estimate of the remaining decommissioning costs and
- Compare the estimated costs with the present funds set aside for decommissioning. The financial assurance instrument required per 10 CFR 50.75 must be funded to the amount of the cost estimate. If there is a deficit in present funding, the LTP must indicate the means for ensuring adequate funds to complete the decommissioning.

Regulatory Guide 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors" (Ref. 10), provides detailed guidance on methods for estimating decommissioning costs, as well as on financial assurance mechanisms that are acceptable to the NRC staff. If the LTP indicates that assurance of funding is to be provided by a surety method, insurance, or other guarantee, the financial assurance instrument must remain in effect until the NRC has terminated the license. The decommissioning cost estimate should include an evaluation of the following cost elements, which are not meant to be all-inclusive.

- Cost assumptions used, including a contingency factor
- Major decommissioning activities and tasks
- Unit cost factors
- Estimated costs of decontamination and removal of equipment and structures
- Estimated costs of waste disposal, including applicable disposal site surcharges
- Estimated final survey costs
- Estimated total costs

The cost estimate should focus on the remaining work, detailed activity by activity, for each activity associated with the decommissioning, including the costs of labor, materials, equipment, energy, and services. The cost estimates should be based on credible engineering assumptions that are related to all major remaining decommissioning activities and tasks. The cost estimate should include the cost of the remediation action being evaluated, the cost of transportation and disposal of the waste generated by the action, and other costs that are appropriate for the specific case. NUREG-1307, "Report on Waste Burial Charges" (Ref. 11), provides information on estimating waste disposal costs. No credit for the salvage value of equipment should be taken.

8. SUPPLEMENT TO THE ENVIRONMENTAL REPORT

The licensee must submit a supplement to the environmental report describing any new information or significant environmental change associated with the site-specific termination activities. The supplement to the environmental report should:

- Describe in detail the impact of the site-specific termination activity,
- Compare the impact with previously analyzed termination activities, and
- Analyze the environmental impact of the site-specific activity.

C. FORMAT OF THE LICENSE TERMINATION PLAN GRAPHIC PRESENTATIONS

Graphic presentations such as drawings, maps, diagrams, sketches, and tables should be employed if the information may be presented more adequately or conveniently by such means. Due concern should be taken to ensure that all information so presented is legible, symbols are defined, and that scales are not reduced to the extent that visual aids are necessary to interpret pertinent items of information. These graphic presentations should appear in the section where they are primarily discussed.

References may appear either as footnotes to the page on which they are cited or at the end of each chapter.

PHYSICAL SPECIFICATIONS

Paper Size

Text pages: 8-1/2 x 11 inches.

Drawings and graphics: 8-1/2 x 11 inches; however, a larger size is acceptable provided the finished copy, when folded, does not exceed 8-1/2 x 11 inches.

Paper Stock and Ink

Suitable quality in substance, paper color, and ink density for handling and reproduction by microfilming or image-copying equipment should be used.

Page Margins

A margin of no less than 1 inch should be maintained on the top, bottom, and binding side of all pages submitted.

Printing

Composition: Text pages should be single-spaced.

Typeface and Style: Should be suitable for microfilming or image-copying equipment, including computer scanning.

Reproduction: Mechanically or photographically reproduced. All pages of text should be printed on both sides and the image printed head to head.

Binding: Pages should be punched for standard threehole loose-leaf binders.

Page Numbering

Pages should be numbered with the digits corresponding to the chapter followed by a hyphen and a sequential number, e.g., the third page of Section 4 should be numbered 4-3. The entire report should not be numbered sequentially.

Table of Contents

A table of contents and an index of key items should be included.

PROCEDURES FOR UPDATING OR REVISING PAGES

Data and text should be updated or revised by replacing pages. The changed or revised portion on each page should be highlighted by a "change-indicator" mark consisting of a bold vertical line drawn in the margin opposite the binding margin. The line should be the same length as the portion actually changed.

All pages submitted to update, revise, or add pages to the report should show the date of change and change or amendment number. A guide page listing the pages to be inserted and the pages to be removed should accompany the revised pages. When major changes or additions are made, a revised table of contents should be provided.

REFERENCES

1. U.S. Nuclear Regulatory Commission, "Decommissioning of Nuclear Power Reactors" (10 CFR Parts 2,50, and 51), Federal Register, Vol.61, pp. 39278-39304 (61 FR 39278), July 29, 1996.

2. USNRC, "Decommissioning of Nuclear Power Reactors," Draft Regulatory Guide DG-1067, June 1997.[1]

3. USNRC, "Radiological Criteria for License Termination" (10 CFR Parts 20, 30, 40, 50, 51, 70, and 72), Federal Register, Vol. 62, pp. 39058-39092 (62 FR 39058), July 21, 1997.

4. USNRC, "Demonstrating Compliance with the Radiological Criteria for License Termination Draft Regulatory Guide DG-4006, August 1998.[1]

5. USNRC, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report," Draft Regulatory Guide DG-1071, December 1997.[1]

6. USNRC, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG-1575, December 1997.[2]

7. USNRC, "Draft Branch Technical Position on Site Characterization for Decommissioning," November 1994.[3]

8. A.M. Huffert, R.A. Meck, and K.M. Miller, "Background as a Residual Radioactivity Criterion for Decommissioning," USNRC, Draft NUREG-1501, August 1994.[1]

9. USNRC, "Decision Methods for Dose Assessment To Comply With Radiological Criteria for License Termination" (draft dated March 13, 1998, is available as Enclosure 2 to SECY-98-051 in the PDR).[3]

10. USNRC, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," Regulatory Guide 1.159, August 1990.[1]

11. USNRC, "Report on Waste Burial Charges, NUREG- 1307, Revision 8, December 1998.[2]

[1]Single copies of regulatory guides, both active and draft, and draft NUREG reports, may be obtained free of charge by writing the Office of the Chief Information Officer, Attn: Printing, Graphics and Distribution Branch, USNRC, Washington, DC 20555-0001,or by fax at (301)415-2289, or by email at <DISTRIBUTION@NRC.GOV>. Active guides may also be purchased from the National Technical Information Service on a standing order basis. Details on this service maybe obtained by writing NTIS, 5285 Port Royal Road, Springfield, VA 22161. Copies of active and draft guides are available for inspection or copying for a fee from the NRC Public Document Room at 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.

[2]Copies are available at current rates from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20402 - 9328 (telephone (202)512-1800); or from the National Technical Information Service by writing NTIS at 5285 Port Royal Road, Springfield, VA 22161. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 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.

[3]Copies are available for inspection or copying for a fee from the NRC Public Document Room at 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.

REGULATORY ANALYSIS

A separate regulatory analysis was not prepared for this 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, D.C.; the PDR's mailing address is Mail Stop LL-6, Washington, D.C. 20555; telephone (202)634-3273; fax (202)634-3343.