

GUIDANCE AND DISCUSSION OF REQUIREMENTS
FOR AN APPLICATION TO TERMINATE A
NON-POWER REACTOR FACILITY OPERATING LICENSE
Revision 1

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GUIDANCE AND DISCUSSION OF REQUIREMENTS
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The following guidance and discussion of requirements for requesting authority to decommission and terminate a non-power reactor facility operating license is an update and adaptation of and supplements NRC Regulatory Guide 1.86, "Termination of Operating License for Nuclear Reactors," a copy of which is attached. Although Regulatory Guide 1.86 pertains specifically to power reactors, most of it is applicable to non-power reactors as well. The guidance contained herein is interim, pending issuance and implementation of new regulations on decommissioning.

I. GENERAL INFORMATION

1. Application

An application for authority to initiate decommissioning should be filed under 10 CFR 50.82. It is recommended that the fuel be removed from the core as soon as practicable and shipped off-site in accordance with DOE, NRC and DOT requirements under the existing facility operating license, which permits all activities associated with those tasks. The application should be an inclusive document that contains all of the necessary information to enable staff review without extensive reference to other documents.

Three signed and notarized originals and 19 copies of the application should be submitted in accordance with 10 CFR 50.30 and Generic Letter No. 84-18 from Darrell Eisenhut to all non-power reactor licensees, dated July 6, 1984. Refer to 10 CFR 170 for information on licensing amendment fees, if applicable.

2. The Decommissioning Plan (DP)

The DP describes an organized means for removing all radioactive components and essentially all radioactivity within the reactor facility that was covered by the facility operating license. The request for dismantling of the reactor and termination of the facility operating license should include a detailed plan describing the organization and program that will be used during the decommissioning of the facility. The plan should accomplish the required tasks with the least possible exposure to radioactive and non-radioactive contaminants. It also must describe clearly how the licensee will continue to protect the health and safety of the public and the environment during the dismantling activities. Termination of the license by the NRC requires that the decommissioned facility be suitable for unrestricted use. At this time, the acceptance criteria being used by the staff for unrestricted use are either 54 Roentgen/hr above background at 1 meter from the surface or 10 mrem/yr above background, considering reasonable proximity and occupancy, and the permissible surface contamination levels given in Table 1 of Regulatory Guide 1.86.

A DP submitted to NRC is reviewed in the above context. Following approval of the DP by the NRC, the NRC will issue an Order authorizing implementation. This Order supersedes and replaces the operating license. The plan may then be implemented by the licensee. Following notification by the licensee of completion of the decontamination and disposal of components and materials from the facility, NRC Regional staff will conduct an on-site survey to verify that the acceptable activity and contamination levels are satisfied. When the requirements are satisfied, NRC will issue an Order that terminates the license and any further NRC jurisdiction over the facility.

Should the DP include fuel removal and partial decontamination, followed by a relatively long delay before the remaining radioactive components are removed, NRC may amend the license to permit "Possession Only". This would pertain until the Order authorizing dismantling is issued.

The "Possession Only" license permits the ownership and possession of fuel, by-product material and reactor components, but does not permit operation of the reactor. This license status, though permitting significant relief from the technical specifications, still requires adequate surveillance, monitoring and reporting.

3. Technical Specifications

The technical specifications that are part of the operating license assure the safe operation of the reactor. Most of these specifications would not be applicable to those operations associated with a DP. The DP should therefore include relevant technical specifications or controls. Since the plan becomes part of the license, it completely replaces the technical specifications which were Appendix A to the operating license.

4. Environmental Report

When requesting authorization for decommissioning and termination, the licensee must also submit an Environmental Report (ER). To the extent practicable, the ER should be written using the guidelines in 10 CFR 51.45. The ER should address: (1) the collective dose equivalent to workers for the entire dismantling and decommissioning project; (2) exposure of the general public to radioactive effluents released during the proposed activities; and (3) anticipated exposure levels of the general public following license termination. The NRC must determine if an Environmental Impact Statement (EIS) is necessary. To make this determination, the staff must prepare an Environmental Assessment (EA) based on the licensee's ER. If it is determined that an EIS is not needed, the staff prepares and publishes a finding of no significant environmental impact (i.e., declares that an EIS is not required). The EA, which forms the basis for this determination, is made publicly available.

II. LICENSEE'S DECOMMISSIONING PLAN OUTLINE AND CONTENTS

1.0 Plan Background and Management

The DP should include, as a minimum, the information discussed below and be in general accordance with the following recommended format and outline. Paragraph numbers correspond to suggested section numbers in the DP.

1.1 Summary Description

This section should contain a brief description of the reactor facility, the duration of the license, the approximate usage during the licensed period and a synopsis of the DP. A discussion of alternatives to the selected decommissioning approach (if any), cost estimates for each alternative, availability of funds (including sources of outside financing, if appropriate), major tasks and schedules (in particular, the estimated date for completion of decommissioning), items subject to quality assurance, tasks that may be performed by a contractor, and the final radiation survey plan all should be included. The collective dose equivalent (person-rem) for the selected approach, as compared to each alternative considered, also should be included.

1.2 Facility Operating History

This section should describe historical information on operational occurrences that could impact decommissioning safety. Such things as radioactivity spills or releases that resulted in significant contamination, specific location of systems and equipment that may contain high levels of radiation, and areas of the site that may contain radioactive hot-spots should be described. This type of information should be obtained from facility records and personnel familiar with the facility.

1.3 Current Radiological Status of Facility

Radiation levels for systems, structures, and components should be established at the time the DP is submitted. It is recognized that, at the time of the DP submittal, complete information might not be available for planning of activities. However, to the extent practicable, sources of radiation that are the bases for radiation protection should be described. Information in this section should be updated as additional radiation surveys are made. The description should tabulate sources by isotopic composition and gamma ray energy groups, strength (curie content), and geometry. Sources of radioactivity should be located on reactor core and plant layout drawings. For all sources, including activation product sources, the model(s) and parameters for calculating the source magnitudes should be provided. Exposure pathways to the public also should be analyzed.

1.4 Decommissioning Alternative

This section should describe the decommissioning alternative selected (e.g., safe entombment (ENTOMB), partial dismantling followed by safe storage and eventual completion of the dismantling of the facility (SAFSTOR), or continuous dismantling and decontamination of the facility (DECON). It should also describe the

measures proposed to reduce radiation to levels that permit unrestricted use of the area, if that is the ultimate goal, or other alternatives to ensure that the utilizing personnel and the public will not be unduly exposed to radiation.

1.5 Decommissioning Organization and Responsibilities

This section should identify key positions in the decommissioning organization and describe their functions. The lines of authority up to upper management levels should be indicated. The person with onsite management authority should be designated by position, along with a description of duties and responsibilities. The education, training and experience requirements should be described for positions that are important to safety.

The management policy and organizational structure related to ensuring that occupational radiation exposures are As Low As Reasonable Achievable (ALARA) should be described along with the responsibilities and the activities of management and health physics personnel having responsibility for radiation protection and maintaining exposures ALARA.

1.6 Regulations, Regulatory Guides and Standards

This section should identify and discuss the various health physics and industrial health criteria and standards which will guide the activities described in the DP; for example, Regulatory Guide 1.86, ANSI/ANS-15.10-1981 and OSHA requirements.

1.7 Training and Qualifications

This section should contain a description of the proposed training program and personnel qualifications, including contractor personnel as well as licensee employees. The description should include the scope of training in decontamination, other decommissioning activities, industrial hygiene, health physics, and use and maintenance of monitoring and safety equipment.

The duties and responsibilities of persons responsible for all training activities should be designated and discussed. The types of records that will be maintained for all training activities (e.g., status of trained personnel, training of new employees, refresher or upgrading) should be described in this section.

2.0 Occupational and Radiation Protection Programs

2.1 Radiation Protection Program

This section should contain a description of methods for occupational radiation protection. It should provide information on survey and personnel monitoring equipment, radiation protection techniques and practices that will be employed by the licensee in meeting the 10 CFR 20 requirements for protection against and the ALARA commitment.

The health physics program during decommissioning should be described in detail. The authority and responsibility of each position should also be identified. The criteria for selection of equipment and instrumentation for performing radiation monitoring and personnel monitoring should also be provided in this section. The use, storage, calibration, testing, and maintenance of these instruments should be described. The policy, methods, frequency, and procedures for conducting radiation surveys and personnel monitoring should also be described.

2.2 Industrial Safety and Hygiene Program

This section is concerned with the protection of personnel from detrimental non-radioactive exposures such as would be associated with controlled demolitions, airborne debris, and the use of various solvents to reduce or eliminate removable radioactive contamination.

The industrial (other than radiation) safety program should be described in detail and should conform with all applicable OSHA and industrial safety requirements. The authority and responsibility of each position should be included. In addition, this section should include the criteria for selecting equipment and methods for controlling non-radioactive exposures. Accident prevention and response should be included.

2.3 Contractor Assistance

The licensee may choose to use contractors to accomplish some or all of the decommissioning activities and tasks. However, the responsibility for health and safety during all aspects of decommissioning rests with the licensee.

For each contract, the plan should describe the scope of work to be accomplished, the administrative control system used to ensure adequate health and safety protection, and the relationship of the contracted work to the schedule for the other activities.

2.4 Cost Estimate and Funding

This section should present a cost estimated, by task, for accomplishing the decommissioning. This estimate should be based on conditions at the facility at the time the DP is submitted. The cost estimate should specifically include estimated costs of the termination radiation survey (see Section 3). The licensee should also show how sufficient funds will be made available to accomplish decommissioning. If a delayed decommissioning alternative is selected, include plans for periodic reevaluation during the safe-storage period.

3. Dismantling and Decontamination Tasks and Schedules

3.1 Tasks

This section should describe the tasks and activities that will be utilized to prepare the site and facility and for the actual dismantling and decontamination operations.

3.2 Schedule

For major activities, the relationship between activities and tasks should be shown. Where pertinent, the schedules for accomplishing interrelated activities and tasks should be delineated. Schedules and/or critical path-type diagrams should clearly indicate the estimated time for completion of major activities and for completely decommissioning the facility.

3.3 Task Analyses

Descriptions and procedures for accomplishing major activities should be provided. Any special health and safety considerations should be addressed for each task, as appropriate.

3.4 Safe Storage

Activities related to preparing and maintaining the facility and site for safe storage of any remaining radioactive components until their removal is accomplished should be described to the extent they are known.

4.0 Safeguards and Physical Security

A description and schedule of any proposed changes to the NRC-approved physical security plan and, when applicable, the NRC-approved material control and accountability plan should be submitted in this section. If this section contains information which must be protected from public disclosure in accordance with 10 CFR 73.21 or 10 CFR 2.790, it should be submitted under separate cover.

5.0 Radiological Accident Analyses

A discussion of radiological accidents related to fuel handling during decommissioning should be presented in this section if the fuel has not been removed previously under the operating license. Sufficient detail should be included so that the consequences of any significant potential accidents are clearly defined and analyzed. If no fuel is present on-site, radiological accidents need not be considered except for those that would fall within the general categories included in Section 3.

6.0 Radioactive Materials and Waste Management

6.1 Fuel Disposal

New fuel should be shipped off-site as soon as practicable. Irradiated fuel also should be removed from the core as soon as practicable and shipped off-site to facilitate the remaining dismantling tasks. Irradiated fuel may be removed from the reactor and shipped under the existing operating license and technical specifications, prior to approval of the DP. Disposal of fuel must be accomplished in accordance with the requirements of the Nuclear Waste Policy Act of 1982 and applicable NRC and DOT regulations. Also, if the fuel is owned by the DOE, DOE will decide its destination and disposition.

6.2 Radioactive Waste Processing

This section should describe the gaseous, liquid, and solid radioactive wastes that will be generated during decontamination and other decommissioning activities and the systems used for their detection, control, storage, treatment and disposal. The discussion should be related to radioactivity levels, volumes of radioactive waste, existing systems that will be retained in an operational status, and radwaste management systems that have to be implemented to meet the various safety and ALARA requirements.

7.0 Technical and Environmental Specifications

After the nuclear fuel is removed from the reactor and shipped off-site, most of the operating license technical specifications are no longer applicable, if the license has been amended or superseded by an Order, as discussed in Section 1.3, above.

Technical specifications during the decommissioning phase should be derived from an analysis of the health and safety and environmental assessment of decommissioning the facility. The analysis should lead to the conclusion that industrial and radiation exposures of decommissioning personnel and the public are ALARA and are small fractions of respective limits and guidelines (10 CFR 20, NIOSH, OSHA, etc.). The technical specifications or controls that are developed should reflect the safety precautions necessary during the various decommissioning phases.

8.0 Proposed Termination Radiation Survey Plan

The purpose of a termination radiation survey plan is to provide the bases for verifying that the facility and site meet prescribed radioactivity levels that permit their unrestricted use. This section should describe the survey plan that will provide the data necessary to demonstrate that the facility and site meet criteria for release for unrestricted use, if that is the ultimate goal. The description should include such things as (1) the proposed method for assuring that sufficient radiological data for all pertinent structures, surfaces, systems, components, and site are included in the survey (diagrams and plant layout drawings may be used to facilitate presentation), (2) the type and number of radiation readings, for both internal and external surfaces, (3) the type and operating condition of instruments to be used, including their lower limit of detection, (4) procedures used to obtain and analyze data, and (5) procedures used for auditing and verification of data.

III. INTERIM REPORT TO NRC

Where a facility is to be only partially dismantled and will remain in safe storage for more than one year, an interim report should be submitted to the NRC at the conclusion of the partial dismantling phase describing the interim status and delineating the various safety, health physics, safeguards and environmental measures that will be taken to ensure the safety of operating personnel, the public and the facility and to minimize environmental impacts. This interim report also should include an update of plans and schedules for the remaining dismantling activities.

IV. FINAL REPORT TO NRC

This report should be submitted at the time the licensee requests the NRC termination survey and should summarize the activities that were conducted at the facility in preparation for receipt of the NRC Order for license termination. The report should present the results of the final radiation and environmental surveys, the respective analyses and their relation to guidelines and limits for unrestricted use of the facility.



U.S. ATOMIC ENERGY COMMISSION

June 1974

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

REGULATORY GUIDE 1.86

TERMINATION OF OPERATING LICENSES FOR NUCLEAR REACTORS

A. INTRODUCTION

Section 50.51, "Duration of license, renewal," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that each license to operate a production and utilization facility be issued for a specified duration. Upon expiration of the specified period, the license may be either renewed or terminated by the Commission. Section 50.82, "Applications for termination of licenses," specifies the requirements that must be satisfied to terminate an operating license, including the requirement that the dismantlement of the facility and disposal of the component parts not be inimical to the common defense and security or to the health and safety of the public. This guide describes methods and procedures considered acceptable by the Regulatory staff for the termination of operating licenses for nuclear reactors. The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

B. DISCUSSION

When a licensee decides to terminate his nuclear reactor operating license, he may, as a first step in the process, request that his operating license be amended to restrict him to possess but not operate the facility. The advantage to the licensee of converting to such a possession-only license is reduced surveillance requirements in that periodic surveillance of equipment important to the safety of reactor operation is no longer required. Once this possession-only license is issued, reactor operation is not permitted. Other activities related to cessation of operations such as unloading fuel from the reactor and placing it in storage (either onsite or offsite) may be continued.

A licensee having a possession-only license must retain, with the Part 50 license, authorization for special nuclear material (10 CFR Part 70, "Special Nuclear Material"), byproduct material (10 CFR Part 30, "Rules of General Applicability to Licensing of Byproduct Material"), and source material (10 CFR Part 40, "Licensing of Source Material"), until the fuel, radioactive components, and sources are removed from the facility. Appropriate administrative controls and facility requirements are imposed by the Part 50 license and the technical specifications to assure that proper surveillance is performed and that the reactor facility is maintained in a safe condition and not operated.

A possession-only license permits various options and procedures for decommissioning, such as mothballing, entombment, or dismantling. The requirements imposed depend on the option selected.

Section 50.82 provides that the licensee may dismantle and dispose of the component parts of a nuclear reactor in accordance with existing regulations. For research reactors and critical facilities, this has usually meant the disassembly of a reactor and its shipment offsite, sometimes to another appropriately licensed organization for further use. The site from which a reactor has been removed must be decontaminated, as necessary, and inspected by the Commission to determine whether unrestricted access can be approved. In the case of nuclear power reactors, dismantling has usually been accomplished by shipping fuel offsite, making the reactor inoperable, and disposing of some of the radioactive components.

Radioactive components may be either shipped offsite for burial at an authorized burial ground or secured

USAEC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the AEC Regulatory staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Published guides will be revised periodically, as appropriate, to accommodate comments and to reflect new information or experience.

Copies of published guides may be obtained by request indicating the divisions desired to the U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Director of Regulatory Standards. Comments and suggestions for improvements in these guides are encouraged and should be sent to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Staff.

The guides are issued in the following ten broad divisions:

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| 1. Power Reactors | 6. Products |
| 2. Research and Test Reactors | 7. Transportation |
| 3. Fuels and Materials Facilities | 8. Occupational Health |
| 4. Environmental and Siting | 9. Antitrust Review |
| 5. Materials and Plant Protection | 10. General |

and/or shielding material. Means such as a remote-readout intrusion alarm system should be provided to indicate to designated personnel when a physical barrier is penetrated. Security personnel that provide access control to the facility may be used instead of the physical barriers and the intrusion alarm systems.

b. The physical barriers to unauthorized entrance into the facility, e.g., fences, buildings, welded doors, and access openings, should be inspected at least quarterly to assure that these barriers have not deteriorated and that locks and locking apparatus are intact.

c. A facility radiation survey should be performed at least quarterly to verify that no radioactive material is escaping or being transported through the containment barriers in the facility. Sampling should be done along the most probable path by which radioactive material such as that stored in the inner containment regions could be transported to the outer regions of the facility and ultimately to the environs.

d. An environmental radiation survey should be performed at least semiannually to verify that no significant amounts of radiation have been released to the environment from the facility. Samples such as soil, vegetation, and water should be taken at locations for which statistical data has been established during reactor operations.

e. A site representative should be designated to be responsible for controlling authorized access into and movement within the facility.

f. Administrative procedures should be established for the notification and reporting of abnormal occurrences such as (1) the entrance of an unauthorized person or persons into the facility and (2) a significant change in the radiation or contamination levels in the facility or the offsite environment.

g. The following reports should be made:

(1) An annual report to the Director of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545, describing the results of the environmental and facility radiation surveys, the status of the facility, and an evaluation of the performance of security and surveillance measures.

(2) An abnormal occurrence report to the Regulatory Operations Regional Office by telephone within 24 hours of discovery of an abnormal occurrence. The abnormal occurrence will also be reported in the annual report described in the preceding item.

h. Records or logs relative to the following items should be kept and retained until the license is terminated, after which they may be stored with other plant records:

- (1) Environmental surveys,
- (2) Facility radiation surveys,
- (3) Inspections of the physical barriers, and
- (4) Abnormal occurrences.

4. DECONTAMINATION FOR RELEASE FOR UNRESTRICTED USE

If it is desired to terminate a license and to eliminate any further surveillance requirements, the facility should be sufficiently decontaminated to prevent risk to the public health and safety. After the decontamination is satisfactorily accomplished and the site inspected by the Commission, the Commission may authorize the license to be terminated and the facility abandoned or released for unrestricted use. The licensee should perform the decontamination using the following guidelines:

a. The licensee should make a reasonable effort to eliminate residual contamination.

b. No covering should be applied to radioactive surfaces of equipment or structures by paint, plating, or other covering material until it is known that contamination levels (determined by a survey and documented) are below the limits specified in Table I. In addition, a reasonable effort should be made (and documented) to further minimize contamination prior to any such covering.

c. The radioactivity of the interior surfaces of pipes, drain lines, or ductwork should be determined by making measurements at all traps and other appropriate access points, provided contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement should be assumed to be contaminated in excess of the permissible radiation limits.

d. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated in excess of the limits specified. This may include, but is not limited to, special circumstances such as the transfer of premises to another licensed organization that will continue to work with radioactive materials. Requests for such authorization should provide:

- (1) Detailed, specific information concerning the premises, equipment, scrap, and radioactive contaminants and the nature, extent, and degree of residual surface contamination.

TABLE I
ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDE ^a	AVERAGE ^{b c}	MAXIMUM ^{b d}	REMOVABLE ^{b e}
U-nat, U-235, U-238, and associated decay products	5,000 dpm a/100 cm ²	15,000 dpm a/100 cm ²	1,000 dpm a/100 cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm ²	300 dpm/100 cm ²	20 dpm/100 cm ²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm ²	3000 dpm/100 cm ²	200 dpm/100 cm ²
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm β-γ/100 cm ²	15,000 dpm β-γ/100 cm ²	1000 dpm β-γ/100 cm ²

^aWhere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

^bAs used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

^cMeasurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

^dThe maximum contamination level applies to an area of not more than 100 cm².

^eThe amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.