# STATUS OF THE U.S. NUCLEAR REGULATORY COMMISSION DECOMMISSIONING PROGRAM

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## **ABSTRACT**

On July 21, 1997, the U.S. Nuclear Regulatory Commission (NRC) published the final rule on Radiological Criteria for License Termination (the License Termination Rule or LTR) as Subpart E to 10 CFR Part 20. NRC regulations require that a materials licensee submit a Decommissioning Plan to support the decommissioning of its facility, if it is required by license condition, or if the procedures and activities necessary to carry out the decommissioning have not been approved by NRC and could increase the potential health and safety impacts to the workers or the public. NRC regulations also require that reactor licensees submit Post-shutdown Decommissioning Activities Reports and License Termination Plans to support the decommissioning of nuclear power facilities. This paper provides a status update of the NRC decommissioning program. It includes:

- 1) the status of the decommissioning of power reactors and complex materials sites
- 2) the current issues being faced in the decommissioning program, such as ensuring adequate financial assurance for decommissioning sites
- 3) the current efforts to improve the decommissioning process
- 4) the status of various tools and guidance the NRC is developing to assist licensees during decommissioning, including an effort to consolidate and risk-inform decommissioning guidance.

## INTRODUCTION

To "decommission" is defined in NRC regulations at 10 CFR 20.1003 as "to remove a facility or site safely from service and reduce residual radioactivity to a level that permits 1) release of the property for unrestricted use and termination of the license; or, 2) release of the property under restricted conditions and termination of the license [1]." NRC regulations at 10 CFR Part 20, Subpart E [2] describe the criteria for the release of decommissioned sites for unrestricted and restricted use, and apply to most NRC licensees.

For power reactor licensees, NRC regulations at 10 CFR Part 50 require that, prior to, or within 2 years following permanent cessation of operations, they provide NRC with a post-shutdown decommissioning activities report (PSDAR). The purpose of the PSDAR is to provide NRC and the public with a general overview of the proposed decommissioning activities. 10 CFR Part 50 also requires that nuclear power reactor licensees submit a License Termination Plan (LTP) at least 2 years before termination of the license. The purpose of the LTP is to describe the radiological condition of the site, provide a dose assessment for the site, identify the remaining decommissioning activities, and provide the final survey plan for the site.

For materials licensees, NRC regulations at 10 CFR Parts 30, 40, 70, and 72 require that a Decommissioning Plan (DP) be submitted to support the decommissioning of its facility, if it is required by license condition, or if the procedures and activities necessary to carry out the decommissioning have not been approved by NRC and could increase the potential health and safety impacts to the workers or the public. The objective of the decommissioning plan is to describe the activities and procedures that the licensee intends to undertake to remove residual radioactive material at a facility to levels that meet NRC criteria for release of the site and termination of the radioactive materials license. Beginning in 2004, any materials site that would be required to submit a DP is referred to in the Decommissioning Program as a "complex" site.

#### **BACKGROUND**

The NRC decommissioning program encompasses decommissioning of all NRC licensed facilities, ranging from the termination of routine licenses for sealed source users to the closure of complex materials sites and reactor facilities. Approximately 300 materials licenses are terminated each year. Most of these license terminations are routine and the sites require little, if any, remediation to meet the NRC unrestricted release criteria. However, some present technical and policy challenges which will require large expenditures of NRC staff resources, including a few complex materials sites that have requested license termination under the restricted-use provisions of 10 CFR 20.1403 [3]. For example, site-specific dose assessments, including complex groundwater modeling, will be required for some sites. At other sites requesting release with restrictions on future site use, "durable institutional controls," as specified in 10 CFR 20.1403(e), [4] will need to be provided to ensure protection of the public health and safety.

# Decommissioning program activities include:

- 1) developing regulations and guidance to assist the NRC staff and the regulated community
- 2) conducting research to develop data, techniques, and models used to assess public exposure from the release of radioactive material resulting from site decommissioning
- 3) reviewing and approving DPs and LTPs
- 4) reviewing and approving license amendment requests
- 5) inspecting licensed and non-licensed facilities undergoing decommissioning
- 6) developing environmental assessments (EAs) and environmental impact statements (EISs) to support the NRC's reviews of DPs and LTPs
- 7) reviewing site final status survey reports; and
- 8) conducting confirmatory surveys

The NRC decommissioning program is administered through NRC's Offices of Nuclear Material Safety and Safeguards (NMSS), Nuclear Reactor Regulation (NRR), and Nuclear Regulatory Research (RES), as well as the Regional Offices. Because of the cross-Agency nature of the decommissioning program, the staff has taken several actions to ensure that decommissioning activities are integrated and coordinated within the Agency, including tracking decommissioning activities in the Agency Operating Plan, preparing an annual Agency-wide decommissioning report, and providing management oversight and coordination of decommissioning activities and policies through a Decommissioning Management Board.

#### POWER REACTOR DECOMMISSIONING

NRC recently completed an effort to enhance the management of nuclear power reactors undergoing decommissioning by transferring the responsibility for project management from NRR to NMSS earlier in the decommissioning process [5]. Under this approach, NMSS regulates the decommissioning of a power reactor once the licensee has completed regulatory and safety milestones that ensure that the reactor more closely represents a materials facility temporarily storing and processing radioactive waste than a commercial power reactor. This new approach takes advantage of decommissioning technical and policy experience in NMSS, and ensures that decommissioning of power reactors and complex materials facilities is conducted in a consistent manner.

The transfer of project management responsibilities for decommissioning power reactors was completed in January 2003. NMSS currently has regulatory project management responsibility for 15 decommissioning power reactors (Big Rock Point, Dresden 1,

Fermi 1, Connecticut Yankee, Humbolt Bay, Lacrosse, Maine Yankee, Peach Bottom 1, Rancho Seco, San Onofre 1, Three Mile Island 1, Trojan, Yankee Rowe, and Zion 1&2).

NRR has retained project management responsibility for two decommissioning power reactors (Indian Point - Unit 1, Millstone - Unit 1). Because of extensive stakeholder interest in the operating reactors at these sites, it is more efficient for NRR to retain, as a single point of contact, project management responsibility for the permanently shutdown units as well. Project management for three early demonstration reactors in decommissioning–Vallecitos, Nuclear Ship Savannah, and Saxton also remains with NRR.

In addition, NRR has retained project management and inspection responsibilities for research-reactors and test-reactors. Currently, 11 research and test reactors have decommissioning orders or amendments. Four other research and test reactors are in "possession-only" status, either waiting for shutdown of another research or test reactor at the site, or for removal of the fuel from the site by DOE. Only four of the 11 test and research reactors with decommissioning orders or amendments, and one of the four test and research reactors in possession-only status still have fuel in storage at the reactor.

During the past year, NMSS completed review and approval of the LTPs for Maine Yankee, Saxton, and Connecticut Yankee. The staff currently is reviewing the LTP for Big Rock Point that was submitted in April 2003, and the LTP for Yankee Rowe that was submitted in November 2003. The Fermi 1 and Rancho Seco LTPs are planned for submittal to NRC in 2004.

## COMPLEX MATERIALS SITE AND FUEL CYCLE SITE DECOMMISSIONING

Currently, there are 45 complex materials facilities undergoing decommissioning. These sites include 25 Site Decommissioning Management Plan (SDMP) sites, 8 contaminated formerly licensed sites, and 12 other newly identified complex sites in decommissioning.

The SDMP was created in response to Commission direction in 1989 and 1990, which required the staff to develop a comprehensive strategy for achieving closure of decommissioning issues in

a timely manner, and to develop a list of contaminated sites, in order of cleanup priority. To date, 36 sites have been removed from the SDMP after successful decommissioning or by transfer to another authority. Most recently in 2003, NRC removed the Watertown GSA facility from the SDMP list after its completion of decommissioning to NRC standards.

The decommissioning program is responsible for overseeing the cleanup of contaminated sites identified under the Oak Ridge National Laboratory (ORNL) Terminated License Review Project completed in September 2001 [6]. As a result of the ORNL review, and subsequent follow-up by the Regions, 42 formerly licensed sites were found to have residual contamination levels exceeding NRC's criteria for unrestricted release. After successful remediation, 20 sites have been closed, and 11 have been transferred to an Agreement States or another Federal entity. Three of these formerly licensed sites were added to the SDMP list, and the remaining eight continue to be decommissioned separately as complex formerly licensed sites.

Other materials sites continue to be added to the list of complex materials sites as they enter decommissioning and submit a DP to the NRC for review and approval.

NMSS also provides licensing oversight and decommissioning project management for fuel cycle facilities, including conversion plants, enrichment plants, and fuel manufacturing plants. Most of these facilities have been in operation for 20 or more years. As technology improves and operations at these facilities change, there are often unused areas of the sites with residual contamination. Pursuant to 10 CFR 70.38 (NRC's "Timeliness Rule") [7], any licensee with a building or outdoor area that has residual contamination and that has not been in use for two years, for that area, must begin decommissioning, submit a DP, or request an extension to the time period for submitting a DP. The NRC staff continues to work closely with the States and EPA to regulate remediation of unused portions of fuel cycle facilities. In 2003, one conversion facility (Honeywell), and four fuel manufacturers (BWX Technologies, Nuclear Fuel Services, Framatome Richland, and General Atomics), although still operating, continued some decommissioning activities.

In addition, NMSS provides project management and technical review for decommissioning and reclamation of facilities that are regulated under 10 CFR Part 40, Appendix A [8]. These uranium recovery licensees include conventional uranium mills and other facilities that process ore primarily for its source material content, such as in-situ leach, heap leach, and ion-exchange facilities. Currently, there are 17 NRC-licensed uranium recovery sites in decommissioning. Groundwater and land transfer issues have slowed these license terminations.

## **GUIDANCE AND RULEMAKING**

# **Control of Solid Materials**

NRC regulations that set standards for protection of the public against radiation currently do not contain specific regulatory requirements for the release of solid materials with very small amounts of radioactivity from licensed control. For several years, NRC has been examining its approach for controlling the disposition of solid materials. In August 2000, the Commission deferred a final decision on whether to proceed with rulemaking on this issue. The Commission

directed the staff to proceed with a National Academy of Sciences (NAS) study on possible alternatives for control of solid materials, and to continue the development of a technical information base to support a Commission policy decision in this area. In March 2002, the NRC received the NAS report. Based on its review of the NAS report and the NRC staff recommendations, in October 2002, the Commission directed the staff to proceed with an enhanced participatory rulemaking to develop specific requirements for the control of solid materials. In February 2003, the staff published a Federal Register notice soliciting public comments on the potential rulemaking and the scope of the environmental impact statement (EIS) to support the rulemaking effort. NRC held a workshop on May 21-22, 2003, to solicit new input, with a focus on the feasibility of alternatives identified in the Federal Register. Approximately 3000 comments were received by the end of the public comment period, on June 30, 2003. The NRC staff plans to submit a draft rule, Environmental Impact Statement, and Regulatory Guide to the Commission in July 2004, and publish it for public comment in September 2004.

# **Partial Site Release**

The NRC issued new regulations on April 22, 2003 [9], at 10 CFR 50.83, providing for release of part of a power reactor facility or site for unrestricted use. The new rule was designed within the context of the existing LTR to assure that radiological release requirements of 10 CFR Part 20, Subpart E would be met for the site as a whole, even though parts may be released before the license is terminated. Two methods are provided for a power reactor licensee to seek approval for a partial site release for unrestricted use before NRC approval of the licensee's LTP. For non-impacted areas, a licensee may submit a letter request for approval. For impacted areas, the request must take the form of a license amendment. In either case, the NRC will notice receipt of the request for a partial site release and make the information available to the public. In addition, the NRC will conduct a public meeting in the vicinity of the facility for the purpose of obtaining public comments. After a part of the site or facility is released in accordance with the NRC regulations, the Commission will require additional cleanup only, if based on new information, residual activity remaining at the site could result in significant threat to the public health and safety.

#### **Financial Assurance**

In June 2001, the Commission directed the staff to develop a rulemaking to amend the financial assurance requirements for materials licensees in 10 CFR Parts 30, 40, and 70. The final rule was published in October 2003. The changes are in four areas: 1) large sealed source licensees--large irradiators—are no longer able to use the \$75,000 certification amount as a basis for financial assurance, and would have to base their financial assurance on a site-specific decommissioning cost estimate; 2) all waste broker licensees must provide financial assurance and would not be permitted to use the certification amounts; 3) the certification amount for all licensees is increased by 50 percent; and 4) licensees using a decommissioning cost estimate must update it at least every 3 years.

#### **Consolidated Guidance**

In September 2003, NMSS completed its efforts to consolidate, risk-inform, and performancebase the policies and guidance for its decommissioning program. The project involved reviewing, updating, and consolidating existing NMSS decommissioning guidance documents, decommissioning technical assistance requests, decommissioning licensing conditions, and all decommissioning generic communications issued over the past several years. The project was conducted by teams, with representatives from NRC Headquarters, NRC regional offices, and Agreement States. The end result is a three-volume NUREG series of reports grouped into decommissioning functional categories (NUREG-1757, "Consolidated NMSS Decommissioning The project team published drafts for public comment; Volume 1, Guidance")[10]. "Decommissioning Process for Materials Licensees," in January 2002; Volume 2, "Characterization, Survey and Determination of Radiological Criteria," in September 2002; and Volume 3, "Financial Assurance, Recordkeeping, and Timeliness," in January 2003. The final volumes were published in September 2003, and are available on the NRC web page, at URL: http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1757/. The NRC staff intends to update the consolidated guidance periodically.

NUREG-1757 is not a substitute for regulations, and compliance with it is not required, but use of the guidance will: 1) result in licensee submittal of more complete license documents that will expedite the approval process, and 2) allow the NRC staff to evaluate information submitted by licensees in a timely, efficient, and consistent manner that protects public health and safety.

# **Analysis of Issues Impacting the Implementation of the LTR**

In June 2002, the Commission directed the staff to conduct an analysis of LTR implementation issues, emphasizing addressing the institutional control issue such that the LTR provision for restricted release and alternate criteria would be more available for licensee use. On October 1, 2002, the staff provided the Commission with an initial analysis that described the scope of each issue and the staff's plans for evaluation [11]. The results of the staff analysis of LTR issues were provided to the Commission in May 2003 [12]. Particular emphasis was given to providing recommendations to resolve the institutional control issue. In addition, the staff evaluated other LTR implementation issues dealing with the relationship of the LTR release limits to other release limits, with realistic exposure scenarios, and with measures to prevent future legacy sites. The staff also raised a new issue on intentional mixing. On November 17, 2003, the Commission approved the implementation of the staff recommendations on the issues evaluated. The results of the separate evaluation on the new issue of intentional mixing will be provided to the Commission in early 2004.

The outcomes of the staff's recommendations affect both existing and future decommissioning sites. For existing decommissioning sites, particularly the complex sites with long-lived radionuclides, many recommendations should facilitate decommissioning by addressing key challenges that these sites must address. Consistent use of more realistic exposure scenarios could result in more economical decommissioning, while maintaining safety. For future decommissioning sites, specific measures are recommended for financial assurance, licensee

operations and reporting, and on-site disposal that should reduce or mitigate the potential for future "legacy" sites that may not have the financial ability to complete decommissioning.

NRC is now planning a variety of regulatory actions to address these issues, including: 1) a rulemaking, for measures to prevent future legacy sites; 2) revised guidance to support the rulemaking and to clarify institutional controls for restricted release, on-site burials, and realistic exposure scenarios; 3) revised inspection procedures and enforcement guidance to enhance monitoring, reporting, and remediation to prevent future legacy sites; and 4) a Regulatory Issue Summary (early 2004) to inform a wide range of stakeholders about the LTR analysis of each issue, the Commission direction, and actions planned to resolve each issue.

# **Decommissioning Program Evaluation**

In 2003, the NRC Decommissioning Branch staff completed a self-evaluation of its decommissioning program. The objectives of this program evaluation were to: 1) evaluate the effectiveness of the Decommissioning Program; 2) evaluate individual completed or ongoing program changes/improvements; and 3) recommend future improvements. A variety of different methods were used to evaluate the effectiveness of the overall program and each of the individual improvements to the program. The staff also evaluated the effectiveness of 18 individual improvements that had been made to the program during the FY 2001–FY 2003 evaluation period. These improvements included implementation of a variety of self-assessments of major program activities such as licensing, inspections, laboratory analyses, guidance, financial assurance, and implementation of the regulations. Based on the results of these evaluations, challenges to the program were identified and corresponding recommendations were made to address the challenges. The staff has posted the results of the program evaluation on the NRC Website at <a href="http://www.nrc.gov/materials/decommissioning.html">http://www.nrc.gov/materials/decommissioning.html</a>.

The evaluation concluded that the decommissioning program already has used many types of self assessments and program changes to improve the regulatory framework, decommissioning processes, internal program management processes, and public involvement. However, the evaluation also concluded that future improvements identified in the evaluation would be beneficial. In particular, the recommendations in the LTR Analysis to resolve the LTR policy issues, when implemented as directed by the Commission, offer significant future improvements for the program. To complement these recommended regulatory and policy improvements, the program evaluation makes additional recommendations that primarily would improve internal program management, such as establishment of a comprehensive decommissioning program perspective, revision of program measures and goals, expansion of management reviews of site progress, and effective implementation of the Consolidated Decommissioning Guidance. Implementation of these and other ongoing program improvements should result in continuing efficiencies in the overall program.

#### PUBLIC OUTREACH

The NRC decommissioning staff interacts with the public in several ways. In March 2001, the staff completed development of a Communication Plan for Regulation of Decommissioning. The goals of NRC's decommissioning communications activities are to increase public

confidence in NRC's commitment and ability to carry out licensing and regulatory responsibilities for the decommissioning of nuclear facilities, and increase the efficiency, effectiveness, and realism of analyses supporting license termination decisions. The Plan provides guidance for developing individual Communication Plans for specific activities associated with the regulation of radiological decommissioning. The staff continues to implement communication plans completed in 2002 for all complex materials sites. In 2003, the staff has prepared and begun implementation of site-specific communication plans for the 13 reactors transferred from NRR to NMSS.

One of the activities identified in the Communication Plans for each site is participation in public meetings to inform the public about major licensing actions. During the past year the staff participated in public meetings regarding the West Valley Demonstration Project site, the B&W Parks Shallow Land Disposal Area, the Cabot Performance Materials Inc. Site, the Combustion Engineering Hematite Site, and the Combustion Engineering Windsor Site. The staff also held a public meeting in Charlevoix, Michigan, to discuss the Big Rock Point power reactor License Termination Plan. Several additional materials and reactor public meetings are scheduled during the coming months.

Decommissioning staff also has taken significant steps to enhance public participation in the decommissioning process. Under an interagency agreement with NRC, the U.S. Institute for Environmental Conflict Resolution (USIECR) completed a project for NRC on effective public involvement in facility decommissioning, with specific application to restricted-use decommissioning of NRC-licensed facilities (per 10 CFR 20.1403). NRC hosted a workshop in September 2002, to discuss the results of the project. The workshop was designed for, and attended by, licensees, NRC staff, and Agreement State regulators. USIECR prepared a guidance document for NRC entitled, "Best Practices for Effective Public Involvement in Restricted-Use Decommissioning of NRC-Licensed Facilities" [13]. The guidance is based, in part, on information obtained from stakeholders, at NRC licensed sites, that have experience with public involvement concerning radioactive contamination and long-term management of contaminated sites, and is being used by NRC staff in conducting interactions with the public as the decommissioning process is carried out.

## **FUTURE CHALLENGES**

In addition to the actions to implement the many program improvements and changes identified in the LTR Analysis and the Program Evaluation discussed above, the NRC Decommissioning Program will face several other challenges. Decommissioning funding is an issue that will require significant staff attention in the future. The Commission previously asked the staff to analyze decommissioning funding issues in Agreement States and non-Agreement States. In accordance with Commission direction, staff currently is administering a grant program to facilitate cleanup of formerly terminated NRC sites in Agreement States. In addition, staff conducted a financial analysis of decommissioning sites in non-Agreement States, and reported its findings in May 2002. The Commission approved the staff's recommendation to proceed with an aggressive regulatory posture for sites identified with inadequate financial assurance. The Commission also requested the staff to prepare a summary report on the outcomes and any recommendations after one year of implementing the regulatory initiative. In November 2003,

staff reported back to the Commission that site-specific and programmatic progress was accomplished under the initiative, and recommended continuing the aggressive regulatory posture in the future. In December 2003, the Commission approved the staff recommendation and requested that the staff continue to provide annual reports on the initiative.

An additional challenge involves responding to the Commission direction to consider creative institutional control options for restricted release (under the LTR), and specifically using AAR Manufacturing Group (AAR) as a pilot project in this area. AAR proposes to release the eastern portion of its site for unrestricted use, and the western portion of the site for restricted use. AAR plans to enter into a settlement agreement with the NRC on the restrictions and controls needed for restricted release. The agreement would include using a covenant that would outline the restrictions on the site, such as prohibiting farming or developing residential properties on the site. The restrictive covenant would transfer to each subsequent owner of the property. The agreement would allow NRC or the local and State government to enforce the controls. Once AAR submits its plan for restricted release, the staff will complete its review and inform the Commission of the results and any policy issues that result from AAR's proposal.

In FY 2004, the staff intends to initiate other efforts to improve the decommissioning program. To increase the public awareness of and access to the status of sites undergoing decommissioning, the staff will enhance the information on the NRC Decommissioning Webpage, including posting decommissioning site summaries and site-specific communications plans. The staff also is evaluating whether there is a continued need to maintain an SDMP program within the context of the comprehensive decommissioning program, and plans to seek Commission direction on this topic.

## **CONCLUSIONS**

The NRC decommissioning program includes oversight and management of a wide variety of facilities, and includes the development of guidance and rules to facilitate the safe and timely decommissioning of these facilities. Continued improvements in the program, consolidation and publication of guidance documents for NRC staff and licensees managing decommissioning projects, and completion of several pertinent rulemakings have resulted in an efficient and consistent program that allows nuclear facilities to be decommissioned safely, while reducing the regulatory burden on licensees.

Future challenges for the decommissioning program include: implementing and identifying improvements for the processes; implementing the consolidated decommissioning guidance; implementing approaches for long-term institutional controls for sites that may not be able to adequately provide for the controls; improving our communication with the public and other stakeholders; and ensuring that all NRC requirements and guidance are based on the principal of providing an appropriate level of safety, while not imposing undue burden on the regulated community.

## REFERENCES

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- 3 U.S. Nuclear Regulatory Commission, U.S. Code of Federal Regulations 10 CFR Part 20.1403 "Criteria for license termination under restricted conditions" <u>Federal</u>, Register Vol. 62, July 21, 1997, 39058.
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- 7 U.S. Nuclear Regulatory Commission, U.S. Code of Federal Regulations 10 CFR Part 70.38, "Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas" Federal Register Vol. 59, July 15, 1994, 38240
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- 12 U.S. Nuclear Regulatory Commission, SECY-03-0069 "Results of the License Termination Rule Analysis" May 2, 2003
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