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# **Status of the Decommissioning Program**

**2011 Annual Report**

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**Division of Waste Management and Environmental Protection  
Office of Federal and State Materials and Environmental Management Programs  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001**

Enclosure

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## ABBREVIATIONS

ACL	alternate concentration limit
ANL	Argonne National Laboratory
BWXT	Babcock & Wilcox Technologies
CBP	Cementitious Barriers Partnership
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	<i>Code of Federal Regulations</i>
CRCPD	Conference of Radiation Control Program Directors
CY	calendar year
DOE	U.S. Department of Energy
D&D	decontamination and decommissioning
DP	decommissioning plan
DWMEP	Division of Waste Management and Environmental Protection
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ES	Energy Solutions
FCSS	Division of Fuel Cycle Safety and Safeguards
FONSI	Finding of No Significant Impact
FSME	Office of Federal and State Materials and Environmental Management Programs
FSS	final status survey
FSSR	Final Status Survey Report
FRN	<i>Federal Register</i> Notice
FTE	full-time equivalents
FUSRAP	Formerly Utilized Sites Remedial Action Program
FY	fiscal year
GETR	General Electric-Hitachi Test Reactor
IAEA	International Atomic Energy Agency

IDIP	Integrated Decommissioning Improvement Plan
ISFSI	independent spent fuel storage installation
ISR	in situ recovery
LLW	low-level waste
LTP	license termination plan
LTR	License Termination Rule
LTSP	long-term surveillance plan
N/A	not applicable
NARM	naturally occurring and accelerator-produced radioactive material
NASA	National Aeronautics and Space Administration
NEA	Nuclear Energy Agency
NIST	National Institute of Standards and Technology
NMSS	Office of Nuclear Material Safety and Safeguards
NRC	U.S. Nuclear Regulatory Commission
OAS	Organization of Agreement States
PNNL	Pacific Northwest National Laboratory
PSDAR	Post-Shutdown Decommissioning Activities Report
RAI	request for additional information
RES	Office of Nuclear Regulatory Research
RP	reclamation plan
RWMC	Radioactive Waste Management Committee
SDMP	Site Decommissioning Management Plan
SER	Safety Evaluation Report
SLDA	Shallow Land Disposal Area
TBD	to be determined
TER	technical evaluation report
TRIGA	Training, Research, Isotopes General Atomics
UMTRCA	Uranium Mill Tailings Radiation Control Act
USACE	U.S. Army Corps of Engineers
VESR	Vallecitos Experimental Superheat Reactor

# 1. INTRODUCTION

This report provides a summary of decommissioning of commercial nuclear facilities in the United States. Its purpose is to provide a reference document that summarizes the U.S Nuclear Regulatory Commission's (NRC's) decommissioning activities in fiscal year (FY) 2011, including the decommissioning of complex materials sites, commercial reactors, research and test reactors, uranium recovery facilities, and fuel cycle facilities. As such, this report discusses current progress and accomplishments of the NRC's Comprehensive Decommissioning Program, provides information supplied by Agreement States on decommissioning in their States, and identifies key Decommissioning Program activities that the staff will undertake in the coming year. The information contained in this report is current as of September 30, 2011.

Approximately 10 years ago, the Division of Waste Management and Environmental Protection (DWMEP) began an effort to enhance the effectiveness of NRC's Decommissioning Program. These enhancements included several initiatives: upgrading the resources available for decommissioning; developing, updating, and consolidating all guidance associated with decommissioning into a concise NUREG guidance document, NUREG-1757; developing metrics to track staff and licensee activities; establishing a proactive communication approach with licensees to facilitate decommissioning; and developing an integrated decommissioning improvement plan to systematically examine the decommissioning program for efficiency gains. This effort resulted in a significant improvement in the decommissioning process and a corresponding increase in the number of sites that have been successfully decommissioned since 2000 (over 50), some of which had been in decommissioning since the late 1980s. In FY 2011, the staff continued to focus on enhancing the effectiveness of the Decommissioning Program by undertaking a comprehensive effort to consolidate and update decommissioning guidance for uranium recovery facilities.

As noted in our FY 2010 report (SECY-09-0167, "Status of the Decommissioning Program-2010 Annual Report"), the character of the decommissioning program has changed a great deal as successes in the past have substantially reduced the inventory of complex materials sites in decommissioning status. In turn, new programmatic issues have arisen as NRC has increased its involvement with facilities with different decommissioning challenges. Examples of such challenges are the regulation of military sites contaminated with depleted uranium from past testing of munitions and the contamination of military sites with naturally occurring and accelerator-produced radioactive material (NARM). The decrease in the inventory of complex materials sites has allowed the staff in FY 2011 to focus specifically on the decommissioning of conventional uranium milling sites, many of which have been in decommissioning for decades. In addition to shifting uranium decommissioning activities to the decommissioning branches in order to enhance regulatory oversight, an effort was undertaken to leverage the broad decommissioning experience of the NRC staff to achieve efficiency gains. In particular, in the aforementioned guidance consolidation effort, highly experienced staff will consider what improvements need to be made in the guidance to allow for a better understanding of the "what" and "how" of uranium recovery decommissioning.

In terms of accomplishments, the final Decommissioning Planning Rule was published in June 2011, and the effort to produce the draft technical basis for a potential rulemaking on prompt remediation of spills was initiated. In addition, although only one site completed

decommissioning in FY 2011 (CSX), this fiscal year did see considerable progress being made at sites that have complex technical issues. For example, progress continued on the Phase I decommissioning activities at the West Valley Demonstration Project near Buffalo, New York; the U.S. Army Corps of Engineers has made substantial progress in completing remediation of contamination at the Stepan Chemical site in New Jersey; and remediation efforts have begun at the long-stalled Babcock & Wilcox Shallow Land Disposal Area in western Pennsylvania.

FY 2012 will see two to three complex materials sites completing decommissioning activities, with similar numbers completing decommissioning in succeeding years. Most power reactors undergoing decommissioning will remain in SAFSTOR and progress in research and test reactor decommissioning will increase somewhat. Within the next 3 years, several Title II<sup>1</sup> uranium recovery sites are expected to complete decommissioning and be transferred to the U.S. Department of Energy (DOE) for long-term control under a general license.

As a final note, in 2011, the Office of the Inspector General conducted an audit of the uranium recovery decommissioning activities. The staff expects that the results of that audit will be released in early FY 2012.

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<sup>1</sup> The Uranium Mill Tailings Radiation Control Act of 1978 classifies certain facilities that mill or process certain radioactive material as: Title 1, which refers to those facilities that were inactive, unregulated processing sites when the act was passed; or Title II, which refers to those facilities licensed by the NRC or an Agreement State. Section 2.4, *infra*, explains this in detail.

## 2. DECOMMISSIONING SITES

The NRC regulates the decontamination and decommissioning of materials and fuel cycle facilities, power reactors, research and test reactors, and uranium recovery facilities. The purpose of the Decommissioning Program is to ensure that NRC-licensed sites, and sites that were, or could be, licensed by the NRC, are decommissioned in a safe, timely, and effective manner so that they can be returned to beneficial use and to ensure that stakeholders are informed and involved in the process, as appropriate. This report summarizes a broad spectrum of activities associated with the Program's functions.

Each year, the NRC terminates approximately 200 materials licenses. Most of these license terminations are routine, and the sites require little, if any, remediation to meet the NRC's unrestricted release criteria. This report focuses on the more challenging sites where the termination of the site's license is not a routine licensing action.

As of September 30, 2011, 12 nuclear power and early demonstration reactors, 12 research and test reactors, 18 complex decommissioning materials facilities, one fuel cycle facility, 21 Title I uranium recovery facilities, and 11 Title II uranium recovery facilities are undergoing non-routine decommissioning or are in long-term safe storage, under NRC jurisdiction. The NRC public Web site (<http://www.nrc.gov/about-nrc/regulatory/decommissioning.html>) contains site status summaries for the facilities managed under the Decommissioning Program. These summaries describe the status of each site and identify the current technical and regulatory issues affecting the completion of decommissioning. The site summaries are updated on a quarterly basis. For those licensees or responsible parties that have submitted a decommissioning plan (DP) or license termination plan (LTP), the schedules for completion of decommissioning are based on an assessment of the complexity of the DP or LTP review. For those that have not submitted a DP or LTP, the schedules are based on other available site-specific information and on the anticipated decommissioning approach.

Through the Agreement State Program, 37 States have signed formal agreements with the NRC, by which those States have assumed regulatory responsibility over certain byproduct, source, and small quantities of special nuclear material, including the decommissioning of some complex materials sites and uranium recovery sites. Agreement States do not have regulatory authority over nuclear reactors licensed under Title 10, Part 50, "Domestic Licensing of Production and Utilization Facilities," of the *Code of Federal Regulations* (10 CFR Part 50) or fuel cycle facilities. Section 7 of this report discusses the NRC's coordination with the Agreement States' decommissioning programs.

### 2.1 Nuclear Power Reactor Decommissioning

NRC power reactor decommissioning activities include project management for decommissioning power reactors, technical review of licensee submittals in support of decommissioning, core inspections, support for the development of rulemaking and guidance, public outreach efforts, international activities, and participation in industry conferences and workshops. In addition, the staff routinely processes license amendments and exemptions to support the progressive stages of decommissioning. The staff regularly coordinates with other

offices on issues affecting both operating and decommissioning power reactors, and with the Office of Nuclear Material Safety and Safeguards (NMSS) regarding the independent spent fuel storage installations (ISFSIs) at reactor sites undergoing decommissioning.

As of September 30, 2011, the 12 nuclear power and early demonstration reactors identified in Table 2-1 are undergoing decommissioning. Table 2-1 provides an overview of the status of these nuclear power reactors. Plant status summaries for all decommissioning nuclear power reactors are available at <http://www.nrc.gov/info-finder/decommissioning/power-reactor/>.

### **2.1.1 Decommissioning Process**

The decommissioning process begins when a licensee decides to permanently cease operations. The major steps that make up the reactor decommissioning process are notification of cessation of operations, submittal and review of the Post-Shutdown Decommissioning Activities Report (PSDAR), submittal, review and approval of the LTP, implementation of the LTP, and completion of decommissioning.

#### Notification

When the licensee has decided to permanently cease operations, it is required to submit a written notification to the NRC. In addition, the licensee is required to notify the NRC in writing once fuel has been permanently removed from the reactor vessel.

#### Post-Shutdown Decommissioning Activities Report

Before, or within 2 years after cessation of operations, the licensee must submit a PSDAR to the NRC and a copy to the affected State(s). The PSDAR must include:

- a description and schedule for the planned decommissioning activities;
- an estimate of the expected costs; and
- a discussion of the means for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate, previously issued Environmental Impact Statements (EISs).

The NRC will notice receipt of the PSDAR in the *Federal Register* and make the PSDAR available for public comment. In addition, the NRC will hold a public meeting in the vicinity of the licensee's facility to discuss the PSDAR. Although the NRC does not approve the PSDAR, the licensee cannot perform any major decommissioning activities until 90 days after the NRC has received the PSDAR. After this period, the licensee can perform decommissioning activities as long as the activities do not have the following results:

- Foreclose release of the site for unrestricted use;
- Result in significant environmental impacts not previously reviewed; or



- Jeopardize reasonable assurance that adequate funds will be available for decommissioning.

The regulations in 10 CFR 50.59, “Changes, Tests, and Experiments,” allow a reactor licensee to make changes in the facility without a license amendment. In taking actions permitted under 10 CFR 50.59, after submittal of the PSDAR, the licensee must notify the NRC, in writing, before performing any decommissioning activity inconsistent with, or making any significant schedule change from, those actions and schedules in the PSDAR. The licensee exercises its own judgment in determining the scope and extent of the latitude provided in 10 CFR 50.59 and proceeds at its own risk.

### License Termination Plan

Each power reactor licensee must submit an application for termination of its license. An LTP must be submitted at least 2 years before the license termination date. The NRC and licensee hold presubmittal meetings to agree on the format and content of the LTP. These meetings are intended to improve the efficiency of the LTP development and review process. The LTP must include the following:

- a site characterization;
- identification of remaining dismantlement activities;
- plans for site remediation;
- detailed plans for the final radiation survey;
- description of the end use of the site, if restricted;
- an updated site-specific estimate of remaining decommissioning costs; and
- a supplement to the environmental report describing any new information or significant environmental change associated with the licensee’s proposed termination activities.

In addition, the licensee must demonstrate that it will meet the applicable requirements of the License Termination Rule (LTR) in 10 CFR Part 20, “Standards for Protection Against Radiation,” Subpart E, “Radiological Criteria for License Termination.”

The NRC will notice receipt of the LTP and make the LTP available for public comment. In addition, the NRC will hold a public meeting in the vicinity of the licensee’s facility to discuss the LTP and the LTP review process. The LTP technical review is guided by NUREG-1700, “Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans,” Revision 1, issued April 2003; NUREG-1757, “Consolidated Decommissioning Guidance,” Revision 1 of Volume 2, issued September 2006; and NUREG-0586, “Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities—Supplement 1,” issued November 2002. The LTP is approved by license amendment.

## Implementation of the License Termination Plan

After approval of the LTP, the licensee or responsible party must complete decommissioning in accordance with the approved LTP. The NRC staff will periodically inspect the decommissioning operations at the site to ensure compliance with the LTP. These inspections will normally include in-process and confirmatory radiological surveys.

Decommissioning must be completed within 60 years of permanent cessation of operations, unless otherwise approved by the Commission.

## Completion of Decommissioning

At the conclusion of decommissioning activities, the licensee will submit a Final Status Survey Report (FSSR) which identifies the final radiological conditions of the site and requests that the NRC either: (1) terminate the 10 CFR Part 50 license; or (2) reduce the 10 CFR Part 50 license boundary to the footprint of the ISFSI. For decommissioning reactors with no ISFSI, or an ISFSI holding a specific license under 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor Related Greater Than Class C Waste," completion of reactor decommissioning will result in the termination of the 10 CFR Part 50 license. The NRC will approve the FSSR and the licensee's request if it determines that the licensee has met both of the following conditions:

- The remaining dismantlement has been performed in accordance with the approved LTP.
- The final radiation survey and associated documentation demonstrate that the facility and site are suitable for release in accordance with the LTR.

### **2.1.2 Summary of Fiscal Year 2011 Activities**

- Regional staff proactively completed spent fuel pool safety inspections at spent fuel pool sites not accompanied by an operating power reactor, including GE Morris, Zion Station, and La Crosse. These inspections were conducted in response to the events at Fukushima Dai-ichi and utilized the inspector guidance found in TI2515/183. Inspections will continue through FY 2012 to verify program integrity and safe operations.
- The staff conducted the technical reviews and issued exemptions from the revised 10 CFR 73.55 for Fermi Unit 1, Dresden Unit 1, and Peach Bottom Unit 1.
- To ensure openness during the regulatory process, the staff held public meetings,<sup>2</sup> including meetings at Zion Station, Humboldt Bay, and La Crosse to discuss decommissioning actions.

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<sup>2</sup>Public meetings include formal public meetings sponsored by the NRC and/or the licensee, as well as technical meetings that are open to observation by members of the public.

- During the past year, staff performed inspections at Dresden Unit 1, Fermi Unit 1, Humboldt Bay, Indian Point 1, La Crosse, Millstone Unit 1, Peach Bottom Unit 1, Three Mile Island Unit 2, and Zion Units 1 and 2.

Additionally, substantial progress was made during FY 2011 at several sites:

- At Zion Units 1 and 2, decommissioning planning activities for the removal of large components were performed. Containment accesses were constructed to allow for equipment removal.
- At La Crosse, testing began on final spent fuel transfer equipment and dry-runs were conducted for the transfer of spent fuel from the spent fuel pool to the Interim Spent Fuel Storage Installation.
- At Humboldt Bay, planning for the removal and segmentation of the reactor core internal structures was performed.

### **2.1.3 Fiscal Year 2012 Trends and Areas of Focus**

Progress in power reactor decommissioning will remain at a similar level as in FY 2011, with the number of sites expected to stay the same as most reactors stay in SAFSTOR. Humboldt Bay is expected to complete decommissioning in 2016. Through unique decommissioning approaches, such as the transfer of the possession license for Zion Units 1 and 2 in FY 2010, there may be an increase in the rate of completion of power reactor decommissioning in the future.

**Table 2-1 Power and Early Demonstration Reactors Undergoing Decommissioning**

	<b>Reactor</b>	<b>Location</b>	<b>PSDAR* Submitted</b>	<b>LTP Submitted</b>	<b>LTP Approved</b>	<b>Completion of Decomm.**</b>
1	Dresden Unit 1	Morris, IL	6/98	TBD	TBD	2036
2	Fermi Unit 1	Newport, MI	4/98	2011***	2030	2032
3	Humboldt Bay	Eureka, CA	2/98	2011	2012	2015
4	Indian Point Unit 1	Buchanan, NY	1/96	2020	2022	2026
5	La Crosse	La Crosse, WI	5/91	TBD	TBD	2026
6	Millstone Unit 1	Waterford, CT	6/99	TBD	TBD	TBD
7	Nuclear Ship Savannah	Baltimore, MD	12/08	2014	TBD	2031
8	Peach Bottom Unit 1	Delta, PA	6/98	TBD	TBD	2034
9	San Onofre Unit 1	San Clemente, CA	12/98	TBD	TBD	2030
10	Three Mile Island Unit 2	Harrisburg, PA	TBD	TBD	TBD	TBD
11	Vallecitos Boiling Water Reactor	Pleasanton, CA	7/66	TBD	TBD	2019
12	Zion Units 1 & 2	Zion, IL	2/00	TBD	TBD	2020

TBD to be determined

\* PSDAR or DP equivalent.

\*\* For decommissioning reactors with no ISFSI or an ISFSI licensed under 10 CFR Part 72, completion of decommissioning will result in the termination of the 10 CFR Part 50 license. For reactors with an ISFSI licensed under the provisions of 10 CFR Part 50, completion of decommissioning will result in reducing the 10 CFR Part 50 license boundary to the footprint of the ISFSI.

\*\*\* Licensing action put on hold at licensee's request.

Note: Licensees submitted DPs (or equivalent) before 1996 and PSDARs after 1996.

## **2.2 Research and Test Reactor Decommissioning**

NRC research and test reactor decommissioning activities include project management for the decommissioning of these reactors, technical review of licensee submittals in support of decommissioning, core inspections, support for the development of rulemaking and guidance, public outreach, and participation in industry conferences and workshops. In addition, the staff routinely processes license amendments and exemptions to support the progressive stages of decommissioning. The staff regularly coordinates with other offices on issues affecting research and test reactors, both operating and decommissioning.

As of September 30, 2011, the 12 research and test reactors identified in Table 2-2 are undergoing decommissioning. Plant status summaries for all decommissioning research and test reactors are available at <http://www.nrc.gov/info-finder/decommissioning/research-test/>.

### **2.2.1 Decommissioning Process**

The decommissioning process begins when a licensee decides to permanently cease operations. The major steps of the decommissioning process are submittal, review and approval of a DP, implementation of the DP, and completion of decommissioning.

#### Application

Within 2 years following permanent cessation of operations, the licensee must submit a written application for license termination to the NRC and in no case later than 1 year before license expiration. Each application for license termination must be accompanied by a DP submitted for NRC approval. The NRC and licensee hold presubmittal meetings to agree on the format and content of the DP. These meetings are intended to improve the efficiency of the DP development and review process.

#### Decommissioning Plan

The DP must include the following:

- The choice of the alternative<sup>3</sup> for decommissioning with a description of the planned decommissioning activities;
- A description of the controls and limits on procedures and equipment to protect occupational and public health and safety;
- A description of the planned final radiation survey;

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<sup>3</sup> An alternative is acceptable if it provides for completion of decommissioning without significant delay. Consideration will be given to delayed alternatives only when necessary to protect public health and safety, including cases where waste disposal capacity is unavailable or other site-specific conditions, such as the presence of co-located nuclear facilities, are a factor.

- An updated estimate of the expected costs for the alternative chosen, including the following:
  - A comparison with the estimated present funds set aside for decommissioning.
  - A plan for assuring the availability of adequate funds for completion of decommissioning.
- A description of technical specifications, quality assurance provisions, and physical security plan provisions in place during decommissioning; and
- A discussion of the means for evaluating the environmental impacts associated with decommissioning activities, such as a supplement to the environmental report describing any new information or significant environmental change associated with the licensee's proposed termination activities.

In addition, the licensee must demonstrate that it will meet the applicable requirements of the LTR.

The technical review is guided by NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," issued February 1996, and applicable portions of NUREG-1757. The DP is approved by license amendment, as a supplement to the Safety Evaluation Report (SER), or equivalent.

#### Implementation of the Decommissioning Plan

For DPs in which the major dismantlement activities are delayed by first placing the facility in storage, planning for these delayed activities may be less detailed. Updated detailed plans must be submitted and approved before the start of any dismantlement activities.

For DPs that delay completion of decommissioning by including a period of storage or surveillance, the licensee shall meet the following conditions:

- Funds needed to complete decommissioning will be placed into an account segregated from the licensee's assets and outside the licensee's administrative control during the storage or surveillance period, or a surety method or fund statement of intent will be maintained in accordance with the criteria of 10 CFR 50.75(e).
- Means will be included for adjusting cost estimates and associated funding levels over the storage or surveillance period.

After approval of the DP, the licensee or responsible party must complete decommissioning in accordance with the approved DP. The NRC staff will periodically inspect the decommissioning operations at the site to ensure compliance with the DP. These inspections will normally include in-process and confirmatory radiological surveys.

## Completion of Decommissioning

At the conclusion of decommissioning activities, the licensee will submit an FSSR which identifies the final radiological conditions of the site and request that the NRC terminate the 10 CFR Part 50 license. The NRC will approve the FSSR and the licensee's termination request if it determines that the licensee has met the following conditions:

- The decommissioning has been performed in accordance with the approved DP.
- The final radiation survey and associated documentation demonstrate that the facility and site are suitable for release in accordance with the LTR.

### **2.2.2 Summary of Fiscal Year 2011 Activities**

- The staff completed its review and approved the DP for Worcester Polytechnic Institute in Worcester, Massachusetts.
- Approved the DP and Final Status Survey Plan for the University of Arizona facility and met with University of Arizona officials and their contractor in preparation for the start of decommissioning activities in FY 2011. Inspections and confirmatory surveys were completed in September 2011. Physical work is expected to be completed in late calendar year (CY) 2011.
- The staff met with officials at the University of Buffalo to discuss the plans for decommissioning and the schedule for submitting the decommissioning plan.
- The staff met with the University of Illinois and their contractor in preparation for active decommissioning starting in FY 2012.
- The staff performed inspections at Ford Nuclear Reactor, General Atomics TRIGA Mark F, General Atomics TRIGA Mark I, General Electric-VESR, National Aeronautics and Space Administration (NASA) Mockup and Plum Brook, and Veterans Administration facilities.

### **2.2.3 Fiscal Year 2012 Trends and Areas of Focus**

Progress in research and test reactor decommissioning is expected to increase in FY 2012 and beyond, with the University of Arizona and NASA Mockup and Plum Brook facilities expected to complete decommissioning. Staff work associated with the NASA Plum Brook facility will include the review of 17 FSSRs related to the decommissioning activities.



**Table 2-2 Research and Test Reactors Undergoing Decommissioning**

<b>Reactor</b>	<b>Location</b>	<b>Status</b>	<b>Completion of Decomm.</b>	
1	Ford Nuclear Reactor	Ann Arbor, MI	DP Approved	2013
2	General Atomics TRIGA Mark F	San Diego, CA	DP Approved	2019
3	General Atomics TRIGA Mark I	San Diego, CA	DP Approved	2019
4	General Electric- Hitachi GETR	Sunol, CA	Possession-Only	2019
5	General Electric-Hitachi VESR	Sunol, CA	Possession-Only	2019
6	NASA Mockup	Sandusky, OH	DP Approved	2012
7	NASA Plum Brook	Sandusky, OH	DP Approved	2012
8	University of Arizona	Tucson, AZ	DP Approved	2012
9	University of Buffalo	Buffalo, NY	Possession-Only	TBD
10	University of Illinois	Urbana, IL	DP Approved	2013
11	Veterans Administration	Omaha, NE	DP Submitted	2013
12	Worcester Polytechnic Institute	Worcester, MA	DP Approved	TBD

Notes: GETR            General Electric Test Reactor  
 NASA                National Aeronautics and Space Administration  
 TBD                    to be determined  
 TRIGA                Training, Research, Isotopes General Atomics  
 VESR                 Vallecitos Experimental Superheat Reactor

## **2.3 Complex Material Facility Decommissioning**

Materials facilities decommissioning activities include maintaining regulatory oversight of complex decommissioning sites, undertaking financial assurance reviews, examining issues and funding options to facilitate remediation of sites in non-Agreement States, interacting with the U.S. Environmental Protection Agency (EPA), interacting with the U.S. Army Corps of Engineers (USACE), inspecting complex decommissioning sites, conducting public outreach, participating in international decommissioning activities, conducting program evaluations, and participating in industry conferences and workshops. In addition, the staff routinely reviews decommissioning financial assurance submittals for operating materials and fuel cycle facilities and maintains a financial instrument security program.

As of September 30, 2011, 18 complex materials sites are undergoing decommissioning (see Table 2-3). In January 2011, Shieldalloy Metallurgical Corporation once again became an NRC licensee. Authority for the site was initially transferred on September 30, 2009, when NRC entered into an agreement with the State of New Jersey; however, the U.S. Court of Appeals concluded that the NRC provided an insufficient response to Shieldalloy's comment asking NRC to retain jurisdiction over its site, and vacated the NRC's transfer of authority to New Jersey. The NRC is assessing the decision, with respect to future actions regarding New Jersey and its authority as an Agreement State Licensing Body for Shieldalloy.

Complex material sites are defined as sites where the complexity of the decommissioning will require more than minimal technical and administrative support from the headquarters program office. It is expected that these sites will take more than a year to complete the decommissioning process. Examples of complex materials sites include: sites with groundwater contamination; sites containing significant soil contamination; sites in which the owners are in bankruptcy, any site where a decommissioning plan is required; all fuel cycle facilities undergoing decommissioning; and sites where there is significant public and/or Congressional interest.

Table 2-3 identifies whether the completion compliance criteria are based on the dose-based LTR criteria or the concentration-based Site Decommissioning Management Plan (SDMP) Action Plan criteria. Under the provisions of 10 CFR 20.1401(b), any licensee or responsible party that submitted its DP before August 20, 1998, and received NRC approval of that DP before August 20, 1999, may use the SDMP Action Plan criteria for site remediation. In the staff requirements memorandum on SECY-99-195, "Notation Vote on an Exemption for Decommissioning Management Program Sites with Decommissioning Plans under Nuclear Regulatory Commission Review and Eligible for Grandfathering, Pursuant to 10 CFR 20.1401(b)(3)," dated August 18, 1999, the Commission granted an extension of the DP approval deadline for 12 sites to August 20, 2000. In September 2000, the staff notified the Commission that the NRC had approved all 12 DPs by the deadline. All other sites must use the dose-based criteria of the LTR. Only one complex material site remains eligible to use the SDMP Action Plan criteria (see Table 2-3).

Status summaries for the complex materials sites undergoing decommissioning are provided at <http://www.nrc.gov/info-finder/decommissioning/complex/>.

### 2.3.1 Decommissioning Process

Any one of the following events can initiate the decommissioning process:

- The license expires;
- The licensee has decided to permanently cease operations at the entire site (or in any separate building or outdoor area that contains residual radioactivity, such that the building or outdoor area is unsuitable for release in accordance with NRC requirements). In the parenthetical cases, the decommissioning process does not lead to license termination;
- No principal activities have been conducted for a period of 24 months;
- No principal activities have been conducted for a period of 24 months in any separate building or outdoor area that contains residual radioactivity, such that the building or outdoor area is unsuitable for release in accordance with NRC requirements. In these cases, the decommissioning process does not lead to license termination.

Major steps in the decommissioning process are notification of cessation of operations, submittal, review and approval of the DP, implementation of the DP, and completion of decommissioning.

#### Notification

Within 60 days of the occurrence of any of the triggering conditions, the licensee or responsible party is required to notify the NRC of such occurrence and either begin decommissioning or, if required, submit a DP within 12 months of notification and begin decommissioning after approval of the plan.<sup>4</sup> With NRC approval, the regulations allow alternative schedules.

#### Decommissioning Plan

A DP must be submitted if required by license condition or if the NRC has not previously approved the procedures and activities necessary to decommission and the procedures could increase potential health and safety impacts on workers or the public, such as in any of the following cases:

- Procedures would involve techniques not applied routinely during cleanup or maintenance operations;
- Workers would be entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during operation;

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<sup>4</sup> Unlike the case of nuclear power reactor decommissioning, complex material site licensees or responsible parties cannot proceed with decommissioning until the DP is approved.

- Procedures could result in significantly greater airborne concentrations than are present during operations;
- Procedures could result in significantly greater releases of radioactive material to the environment than those associated with operations.

Before submitting a DP, the licensee or responsible party meets with the NRC to agree on the form and content of the DP. This presubmittal meeting is intended to make the DP review process more efficient by reducing the need for requests for additional information (RAIs). It is important for the NRC and the licensee to work effectively in a cooperative manner to resolve the issues that make the decommissioning of complex sites challenging.

In a process similar to LTPs and research and test reactor DPs, the complex material site DP review process begins with an acceptance review, to ensure that the DP contains: (1) all required information; (2) legible drawings; (3) justification for any proprietary information claims; and, (4) no obvious technical inadequacies. The objective of the acceptance review is to verify that the application contains sufficient information before the staff begins an in-depth technical review. In addition, the staff will conduct a limited technical review to identify significant technical deficiencies at an early stage, thereby avoiding a detailed technical review of a technically inadequate submittal. At the conclusion of the acceptance review, the NRC will either accept the DP for detailed technical review or not accept it and return it to the licensee or responsible party with the deficiencies identified. The staff's detailed technical review is guided by NUREG-1757 and its supporting references.

The staff documents the results of its detailed technical review in an SER and either an Environmental Assessment (EA) or EIS. Before finalizing the E/A/EIS, the staff provides its draft to the appropriate State agency for review and comment. If an EA is developed and a Finding of No Significant Impact (FONSI) is made, the final EA is published in full or summary form in the *Federal Register*. If a FONSI cannot be made, an EIS is developed.

The NRC conducts reviews of DPs proposing restricted release in two phases. The first phase of the review focuses on the financial assurance and institutional control provisions of the DP. The staff will begin the review of the remainder of the DP only after it is satisfied that the licensee's or responsible parties' proposed institutional control and financial assurance provisions comply with the requirements of the LTR. The applicable portions of NUREG-1757 guide both phases of the review.

The second phase of the review addresses all other sections of the technical review and will usually include the development of an EIS. If an EIS is to be prepared, the following steps are taken:

- Publication of a Notice of Intent;
- Public scoping meeting;
- Preparation and publication of the scoping report;
- Preparation and publication of the draft EIS;

- Public comment period on the draft EIS, including a public meeting; and
- Preparation and publication of the final EIS.

In parallel with the development of the EIS, the staff develops a draft and final SER. The staff coordinates the development of the draft SER with the development of the draft EIS so that any RAIs can be consolidated.

Regardless of whether an EA or EIS is developed, the staff structures its reviews to minimize the number of RAIs, without diminishing the technical quality or completeness of the licensee's or responsible party's ultimate submittal. For example, the staff first develops a set of additional information needs and clarifications, including the bases for the additional information and clarifications, and then meets with the licensee or responsible party to discuss the issues. The staff gives notice of, and conducts, this meeting in accordance with NRC requirements for meetings open to the public. The staff documents the results of the meeting in a meeting report. The formal RAI includes any issues that cannot be resolved during the meeting. In developing the final RAI, the staff documents the insufficient or inadequate information submitted by the licensee or responsible party and communicates what additional information is needed to address the identified deficiencies. The quality and completeness of the licensee's DP factor directly into the scope and extent of the NRC's RAIs.

After publication of the FONSI or EIS, the NRC issues a license amendment, approving the DP, along with any additional license conditions found to be necessary as a result of the findings of the EA, EIS, and/or the SER.

#### Implementation of the Decommissioning Plan

After approval of the DP, the licensee or responsible party must complete decommissioning within 24 months in accordance with the approved DP, or apply for an alternate schedule. The NRC staff will periodically inspect the decommissioning operations at the site to ensure compliance with the DP. These inspections will normally include in-process and confirmatory radiological surveys.

#### Completion of Decommissioning

As the final step in decommissioning, the licensee or responsible party is required to do the following:

- Certify the disposition of all regulated material, including accumulated wastes, by submitting a completed NRC Form 314, "Certificate of Disposition of Materials," or equivalent information.
- Conduct a radiation survey of the premises where licensed activities were carried out (in accordance with the procedures in the approved DP, if a DP is required) and submit a report of the results of the final status survey, unless the licensee or responsible party demonstrates in some other manner that the premises are suitable for release in accordance with the LTR.

Licenses are terminated or the site is released by written notice when the NRC determines that the licensee has met the following conditions:

- Regulated material has been disposed of properly.
- Reasonable effort has been made to eliminate residual radioactive contamination, if present.
- The radiation survey has been performed or other information submitted by the licensee or responsible party demonstrates that the premises are suitable for release in accordance with the LTR.

### **2.3.2 Summary of Fiscal Year 2011 Activities**

- The staff completed its review of Westinghouse Electric-Hematite Decommissioning Plan for its former Fuel Fabrication facility in Festus, Missouri. Related approvals include Fundamental Nuclear Material Control Plan, Physical Security Plan, Decommissioning Funding Plan, and a 20.2002 exemption for disposal of waste to US Ecology, Idaho. Final approval is expected in early FY 2012.
- The staff continued implementing the limited involvement approach approved by the Commission in June 2008, for the Navy's remediation of the Hunters Point Shipyard site in San Francisco, CA.
- The staff conducted site visits at McClellan Air Force Base, Alameda Naval Air Station, and Hunters Point Shipyard.
- The Sigma-Aldrich site was transferred from Regional lead to Headquarters lead due to the need for detailed expertise to understand licensee modeling of groundwater.
- Inspections were performed at AAR Manufacturing, ABB Prospects, ABC Labs, Jefferson Proving Grounds, Mallinckrodt Chemical, NWI Breckenridge, Sigma-Aldrich, Stepan Chemical, United Nuclear Corporation (UNC) Naval Products, and Westinghouse Electric-Hematite facilities.

Other significant activities are described below.

#### **Release of CSX Property**

The CSX Transportation (CSX) property is an unlicensed parcel of land containing three major rail lines and right-of-way adjacent to the AAR Manufacturing in Livonia, Michigan. The AAR site is a former Site Decommissioning Management Plan (SDMP) unlicensed site. Residual radioactivity was found on the CSX property that was believed to have originated from the AAR site. In late 2009, the project management for CSX property was transferred from Region III to FSME/DWMEP's Reactor Decommissioning Branch, which also had project management responsibility for the AAR site. The CSX property was surveyed by Headquarters health

physicists, Region III inspectors, and the Oak Ridge Institute for Science and Education (ORISE), NRC's independent contractor. The CSX property was found to meet unrestricted release criteria under 10 CFR 20.1402 on July 28, 2011 (ML111370451).

#### Progress at NWI Land Management - Breckenridge

The decommissioning contractor, Energy Solutions (ES), completed all remediation activities at the Breckenridge Waste Disposal Site, and as of September 2011, completed backfilling, grading and seeding the site. The final status surveys were completed and ES plans to submit their final status survey report in October 2011 for NRC review and approval. The Region III inspectors completed all inspections and their confirmatory surveys of the site. Region III management and staff attended a public meeting on Wednesday, September 21, 2011, to communicate the status and final steps for the project to local stakeholders. EPA and their contractor removed for disposal two 55 gallon drums of chemical. The Region III project management staff plans to complete a SER and *Federal Register* notice (FRN) sometime in December 2011 to bring the Breckenridge Decommissioning Project to a conclusion.

#### Hunters Point, McClellan, and Alameda Military Sites in California

The staff continued implementing the Limited Involvement Approach approved by the Commission in June 2008 for the Navy's remediation of the Hunters Point Shipyard site in San Francisco, CA. This approach includes reliance on the Navy's ongoing remediation of this Superfund site conducted under the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) process and with EPA oversight. The primary purpose of NRC's Limited Involvement Approach is to stay informed about the ongoing Navy remediation activities and confirm its continued reliance on the CERCLA process and EPA oversight. The staff also continued the same approach for the McClellan former Air Force Base, a Superfund site in Sacramento, CA. The staff conducted its third annual sites visits in March 2011 to these sites that included site visits with the Navy and Air Force, along with meetings with EPA Region 9, and State of California agencies. Conference calls were also conducted with representatives from the City of San Francisco and Sacramento County. These discussions with the principal stakeholders that are participating in the ongoing remediation process continue to be an effective way to understand the remediation progress, issues that are being addressed, and the oversight activities of EPA and the State agencies. Based on these interactions, the staff plans to continue its reliance on the CERCLA process and EPA oversight at these two sites.

As a follow-up to a September 2009 scoping site visit and March 2010 site visit to the Navy's Alameda Naval Air Station in Alameda, CA, the staff conducted a second site visit in March 2011 and met with the Navy, EPA Region 9, and State of California agencies. A conference call was also conducted with the City of Alameda representatives. These visits provided information on the radioactive contaminants at this site, the Navy's ongoing remediation under the CERCLA process, and EPA's oversight activities. Based on the information from the site visits and additional discussions with the Navy, the staff has decided to take the Limited Involvement Approach at Alameda and rely on the Navy's use of the CERCLA process and EPA's oversight as it is doing for Hunters Point Shipyard and McClellan sites. The staff plans to prepare agreement letters in 2011 to EPA Region 9 and the Navy to document NRC's approach for this site.

## Clarification of NRC's Jurisdiction of Military Radium-226

The Statement of Considerations for NRC's November 2007 NARM rule included a commitment for NRC to interact with the military to obtain a common understanding of the uses of discrete sources of radium-226 and resolve any potential conflicts on a case-by-case basis. During FY 2011, the staff continued its interactions with the military services to understand the types of radium-226 that are under military control (e.g., contamination, devices in vehicles and aircraft, and devices in storage) and associated military activities (e.g., remediation of contamination in soil and landfills, and removal of devices from vehicles). The staff worked with each military service to obtain a list of sites with confirmed radioactive material, including radium-226, that provided estimates of how many sites could come under NRC jurisdiction. These interactions as well as the staff annual site visits to the Navy's Hunters Point Shipyard site and the Air Force's McClellan site contributed to identifying potential issues. The issues and staff recommendations for clarifying NRC's jurisdiction for certain types of radium-226 under military control were provided in a February 16, 2011, Commission paper (SECY-11-0023). On March 24, 2011, the Commission approved the staff's recommendation to prepare a guidance document and FRN clarifying that radium-226 that would be subject to NRC regulations, and described possible regulatory approaches to be used to implement NRC authority for radium-226 contamination and radium-226 in items and equipment (SRM-SECY-11-0023). The FRN and draft Regulatory Issue Summary were issued on July 8, 2011 (76 FR 40282), for public comment. The initial 60-day public comment period ended on September 6, 2011. On September 15, 2011 (76 FR 57006), the public comment period was reopened for an additional 75 days, and currently closes on November 29, 2011. In addition, the U.S. Department of Defense has requested a meeting with the NRC staff; accordingly, a public meeting has been scheduled for November 1, 2011.

## Coordination with U.S. Army Corps of Engineers Regarding Formerly Utilized Sites Remedial Action Program Sites

When New Jersey became an Agreement State on September 30, 2009, it did not request regulatory authority for 11(e).2 materials. As a result, the NRC retained jurisdiction over the Stepan Company site, in Maywood, New Jersey. There are three burial pits at the Stepan site. On October 21, 2008, NRC issued a Confirmatory Order suspending Stepan's NRC license in order for the U.S. Army Corps of Engineers (USACE) to initiate remediation activities of Formerly Utilized Sites Remedial Action Program (FUSRAP) material under their CERCLA authority. To date, the license remains suspended for all three burial pits. USACE has completed the remediation for all three burial pits and is continuing with final status survey to ensure cleanup criteria have been met. The NRC staff continues to perform periodic inspections to ensure that the licensee complies with environmental monitoring requirements.

In FY 2011, the NRC participated in several interagency meetings with USACE and the State of Pennsylvania to discuss a path forward for license suspension and the development of Confirmatory Order for Babcock & Wilcox Technologies (BWXT) Shallow Land Disposal Area (SLDA) Site in Vandergrift, Pennsylvania. There are 10 burial pits with waste contaminated with special nuclear materials. On July 27, 2011, the NRC issued a letter to USACE regarding the acceptability of the Work Plans developed to address special nuclear material requirements in 10 CFR Parts 70, 73 and 74. On August 5, 2011, the NRC issued a Confirmatory Order suspending BWXT's license to allow for USACE to initiate remediation activities of FUSRAP



material under their CERCLA authority. Subsequently, on August 22, 2011, USACE commenced remediation activities at burial pits #2 and #3. The USACE projects that remediation activities will take approximately 10 years to complete. The NRC staff will continue to monitor USACE's progress at the SLDA site through routine site visits.

There are two other FUSRAP sites that are being remediated by NRC licensees instead of USACE: Mallinckrodt in St. Louis, Missouri, and ABB in Windsor, Connecticut. Significant remediation progress has been made in FY 2011 for both sites, and remediation is near completion for both.

#### Review of University of Missouri's Alternative Schedule for Decommissioning

In March 2011, the staff accepted and began its technical review of a request for an alternative schedule for decommissioning for Pickard Hall located on University of Missouri's campus. Pickard Hall, built in 1892, was identified as containing residual naturally occurring radiological material from early 1900s radium separation work performed in the building. The contamination was discovered by the university in 2009, during a review of archived records. The licensee requested an alternative schedule for decommissioning since the building also serves as the University's Museum of Art and Archaeology and contains numerous vulnerable artifacts. The staff is reviewing the request to ensure the university's controls are adequate to ensure no undue health risks to the occupants of the building or the members of the public should an alternative schedule be approved.

#### **2.3.3 Fiscal Year 2012 Trends and Areas of Focus**

Progress in the decommissioning of complex material sites is expected to increase in FY 2012, with sites such as ABC Laboratories, NWI Breckenridge, and UNC Naval Products expected to complete decommissioning in the coming year. The staff will also continue its focus on Army sites with depleted uranium contamination, and continue to work toward clarifying NRC's jurisdiction of military radium-226.

**Table 2-3 Complex Decommissioning Sites**

Name	Location	Date DP Submitted	Date DP Approved	Compliance Criteria	Projected Removal	
1	AAR Manufacturing, Inc.	Livonia, MI	10/97 revised 9/06, 4/07 <sup>+</sup>	5/98 TBD	LTR-RES	2/13
2	ABB Prospects, Inc.	Windsor, CT	4/03	6/04	LTR-UNRES	9/12
3	ABC Labs	Columbia, MO	10/09	TBD	LTR-UNRES	2012
4	Babcock & Wilcox (Shallow Land Disposal Area)	Vandergrift, PA	6/01 revised N/A	N/A	LTR-UNRES	12/20
5	Beltsville Agricultural Research Laboratory	Beltsville, MD	8/09	TBD	LTR-UNRES	10/12
6	FMRI (Fansteel), Inc.	Muskogee, OK	8/99, revised 5/03	12/03	LTR-UNRES	6/23
7	Hunter's Point Naval Shipyard** (former Naval shipyard)	San Francisco, CA	N/A	N/A	N/A	N/A
8	Jefferson Proving Ground	Madison, IN	8/99 revised 6/02, 9/13	10/02 TBD	LTR-RES	12/13
9	Kerr-McGee	Cimarron, OK	4/95	8/99	Action-UNRES	1/17
10	Mallinckrodt Chemical, Inc.	St. Louis, MO	Phase 1 11/97, Phase 2 9/08	Phase 1 5/02, Phase 2 7/10	LTR-UNRES	2/13

**Table 2-3 Complex Decommissioning Sites**

Name		Location	Date DP Submitted	Date DP Approved	Compliance Criteria	Projected Removal
11	McClellan** (former Air Force base)	Sacramento, CA	N/A	N/A	N/A	N/A
12	NWI Breckenridge	Breckenridge, MI	3/04, 1/10	8/04, 2/10	LTR-UNRES	12/11
13	Shieldalloy Metallurgical Corporation	Newfield, NJ	6/06	TBD	LTR-RES	TBD
14	Sigma-Aldrich	Maryland Heights, MO	10/08, revised 11/10	5/09, revised TBD	LTR-UNRES	TBD
15	Stepan Chemical Company	Maywood, NJ	N/A	N/A	LTR-UNRES	2/13
16	UNC Naval Products	New Haven, CT	8/98, revised 2004, 12/06	4/99, revised 10/07	LTR-UNRES	9/12
17	West Valley Demonstration Project	West Valley, NY	Phase 1 3/09	Phase 1 2/10	LTR-UNRES*	TBD
18	Westinghouse Electric-Hematite Facility	Festus, MO	4/04 revised 6/06, 8/09	TBD	LTR-UNRES	12/13

- + The staff is currently reviewing the draft legal agreement and restrictive covenant for restricted use.
- \* The West Valley Phase I DP includes plans to release a large portion of the site for unrestricted use, while the remainder of the site may have a perpetual license or be released with restrictions.
- \*\* The Navy's Hunter's Point Shipyard site and the Air Force's McClellan site are being remediated by the Navy and Air Force, respectively, under the required CERCLA process and EPA oversight. It is assumed that some licensable material might be present at both sites; however, NRC has not licensed these sites. Instead, the Commission has approved a "limited involvement approach to stay informed" and will rely on the ongoing CERCLA process and EPA oversight. More information is available on this approach in SECY-08-0077.

Notes:

- The compliance criteria identified in this table present the staff's most recent information but do not necessarily represent the current or likely outcome.
- Abbreviations used in this table include: "N/A" for not applicable, "TBD" for to be determined, "Action" for SDMP Action Plan criteria, "LTR" for LTR criteria, "RES" for restricted use, and "UNRES" for unrestricted use.
- Reasons for multiple DP submittals range from changes in the favored decommissioning approach, to the phased implementation of decommissioning, to poor submittals.

## 2.4 Uranium Recovery Facility Decommissioning<sup>5</sup>

In enacting the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), as amended, Congress had two general goals. The first was to provide a remedial action program to stabilize and control the residual radioactive material at various identified inactive mill sites, the second was to ensure the adequate regulation of uranium production activities and cleanup of mill tailings at mill sites that were active and licensed by the NRC (or Agreement States). At the time, the NRC did not have direct regulatory control over uranium mill tailings. The tailings themselves did not fall into any category of NRC-licensable material. Before 1978, the NRC was regulating tailings at active mills indirectly through its licensing of source material milling operations under the Atomic Energy Act of 1954, as supplemented by authority provided by the National Environmental Policy Act of 1969, as it was then construed.

Through the provisions of Title I of UMTRCA, Congress addressed the problem of inactive, unregulated tailings piles. Title I of UMTRCA specifies the inactive processing sites for remediation. Except at the Atlas Moab site, surface reclamation activities have been completed and approved by the NRC at all Title I sites. However, groundwater cleanup is still ongoing at many of these Title I sites. When groundwater cleanup is completed, DOE will submit a revised long-term surveillance plan (LTSP) for NRC concurrence. Table 2-4a identifies the Title I sites that are undergoing decommissioning. Title 10 of the *Code of Federal Regulations* (10 CFR), Section 40.27, "General License for Custody and Long-Term Care of Residual Radioactive Material Disposal Sites," governs the long-term care of Title I sites under a general license held by either DOE or the State in which the site is located.

Title II of UMTRCA addresses mill tailings produced at active sites licensed by the NRC or an Agreement State. Title II amended the definition of byproduct material to include mill tailings and added specific authority for the Commission to regulate this new category of byproduct material at licensed sites. Title II uranium recovery decommissioning activities include regulatory oversight of decommissioning uranium recovery sites; review of site characterization plans and data; review and approval of reclamation plans (RPs); preparation of EAs and EISs; inspection of decommissioning activities, including confirmatory surveys; decommissioning cost estimate reviews, including annual surety updates; and oversight of license termination. Regulations governing uranium recovery facility decommissioning are at 10 CFR Part 40, "Domestic Licensing of Source Material," and in Appendix A to that Part, "Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings of Wastes Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for Their Source Material Content." Licensed operations include conventional uranium mill facilities and in situ recovery (ISR) facilities, as both types of these facilities conduct "uranium milling" (as defined in 10 CFR 40.4). Table 2-4b identifies the Title II sites no longer operating and in decommissioning. As of September 30, 2009, 11 Title II uranium recovery facilities are undergoing decommissioning. Title 10 of the *Code of Federal Regulations*, Section 40.28, "General License for Custody and Long-Term Care of Uranium or Thorium Byproduct Materials Disposal Sites," governs the long-term care of Title II conventional uranium mill sites under a general license held by either DOE or the State in which the site is located. Status summaries for the Title II sites undergoing decommissioning are provided at <http://www.nrc.gov/info-finder/decommissioning/uranium/>.

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<sup>5</sup> This report does not address regulation of new or operating uranium recovery facilities with the exception of a brief discussion on their decommissioning.

### 2.4.1 Decommissioning Process for Uranium Mills

These facilities are not subject to the license termination criteria set forth in Subpart E, “Radiological Criteria for License Termination,” to 10 CFR Part 20, “Standards for Protection Against Radiation.” Instead, they are subject to similar requirements in 10 CFR Part 40, Appendix A, as summarized below.

Any one of the following events may initiate the decommissioning process for uranium recovery facilities:

- The license expires or the license is revoked;
- The licensee has decided to permanently cease principal activities at the entire site or in any separate building or outdoor area;
- No principal activities have been conducted for a period of 24 months (except for impoundments and disposal areas);
- No principal activities have been conducted for a period of 24 months in any separate building or outdoor area (except for impoundments and disposal areas).

The uranium recovery facility decommissioning process includes several major steps, depending on the type of facility. These steps may include notification of intent to decommission; submittal, review and approval of the DP<sup>6</sup> or RP; implementation of the DP/RP; completion of decommissioning/reclamation; submittal and review of a completion report; submittal and review of a well-field restoration report (for ISR facilities); submittal and review of an LTSP for sites with tailings piles; termination of the license; and transfer of the property to the long-term care custodian for sites with tailings piles, under a general license held by either DOE or a State.

#### Notification

Within 60 days of the occurrence of any of the triggering events, the licensee must notify the NRC of such occurrence and either begin decommissioning or, if required, submit a DP/RP within 12 months of notification and begin decommissioning upon plan approval. For new ISR or conventional facilities, the licensee submits groundwater restoration, surface reclamation, and facility DPs with the initial license application. The NRC reviews and approves these plans before issuing a license. For ISR facilities, groundwater restoration should occur at one well-field, while other well-fields are actively extracting uranium. Under 10 CFR 40.42(f), facilities may delay decommissioning if the NRC determines that such a delay is not detrimental to public health and the environment and is in the public interest.

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<sup>6</sup> For uranium recovery sites, DPs typically deal with the remediation of structures, while RPs typically deal with tailings impoundments, groundwater cleanup, and other remediation efforts.

### Decommissioning Plan/Reclamation Plan—Existing Facilities

All uranium recovery facilities currently licensed by the NRC have NRC-approved DP/RPs. Therefore, for these facilities, the staff would review only amendments to the existing DP/RPs. Amendments would be necessary under the following circumstances:

- Environmental contamination exists or other new conditions arise that were not considered in the existing DP/RP;
- The licensee requests a change in reclamation design or procedures; or
- The licensee requests a change in the timing of restoration.

Depending on the complexity of the revision, a meeting between the licensee and the NRC staff may be warranted.

### Decommissioning Plan/Reclamation Plan—New Facilities

Procedures for reviewing DP/RPs for new facilities are similar to those for existing facilities. Note that, under 10 CFR 51.20(b)(8), preparation of an EIS is a required part of the licensing process for new uranium milling facilities. A generic EIS is now in place for ISR facilities. Site specific supplemental EISs (SEISs) are being developed for the new ISR license applications under review, and these SEISs will tier off of the generic EIS.

### Implementation of the Decommissioning Plan/Reclamation Plan

Typically, a DP/RP is submitted with an application for an ISR facility. As the licensee prepares to enter decommissioning, a revised DP/RP is submitted. After approval of the DP/RP, the licensee must complete decommissioning within 24 months or apply for an alternate schedule. For conventional facilities, with groundwater contamination, or for ISR facilities with well-field restoration, 24 months is usually insufficient, because remediation of groundwater contamination is more time-consuming than remediation of surface contamination. As such, an alternate schedule may be appropriate.

The NRC staff will inspect the licensee activities during decommissioning/reclamation to ensure compliance with the DP/RP, associated license conditions, and NRC and other applicable regulations (e.g., U.S. Department of Transportation regulations). The staff will also ensure that there is no degradation in groundwater quality after the completion and approval of groundwater restoration by monitoring the groundwater for a period of time.

Decommissioning at uranium recovery sites involves two main activities, surface reclamation (i.e., soil contamination cleanup, 11e.(2) byproduct material reclamation and disposal, equipment removal, and structure decommissioning), and groundwater restoration. Groundwater restoration is considered completed when concentrations on and off site (depending on the extent of contaminant migration) meet previously established groundwater protection standards in accordance with Appendix A of 10 CFR Part 40. For the groundwater constituents being monitored at a given site, three types of standards are potentially applicable in accordance with Criterion 5B(5) in Appendix A:

1. NRC-approved background concentrations;
2. Maximum contaminant levels established by the EPA (in Table 5C of 10 CFR Part 40, Appendix A); and
3. NRC-approved alternate concentration limits (ACLs).

If the licensee demonstrates that concentrations of monitored constituents cannot be restored to either background or Appendix A, Table 5C values (whichever value is higher), the staff may approve ACLs, after considering all the factors required in Appendix A, Criterion 5B(6). To obtain approval of ACLs, the licensee submits a license amendment request and a detailed environmental report that addresses all the Criterion 5B(6) factors. If the staff determines that the ACLs are protective of public health and the environment, the staff may approve the ACLs.

After surface decommissioning/reclamation is completed, the licensee issues a construction completion report for staff review and approval. As part of this review, the staff performs a completion inspection to confirm that surface reclamation was performed according to the DP/RP, license conditions, and NRC regulations. Inspections also include surveys of tailings disposal areas to ensure that radon emissions comply with 10 CFR Part 40, Appendix A, Criterion 6. If additional information is required, the staff will issue RAs to address outstanding issues.

#### License Termination—Conventional Mills

After all reclamation activities have been completed and approved, the licensee, the NRC staff, and the long-term custodian will start license termination procedures. Before a conventional mill license is terminated, the custodial agency (i.e., State agency, DOE, or other Federal agency) will submit an LTSP for NRC staff review and acceptance. The LTSP documents the custodian's responsibilities for long-term care, including security, inspections, groundwater and surface water monitoring, and remedial actions. Concurrent with the staff's acceptance of an LTSP, the existing license is terminated and titles to any mill tailings disposal sites are transferred to the custodian under 10 CFR 40.28, "General License for Custody and Long-Term Care of Uranium or Thorium Byproduct Materials Disposal Sites."

#### License Termination—In Situ Uranium Recovery Facilities

License termination at an ISR uranium recovery facility occurs when all groundwater is restored to acceptable levels and surface decommissioning/reclamation is completed and approved by the NRC. Surface decommissioning completion typically would include an inspection. Because 10 CFR Part 40, Appendix A, Criterion 2 generally prohibits ISR uranium extraction facility owners from disposing of 11e.(2) byproduct material at their sites, long-term care of ISR facilities by a governmental custodian under a general license is not required. However, ISR facilities are still required to find a licensed 11e.(2) disposal site for their waste, though some facilities are allowed to dispose of liquid wastes in deep disposal wells. Thus, all groundwater restoration and surface reclamation is performed so that the site can qualify for unrestricted release.



## **2.4.2 Summary of Fiscal Year 2011 Activities**

- For Title I facilities, the staff continued its review of the Groundwater Compliance Action Plans for the Gunnison, Naturita, and Lakeview sites.
- For Title II facilities, the staff continued its review of the Pathfinder-Lucky Mc LTSP.
- The staff held a technical meeting regarding its review of Umetco's Erosion Protection Enhancement Design Report.
- The staff held a public meeting with Western Nuclear to discuss license termination for the Split Rock Mill tailings impoundment.
- Site inspections were performed at the American Nuclear Corporation, UNC Church Rock, Sequoyah Fuels, Western Nuclear, Power Resources Inc., Crow Butte, and Kennecott Uranium Company sites. Staff also visited the Falls City, Moab, and Umetco sites
- The staff continued to implement a number of initiatives under the Integrated Decommissioning Improvement Plan (IDIP), including: senior staff writing site-specific summaries of their knowledge on issues at the Title I and II uranium recovery sites and training more junior staff in the field; documenting and cataloging historic Title I and II site information; continuing periodic "Lessons Learned" meetings with all of the decommissioning uranium recovery project managers; and working with DOE to finalize a site transfer protocol for the license termination of title II sites.
- The staff began to prepare a 4<sup>th</sup> volume to the Consolidated Guidance for Decommissioning (NUREG-1757) that will incorporate provisions and aspects of the existing uranium recovery guidance, which are specifically relevant to the reclamation, restoration, and decommissioning of uranium recovery facilities.
- The Office of the Inspector General conducted an audit of the uranium recovery decommissioning program. The results of that audit are expected to be released in early FY 2012.

## **2.4.3 Fiscal Year 2012 Trends and Areas of Focus**

In FY 2012, the staff expects the termination of the Bear Creek and Pathfinder Lucky Mc facilities in Wyoming, and the subsequent transfer of these sites to the Department of Energy for long term surveillance and monitoring. As in FY 2011, the staff will also continue its increased interaction with other agencies and the Navajo Nation. Additionally, the staff will maintain its focus on improvements to the Title I/Title II uranium recovery program. Work will continue on NUREG-1757, Volume 4, with the completion of the document currently projected for FY 2013.

In FY 2012, the staff will begin to include in this report the status of decommissioning of operating uranium recovery in situ facilities. In situ uranium recovery facilities are required to carry out decommissioning concurrently with operations. In particular, when a licensee permanently ceases injecting lixiviant into a well field, the requirements for decommissioning that well field are applicable.

**Table 2-4a Decommissioning Title I Uranium Recovery Sites**

	<b>Name</b>	<b>Location</b>	<b>Status</b>
1	Ambrosia Lake	New Mexico	Monitoring
2	Burrell	Pennsylvania	Monitoring
3	Canonsburg	Pennsylvania	Monitoring
4	Durango	Colorado	Active
5	Falls City	Texas	Monitoring
6	Grand Junction	Colorado	Monitoring
7	Green River	Utah	Active
8	Gunnison	Colorado	Active
9	Lakeview	Oregon	Active
10	Lowman	Idaho	Monitoring
11	Maybell	Colorado	Monitoring
12	Mexican Hat/Monument Valley	Utah	Monitoring
13	Moab Mill	Utah	Active
14	Naturita	Colorado	Monitoring
15	Rifle	Colorado	Active
16	Riverton	Wyoming	Active
17	Salt Lake City	Utah	Monitoring
18	Shiprock	New Mexico	Active
19	Slick Rock	Colorado	Active

<b>Table 2-4a Decommissioning Title I Uranium Recovery Sites</b>			
20	Spook	Wyoming	Monitoring
21	Tuba City	Arizona	Active
<p>Note: Active denotes that a site is still undergoing surface reclamation or is resolving groundwater issues. Monitoring denotes that the site is being monitored under its LTSP or a groundwater compliance action plan.</p>			

**Table 2-4b Decommissioning Title II Uranium Recovery Sites**

	<b>Name</b>	<b>Location</b>	<b>DP/RP Approved</b>	<b>Completion of Decomm.</b>
1	American Nuclear Corporation	Casper, WY	10/88, Revision 2006	2012
2	Bear Creek	Converse County, WY	5/89	2012
3	ExxonMobil Highlands	Converse County, WY	1990	2012
4	Homestake Mining Company	Grants, NM	Revised plan—3/95	2017
5	Pathfinder—Lucky Mc	Gas Hills, WY	Revised plan—7/98	TBD
6	Pathfinder—Shirley Basin	Shirley Basin, WY	Revised plan—12/97	TBD
7	Rio Algom—Ambrosia Lake	Grants, NM	2003 (mill); 2004 (soil)	2012
8	Sequoyah Fuels Corporation	Gore, OK	2008	2012
9	Umetco Minerals Corporation	East Gas Hills, WY	Revised soil plan—4/01	TBD
10	United Nuclear Corporation	Churchrock, NM	3/91, Revision 2005	TBD
11	Western Nuclear Inc.—Split Rock	Jeffrey City, WY	1997	TBD
Note: COGEMA, Crow Butte, Kennecott Uranium Company, and Power Resources Inc., are all operating, or in standby, uranium recovery facilities in various stages of partial restoration/decommissioning. TBD to be determined				

## **2.5 Fuel Cycle Facility Decommissioning**

Currently, the only fuel cycle facility undergoing partial decommissioning is the Nuclear Fuel Services site in Erwin, Tennessee. The NRC's public Web site at <http://www.nrc.gov/info-finder/decommissioning/fuel-cycle/> summarizes additional information about the status of the facility.

### **2.5.1 Fuel Cycle Facility Decommissioning Process**

The decommissioning processes for fuel cycle facilities and for complex material sites are similar (see Section 2.3.1). Decommissioning activities at fuel cycle facilities can be conducted during operations (partial decommissioning) or after the licensee has ceased all operational activities.

Project management responsibility for fuel cycle facilities resides within NMSS and the Division of Fuel Cycle Safety and Safeguards (FCSS) during licensee operations and partial site decommissioning with technical support from the Office of Federal and State Materials and Environmental Management Programs (FSME). In cases where the entire site is being decommissioned in support of license termination, the project management responsibility resides within FSME and, specifically, DWMEP. Project management responsibility for fuel cycle facilities is transferred from FCSS to DWMEP when the licensee has ceased all operational activities and a critical mass of material no longer remains at the site.

### **2.5.2 Summary of Fiscal Year 2011 Activities**

Nuclear Fuel Services has continued to work toward releasing portions of area within its site located in Erwin, Tennessee.

DWMEP staff reviewed the proposed source reduction activities at the AREVA-Lynchburg uranium fuel fabrication site in Virginia as part of the licensee's proposal to ultimately transition from a special nuclear material license to a Commonwealth of Virginia byproduct materials license, under which the future decommissioning of the facility will ultimately take place. The source reduction project is near completion.

DWMEP staff completed the acceptance review and continued with the detailed technical review of Honeywell International, Inc.'s surface impoundment decommissioning plan for pond closure activities at its Metropolis Works facility in Illinois. Due to the presence of hazardous waste constituents at the pond, close coordination with the State of Illinois will continue to ensure that both NRC and State requirements are being met.

### **3. GUIDANCE AND RULEMAKING ACTIVITIES**

In FY 2011, the staff worked to increase the effectiveness of the Decommissioning Program and to gain a better perspective on decommissioning as a whole. The Decommissioning Program has been performing a self-evaluation of dose modeling to help it become more effective in the decommissioning of sites. Additionally, staff has been working on initiatives, which will help prevent the creation of sites that are unable to complete decommissioning.

#### Division of Waste Management and Environmental Protection Self-Evaluation of Dose Modeling

DWMEP is conducting an evaluation of the uses and applicability of computer codes employed in carrying out DWMEP licensing activities, particularly those codes used for the demonstration of compliance with the decommissioning dose criteria. This evaluation is intended for DWMEP management use to enhance the efficiency of the use of codes and models and to establish consistency and relevance in the selection of these computer codes and models. This activity is expected to continue into FY 2012.

#### Decommissioning Planning Rule

As the NRC's Decommissioning Program continues to mature, and fewer sites remain in the Decommissioning Program, the Program is evolving to focus on ways to expedite the timely and effective decommissioning of sites with difficult issues (e.g., those with groundwater contamination) and the prevention of future sites that are unable to complete decommissioning (i.e., legacy sites). In June 2011, the NRC published the Decommissioning Planning Rule, "Decommissioning Planning (10 CFR Parts 20, 30, 40, 50, 70, and 72)" (76 FR 35512). One aspect of the rulemaking focuses on ensuring that licensees have adequate financial assurance to complete decommissioning, and another ensures that licensees have an adequate groundwater monitoring program in place and will implement measures to minimize groundwater contamination. Additionally, in certain cases, licensees have new recordkeeping requirements for documenting spills, leaks, and unplanned releases.

#### Consolidated Decommissioning Guidance

Volume 3 of NUREG-1757, "Consolidated Decommissioning Guidance," has been updated to be consistent with the recently approved Decommissioning Planning Rule, discussed above. Revision 1 to Volume 3 will provide updated guidance on the technical aspects of compliance with requirements for timeliness in decommissioning of materials facilities, the requirements for financial assurance for decommissioning, and the recordkeeping requirements related to eventual decommissioning. Work on NUREG-1757, Volume 3, Revision 1, has been completed and the document is expected to be published in early FY 2012.

As the guidance for uranium recovery licensing goes back to the late 1970s, a thorough reexamination, consolidation, and updating of the guidance being used by DWMEP staff was determined to be appropriate. This update is being prepared as a 4<sup>th</sup> volume to NUREG-1757. This volume will incorporate those provisions and aspects of the existing uranium recovery guidance, which are specifically relevant to the reclamation, restoration and decommissioning of

uranium recovery facilities. All commercial licensed facility types will be addressed: convention mills, ISR, heap leach and byproduct recovery operations. Unlike the other three volumes, this one will incorporate provisions unique to byproduct material as defined in section 11(e).2 of the Atomic Energy Act of 1954, as amended, permanent waste disposal, and financial assurance, which are significantly different from such considerations in the decommissioning of other materials facilities. The document is currently projected to be completed in the spring of 2013.

#### Proposed Rulemaking Initiative on Prompt Remediation

On June 17, 2011, NRC issued the Decommissioning Planning Rule to reduce the likelihood of legacy sites. In SRM-SECY-07-0177 (for the Decommissioning Planning Proposed Rule), the Commission directed staff to “make further improvements to the decommissioning process by addressing remediation of residual radioactivity during the operational phase with the objective of avoiding complex decommissioning challenges that can lead to legacy sites ... [and] engage stakeholders to develop a technical basis, possible dose limits, criteria for applying the dose limits to address this matter, or alternatives to the dose limits to address the intent of this objective.” To respond to the Commission’s direction, the staff developed a draft proposed technical basis as a precursor to a potential rulemaking. On July 25, 2011, the NRC staff conducted a public webinar to inform and solicit stakeholder input on a potential rulemaking to address prompt remediation of residual radioactivity during operations. A stakeholder letter and *Federal Register* notice provided information and advance notice of this public webinar. A broad spectrum of stakeholders participated in the webinar and the meeting was transcribed to capture comments. The *Federal Register* notice also established a 60-day public comment period after the webinar. The NRC staff is presently evaluating stakeholder comments and intends to use this input to inform a future SECY paper for Commission consideration.



## 4. RESEARCH ACTIVITIES

The Office of Nuclear Regulatory Research (RES) continues to support the dose modeling of releases of radioactive material from decommissioning sites through a number of activities discussed below.

Research is in progress to investigate the effects of coupling hydrology, erosion and erosion protection approaches on the performance of engineered covers to isolate waste. The research thus far indicates that effective erosion control can be achieved with a variety of surfaces in addition to conventional rip rap. Gravel admixtures to fine-textured soil appear optimal, as they minimize erosion and enhance hydrologic control. Effective erosion control on steep slopes can be achieved using ribbons of rip rap or other coarse materials (i.e., they act as "speed bumps" for erosion), rather than continuous rip rap slopes. Conventional linear cover slopes are prone to change. Using a more natural non-linear grade reduces erosion and promotes long-term stability, but will be slightly more complicated to construct. Landform evolution models are valuable in identifying future shapes of covers. Creating cover designs that mimic the long-term geometry in the as-built condition reduces erosion and promotes better hydrologic control. Future research studies include validating the methodologies with field data, developing standard practices for calibrating and conducting landform simulations to assess and optimize coupled hydrologic-erosion design, creating a series of recommended erosion control strategies that result in acceptable hydrologic control and comparing the findings between humid and semi-arid/arid sites to evaluate climate effects.

RES is continuing the development or modification of computer codes useful for site decommissioning analyses. The incorporation of source-term modeling into RESRAD-OFFSITE is being implemented with Argonne National Laboratory (ANL) incorporating the Disposal Unit Source Term (DUST) code, which contains several source-term models and was prepared by Brookhaven National Laboratory, into RESRAD-OFFSITE. ANL is now preparing a final report on the use of the DUST-modified RESRAD-OFFSITE. ANL also issued NUREG/CR-7038, "Verification of REDRAD-OFFSITE."

Cooperative efforts with the DOE, National Institute of Standards and Technology (NIST), and academic, private sector, and international experts continued on the Cementitious Barriers Partnership (CBP) which is in its 4th year. The CBP is a multi-disciplinary collaboration formed to develop the next generation of simulation tools to evaluate the structural, hydraulic and chemical performance of cementitious barriers used in nuclear applications over extended time frames (e.g., more than 100 years for operating facilities and greater than 1000 years for waste management applications). The CBP has published numerous reports assessing the behavior of cementitious materials for waste disposal and describing models for their evaluation and prediction of long-term processes. Complementary work at NIST is in progress to examine pore solution chemistry and mineral phases in cementitious composites with chemical and mineral admixtures.

In the biosphere research program, soil-to-plant concentration ratios were determined for neptunium in three U.S. soils for uptake in alfalfa, corn, potato, and onion. Experiments to

determine concentration ratios for iodine in these same plants were completed this year. A NUREG/CR report on "Radionuclide Behavior in Soils and Soil-to-Plant Concentration Ratios for Assessing Food-Chain Pathways" was completed and published. Cooperative studies continued with Pacific Northwest National Laboratory (PNNL) and Oregon State University to study radionuclide uptake in fruit and nut trees were completed and a draft NUREG/CR report on "Transfer Factors for Nuclide Uptake by Fruit and Nut Trees" is under review.

Researchers at PNNL and the United States Geological Survey (USGS) are completing their work to determine the long term efficacy of bioremediation of groundwater contaminated with uranium at both surficial sites and deeper ISR facilities. USGS has completed long term column experiments on the bioremediation of uranium in shallow aquifers. These results and those from the PNNL modeling show that uranium will be readily reoxidized and released to solution. The use of added iron (as proposed by a licensee) to generate large quantities of adsorptive minerals, was shown to have little effect. As a result, RES has recommended that this approach for shallow systems should not be relied on to sequester uranium. Experiments have been conducted to assess bioremediation of uranium at ISR sites with modeling activities for these sites also underway.

In NUREG/CR-7025, ANL reported research on test methods that have been used to assess the release of contaminants from cement and slag wastes. Critical evaluations were made of leach tests and modeling approaches that have been used to predict the release of contaminants as these materials are weathered. The primary conclusion reached from this analysis is that many test results have been misinterpreted due to the inappropriate application of a process model to the data set. The second report, NUREG/CR-7105 which will be published soon, is a discussion of the causes of differences in weathering and leaching rates observed in laboratory and field tests. The expected product of this activity is a protocol that can be used by the NRC to integrate the results of short-term laboratory tests and field measurements that address long-term waste material degradation and leaching into the model calculations that are used to assess the stability of wastes at NRC-regulated sites.

RES is participating in the Nuclear Energy Agency (NEA) Sorption Project, Phase III, to provide practical and widely accepted guidance for the use of reactive transport models in performance assessments of chemically complex sites. Phase III of the project was completed this year and the final report has been submitted for publication. This final report, "Thermodynamic Sorption Modelling in Support of Radioactive Waste Disposal Safety Cases: A Guideline Document," will provide technical bases to support the use of thermodynamic sorption models in performance assessments.

RES staff also provided direct assistance to FSME efforts through a variety of tasks that included: (1) contributing to the critical review and Technical Evaluation Report for the Savannah River F-Tanks Performance Assessment; (2) contributing to the Engineered Covers Technical Group evaluation of covers for UMTRCA wastes; and (3) participating in the MARSSIM Interagency Working Group.

## 5. INTERNATIONAL ACTIVITIES

The NRC participates in multiple international activities to fulfill U.S. commitments to international conventions, treaties, and bilateral/multilateral agreements. Staff is also actively engaged in developing and updating international radiation safety standards, and technical support documents through interaction with international organizations and governments including the International Atomic Energy Agency (IAEA) and the NEA (of the Organization for Economic Cooperation and Development). The NRC participates in bilateral and trilateral exchanges with other countries, hosting foreign assignees and providing reciprocal assignments, developing and providing workshops to requesting countries, and providing technical support as needed to the Office of International Programs. The NRC is generally recognized in the international nuclear community as an experienced leader in the regulation and safety of decommissioning, waste disposal, site remediation and environmental protection. Interaction with international organizations and governments allows the NRC to share insights about successful, safe, and effective decommissioning approaches. This interaction also allows the staff to provide input for various international guidance and requirements that benefit other countries in establishing and implementing safe decommissioning strategies in the international community. The staff gains insight into approaches and methodologies used in the international community and considers these approaches as they continue to risk-inform the NRC Decommissioning Program. The most significant of these activities are summarized below.

### International Atomic Energy Agency Activities

The staff participated in the review and development of IAEA Safety Standards, and also participated in IAEA projects related to decommissioning and waste disposal, the International Project on Evaluation and Demonstration of Safety for Decommissioning of Facilities Using Radioactive Material and developing safety criteria/positions regarding exemption of decommissioning installations from liability under Vienna Convention. The FSME Division Director was the U.S. representative to the IAEA Waste Safety Standards Committee. Within the past year, the staff participated and supported IAEA activities in the following ways:

- Participated in the 30<sup>th</sup> and 31<sup>st</sup> semi-annual review cycles of the IAEA Waste Safety Standards Committee and meetings held in December 2010 and June 2011, respectively. These meetings addressed decommissioning and other related issues specifically, as part of IAEA waste safety activities.
- Participated in the second annual meeting of the International Project entitled "Use of Safety Assessment in Planning and Implementation of Decommissioning of Facilities Using Radioactive Material." The focus of this project is to develop guidance for developing safety assessments in support of the decommissioning of nuclear facilities, and to provide insights from the NRC's Decommissioning Program for developing guidance on the use of safety assessments in decommissioning. During 2010, NRC staff acted as a Steering Committee member, as the chairman for the development of the regulatory review chapter writing team, and as a writing team member for several chapters.

- Participated in an IAEA steering committee meeting to develop safety assessment guidance for the decommissioning of nuclear facilities to help ensure that IAEA guidance is appropriate and sufficient, and to provide insights from the NRC's Decommissioning Program for developing guidance on the use of safety assessments in decommissioning.
- Participated in the development of the new Safety Standard for Decommissioning of Nuclear Facilities. Staff acted as U.S. country expert in his participation in the IAEA consultancy to revise the Safety Requirement for the decommissioning of facilities that use radioactive materials.
- Participated as the sole U.S. government representative in a technical meeting for the International Working Forum on Regulatory Supervision of Legacy Sites, with initial focus on International and Regional Initiatives to Remediate Contaminated Sites in Central Asia.
- Participated at the October 2011 IAEA-sponsored workshop for the Research Reactor Decommissioning Demonstration Project at the Riso Technical Center in Roskilde, Denmark. Staff provided three lectures on decommissioning plans, decommissioning safety and decommissioning work integration. Staff participated as a mentor for the practical exercises in decommissioning safety assessment.
- Supported IAEA with the development of three IAEA decommissioning safety standards; Power and Research Reactors, Fuel Cycle Facilities and Small Materials Facilities.
- Participated in the July 2011 IAEA Meeting in Vienna, Austria, to develop of a voluntary code of safety conduct for the inadvertent disposal of radioactive sources in scrap metal.
- Participated in IAEA Consultancy Meeting on the State Control and Nuclear Security of Natural Uranium Production.
- Participated in the IAEA conference on uranium recovery and cleanup activities, as well as the evaluation of proposed IAEA projects for decommissioning of uranium recovery facilities.
- Participated in the interagency working group and steering committees for preparation of the triennial Review Meeting of the Contracting Parties of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Decommissioning of nuclear facilities is included in the scope of this convention for achieving a uniform global level of safety in such management of radioactive materials and activities. The NRC staff cooperated with DOE, EPA and the U.S. State Department in the preparation of a National Report on the national safety program in this area. L. Camper (NRC) was elected to serve as a member of the General Committee and as a Country Group Chair for the peer review process at the review meeting in May 2012.

- Participated in responding to questions pertaining to the Convention on Nuclear Safety National Report sections on Decommissioning and Low-Level Waste.
- Hosted a technical visit by senior managers and staff of Iraq and discussed decommissioning safety aspects in coordination with DOS and OIP.

#### Nuclear Energy Agency Activities

- Co-Hosted with DOE in November 2010, the 11<sup>th</sup> Annual meeting of the Working Party on Dismantling and Decommissioning. NRC staff delivered five presentations and allocated a one-day Session on the U.S. Decommissioning Scene.
- Contributed to the NEA Radioactive Waste Management Committee Bureau Annual Report for the Radioactive Waste Management Committee (RWMC)-44.
- Participated as U.S. representative and core group member of the NEA Working Party on Decommissioning and Dismantling.
- Participated in the 14<sup>th</sup> International Conference on Environmental Remediation and Radioactive Waste Management in Reims/France. Activities included: (a) presentations and discussions on decommissioning lessons learned; (b) disposal of radioactive waste and large components from decommissioning; (c) challenges when selecting disposal options and waste classification; (d) treatment of radium in the U.S.; and (e) the Value of a Mature, Stable, and Transparent Regulatory Framework in Facilitating ER Programs – Lessons Learned in Decommissioning of Uranium Recovery and Other Facilities in the U.S.A.
- Participated as expert in an NEA Expert Group on Managing Environmental and Health Impacts of Uranium Mining (includes milling and ISR referred to as mining internationally).
- Participated in international workshop on “Ageing Management of Nuclear Power Plants and Waste Disposal Structures. A paper, “Performance Assessment Insights on the Use of Cements in Waste Management,” was presented.
- Participated in the NRC-South Korea bilateral technical discussions including delivering a presentation on “NRC Approaches and Methods for Decommissioning Licensing Activities of Commercial Facilities.”

## 6. PROGRAM INTEGRATION

The Decommissioning Program currently encompasses power and early demonstration reactors, research and test reactors, complex materials facilities, fuel facilities, and uranium recovery facilities. In addition to the sites undergoing decommissioning regulated by the NRC, many complex decommissioning sites are being decommissioned under the purview of the Agreement States. Given this breadth of projects, the Decommissioning Program has undertaken many initiatives to keep abreast of sites undergoing decommissioning.

### Comprehensive Decommissioning Program

In FY 2011, NRC continued the implementation of an enhanced Comprehensive Decommissioning Program, which allows NRC to compile, in a centralized location, more complete information on the status of decommissioning and decontamination of complex sites and uranium recovery sites in the United States. State contacts were provided a username and password to edit their site summaries in NRC's Complex Sites Tracking System database as new information becomes available. Summaries of information on sites regulated by the Agreement States are currently available to the public to ensure openness and promote communication and thus enhance public confidence by providing them with a national perspective on decommissioning.

### Knowledge Management and Improvements

Progress was made on many of the activities identified in the staff's June 2010 IDIP, Rev. 3. Emphasis continued to be placed on the uranium recovery part of the decommissioning program. The ongoing improvements and knowledge management activities should result in future efficiencies and enhancements in the staff's oversight of uranium recovery sites under general license with the DOE for long term surveillance as well as those uranium recovery sites in closure and under specific licenses to private entities.

As part of the IDIP improvements in 2011, staff began a multi-year effort to review, consolidate and update over 130 uranium recovery decommissioning guidance documents. During FY 2011, existing documents were collected and screened, an outline was prepared, and drafting of guidance was started. This effort was discussed with stakeholders such as the National Mining Association. When completed, this document will be published as Volume 4 of the Consolidated Decommissioning Guidance, NUREG-1757.

Two major tasks were completed that evaluated and documented extensive staff knowledge about engineered covers. One task involved establishing the working group "Engineered Covers Technical Group" (ECTG) to discuss and review the implications of NRC's Office of Nuclear Regulatory Research draft report NUREG/CR-7028, "Effectiveness of Engineered Covers: From Modeling to Performance Monitoring," (*in press*) on engineered covers at 38 sites regulated by NRC. All but one of the 38 sites was related to uranium recovery activities. An important conclusion of the report is that compacted soil materials used in engineered covers do not retain "as built" properties over the period of regulatory interest as assumed in most performance assessments. ECTG compiled information and data on the 38 sites. Using this information, ECTG qualitatively assessed the potential for increased radon release and

increases groundwater contamination at the sites. Conclusions and short- and long-term recommendations will be documented in a report this calendar year. One recommendation has been acted upon early: an NRC contractor is currently developing a detailed database on Title II in closure sites, which should allow analyses to identify statistical trends, insights, and recommendations on future radon and groundwater monitoring and data analyses. This task also provides a significant knowledge preservation and transfer document. A large number of documents from the 1980s and 1990s related to the 38 sites were obtained, reviewed, pertinent information consolidated, and qualitatively evaluated. The resulting report will provide easy access to this information for future use.

The second engineered cover task for knowledge preservation and transfer was completed for erosion protection covers at uranium recovery decommissioning sites. A retired NRC staff member with over 30 years of experience in developing NRC's guidance and reviewing uranium recovery erosion protection covers documented his knowledge and experience in a desk guide. This desk guide includes summaries of the erosion protection covers at over 40 sites for which NRC has regulatory responsibility. Each site summary includes the design challenges resolved, lessons learned, and recommendations for future NRC tracking. The desk guide also provides lessons learned and review suggestions for over 17 technical methods used in reviewing erosion protection cover designs. A seminar was given so that the uranium recovery decommissioning project managers and technical reviewers would be aware of the information in the site summaries and how it could focus their future oversight at these sites.

Other IDIP completed tasks are related to decommissioning guidance. Staff reviewed NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing Non-Power Reactors," Part 1 and 2, dated February 1996, and recommended that the applicable sections of the Standard Review Plan (SRP) be incorporated into the Consolidated Decommissioning Guidance in NUREG-1757 as another Chapter in Volume 2 or, alternatively, a new Volume 5. The staff also evaluated lessons learned from the review of the first Decommissioning Plan for a restricted use site. This evaluation identified improvements for using ALARA in the "eligibility analysis" requirement in 10 CFR 20.1403(a) for restricted use sites. The staff plans on incorporating these improvements into the Consolidate Decommissioning Guidance in NUREG-1757 so that licensees can have a clearer understanding of the intent and information to be submitted in a Decommissioning Plan for the 10 CFR 20.1403(a) requirement.

IDIP tasks for developing new training courses and methods were also completed. A Visual Sample Plan was added to iLearn. A Health Physics for Uranium Recovery course was also provided to Agreement States. The MARSAME training class was added to iLearn. A MILDOS-Area computer code training class was accepted by Human Resources – Training Resource Development. Finally, a contract was developed to upgrade MILDOS-Area computer code for training course development.

During FY 2011, several improvements to business processes were completed. Improvements for uranium recovery decommissioning are described in detail later in this section. Improvements for reactor decommissioning included: clarification of review responsibilities for financial assurance and revised Policy and Procedure 5.1; documentation of the 10 CFR Part 72 general license process and staff roles; and clarification of the power and test reactor transfer process with the Office of Nuclear Reactor Regulation.

## Uranium Recovery Program Enhancements

In 2007, responsibility for the uranium recovery sites undergoing decommissioning was transferred to DWMEP, along with the staff from the Division of Fuel Cycle Safety and Safeguards responsible for oversight of the decommissioning uranium recovery (UR) sites. At that time, the price of uranium was low and it was expected that most of the staff's efforts would be associated with the oversight of uranium recovery sites undergoing decommissioning. However, shortly after the transfer, the price of uranium increased significantly, resulting in the uranium industry submitting, or planning to submit over 25 applications for new and/or expanded facilities or to re-start facilities that were in standby. This resulted in the need to refocus uranium recovery staff efforts from the oversight of decommissioning sites to the review and approval of these new applications.

In order to accommodate this increase in uranium recovery site licensing, and to enhance the oversight of decommissioning uranium recovery facilities, the staff in FSME's Decommissioning and Uranium Recovery Licensing Directorate began a multi-phased effort focused on increasing the efficiency and the effectiveness of the oversight of decommissioning UR facilities.

Because of the efficiency gains realized through the enhancements in the decommissioning program, resources that would have been used in the materials and reactor decommissioning program are now used to oversee the uranium recovery sites undergoing decommissioning. Project management responsibility was transferred from the uranium recovery licensing staff to the materials/reactor decommissioning staff, allowing more staff resources to be devoted to these sites. This effort began in FY 2009 and was fully implemented in FY 2011. In addition to the oversight activities by project managers, beginning in FY 2012, staff will begin routine inspections of sites that have been transferred to the Department of Energy and are generally licensed pursuant to 10 CFR 40.27 and 40.28.

NRC staff also enhanced interactions with DOE for those sites that are generally licensed under 10 CFR 40.27 and 40.28. Staff holds quarterly calls with DOE site Project Managers and contractors to discuss site status and issues. Staff is also working with DOE to develop a site transfer protocol and has provided comments to DOE on its site transfer guidance for DOE staff.

DOE routinely submits groundwater and data validation information to NRC for each of the sites that it has responsibility for under UMTRCA. In FY 2011, staff began the development of a site activities/issues database to better track the review of these documents as well as issues that are complicating the oversight of the sites. This effort will continue into FY 2012. When completed, the database will contain basic information about the site, DOE/Native American contact information, and the issues associated with each site. Staff is also developing quantifiable metrics to track the review and comment or approval of the information for those sites that are specifically licensed and those that have transferred to DOE and are generally licensed under 10 CFR 40.27 and 40.28.



## 7. AGREEMENT STATE ACTIVITIES

Thirty-seven States have signed formal agreements with the NRC and assumed regulatory responsibility over certain byproduct, source, and small quantities of special nuclear material, including the decommissioning of some complex materials sites. However, after a State becomes an Agreement State, the NRC continues to have formal and informal interactions with the State.

Formal interactions with Agreement States in FY 2011 included the following:

- DWMEP staff participated in the Conference of Radiation Control Program Directors (CRCPD) activities.
- DWMEP staff worked with the Agreement States to incorporate more detailed information about complex materials decommissioning sites and uranium recovery facilities undergoing decommissioning under the purview of the Agreement States on the decommissioning Web site. These site summaries are available at <http://www.nrc.gov/info-finder/decommissioning/complex/>.
- Integrated Materials Performance Evaluation Program reviews that included decommissioning were conducted in several Agreement States (Arkansas, Florida, Iowa, Maine, Maryland, Nebraska, New Jersey, New York, North Dakota, Utah, Virginia).
- NRC conducted a Health Physics for Uranium Recovery training course in Austin, Texas, which was attended by staff from many Agreement State programs.

Table 7-1 identifies the decommissioning and uranium recovery sites in the Agreement States.

<b>Table 7-1 Agreement State Decommissioning Sites</b>					
<b>State</b>	<b>Name</b>	<b>Location</b>	<b>Date DP Submitted</b>	<b>Date DP Approved</b>	<b>Project Complete</b>
CA	General Atomics	San Diego, CA	10/14/96	8/26/97	TBD
CA	Excel Research Services, Inc	Fresno, CA	6/22/06	8/30/07	TBD
CA	Providencia Holdings, Inc.	Burbank, CA	7/16/01	10/31/02	TBD
CA	Halaco	Oxnard, CA	TBD	TBD	TBD
CA	The Boeing Company	Simi Valley, CA		2/18/99	TBD
CA	Chevron Mining, Inc. (formerly Molycorp)	Mountain Pass, CA	6/9/06	TBD	TBD
CA	AeroJet Ordnance Company	Chino, CA	2/23/96	5/31/96	TBD
CA	Isotope Specialties	Burbank, CA	N/A	N/A	TBD
CA	Magnesium Alloy Products	Compton, CA	N/A	N/A	TBD
CO	Umetco Uravan	Uravan, CO		2/01/87	TBD
CO	Cotter Uranium Mill	Canon City, CO	2005, revision pending	2005, TBD	In standby. TBD if going into D&D.

<b>Table 7-1 Agreement State Decommissioning Sites</b>					
<b>State</b>	<b>Name</b>	<b>Location</b>	<b>Date DP Submitted</b>	<b>Date DP Approved</b>	<b>Project Complete</b>
CO	Schwartzwalder Mine (Cotter)	Golden, CO	12/01/96	1997	TBD
CO	Colorado School of Mines Research Institute Table Mtn.	Golden, CO	08/01/06	TBD	TBD
CO	Colorado School of Mines Research Institute Creekside	Golden, CO	TBD	TBD	TBD
CO	Sweeney Mining and Milling	Boulder, CO	Pending	TBD	TBD
CO	Homestake Mining and Pitch	Sargeants, CO	05/01/01	06/01/01	TBD
CO	Redhill Forest	Fairplay, CO	Pending	TBD	TBD
CO	Clean Harbors	Deer Trail, CO	2005	2006	TBD
FL	Inuka Resources	Green Cove Springs, FL	TBD	TBD	TBD
IL	Spectrulite Consortium	Madison, IL	TBD	TBD	TBD
IL	Chicago Magnesium	Blue Island, IL	11/02/02	02/01/04	Phase 1— 12/04 Phase 2— 8/06 Phase 3— TBD

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IL	TRONOX (formerly Kerr-McGee)	West Chicago, IL	09/01/93	09/01/94	Phase 1— 11/05 Phase 2— TBD
KS	Air Capitol Dial	Wichita, KS	TBD	TBD	TBD
KS	Aircraft Instrument & Development/RC Allen Instruments	Wichita, KS	TBD	TBD	TBD
KS	Century Instruments Corporation	Wichita, KS	TBD	TBD	TBD
KS	Instrument and Flight Research	Wichita, KS	TBD	TBD	TBD
KS	Kelley Instruments, Inc.	Wichita, KS	TBD	TBD	TBD
KS	Instrument, Inc.	Wichita, KS	TBD	TBD	TBD
MA	Shpack Landfill	Norton, MA	09/04	09/04	TBD
MA	BASF (formerly Engelhard)	Plainville, MA	None	N/A	TBD
MA	Starmet Corp. (formerly Nuclear Metals)	Concord, MA	10/06	Pending	TBD
MA	Wyman-Gordon Co.	North Grafton, MA	None	TBD	TBD
MA	Texas Instruments	Attleboro, MA	None	TBD	TBD

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MA	Norton/St. Gobain	Worcester, MA	None	TBD	TBD
NE	LLWR Disposal Site (University of Nebraska-Lincoln)	Mead, NE	9/05/07	9/14/07	TBD
OH	Metallurg Vanadium Corp. (Formerly Shieldalloy Metallurgical Corp.)	Cambridge, OH	7/13/99	3/6/02	TBD
OH	Ineos USA, LLC (formerly BP Chemical)	Lima, OH	4/92	6/98	2020
OH	Advanced Medical Systems, Inc.	Cleveland, OH	6/01/04	5/23/05	2015
OR	TDY Industries d/b/a Wah Chang	Albany, OR	6/11/03	3/08/06	TBD
OR	PCC Structurals, Inc.	Portland, OR	6/10/06	9/14/06	TBD
PA	Curtis-Wright Cheswick	Cheswick, PA	3/06	6/07	TBD
PA	Karnish Instruments	Lock Haven, PA			TBD
PA	Molycorp, Inc. (Washington)	Washington, PA	6/99	8/00	TBD
PA	Superbolt (formerly Superior Steel)	Carnegie, PA			TBD
PA	Quehanna (formerly Permagrain Products, Inc.)	Karthus, PA	4/98, revised 3/03, 3/06	7/98, 9/03, 11/06	TBD

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PA	Safety Light Corporation	Bloomsburg, PA			TBD
PA	Strube Incorporated	Lancaster County, PA			TBD
PA	Westinghouse Electric Corp. (Waltz Mill)	Madison, PA	4/97	1/00	TBD
PA	Whittaker Corporation	Greenville, PA	12/00, revised 8/03, 10/06	5/07	TBD
TX	ExxonMobil	Three Rivers, TX	4/85	9/82	TBD
TX	ConocoPhillips	Falls City, TX	11/87	9/80	TBD
TX	Rio Grande Resources	Hobson, TX	4/93 Alternate Concentration Limit—11/97	11/96	TBD
TX	COGEMA	Bruni, TX	11/03	4/06	Groundwater complete Surface ongoing
TX	Intercontinental Energy Corp.	Three Rivers, TX	3/03	Ongoing	Groundwater complete Surface TBD

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TX	Everest Exploration, Inc. (decommissioning of Tex-1, Mt. Lucas sites)	Hobson and Dinero, TX	8/01	Ongoing	Groundwater complete  Surface cleanup ongoing
UT	Rio Algom Uranium Mill	Lisbon Valley, UT	9/03/02	7/06/04	TBD
WA	Dawn Mining Company	Ford, WA	12/94	02/95	2013
D&D decontamination and decommissioning N/A not applicable TBD to be determined					

## **8. RESOURCES**

The total Decommissioning Program staff budget for FY 2011 was 62 full-time equivalents (FTE); and for FY 2012, the program has 57 FTE. These resource figures include personnel to perform licensing casework directly related to decommissioning sites; inspections; project management and technical support for decommissioning power reactors, complex materials sites, uranium mill tailings facilities, and fuel cycle facilities; development of rules and guidance; EISs and EAs; research to develop more realistic analytical tools to support licensing and rulemaking activities; and Office of the General Counsel support. These figures also include supervisory and nonsupervisory indirect FTE associated with the Decommissioning Program, and safety and environmental reviews for new uranium recovery facilities.



## **9. FISCAL YEAR 2012 PLANNED PROGRAMMATIC ACTIVITIES**

The staff has planned a number of programmatic activities for FY 2012, including the continued implementation of IDIP. In FY 2012, staff will continue to focus its activities on implementing knowledge management aspects of the IDIP. Specifically, knowledge management activities for the exchange of decommissioning lessons learned for selected topics (e.g., uranium recovery, institutional controls) have been identified by NRC staff. DWMEP management has prioritized the implementation of the identified topics. One of the major tasks that has been identified for implementation is the update of uranium recovery decommissioning and reclamation guidance for Title I and II sites. The staff is in the early stages of this guidance development project.

Regarding the question about NRC jurisdiction for military radium-226, the staff plans on meeting with the military branches and the Department of Defense prior to the submission of their public comments on the draft Regulatory Information Summary (RIS). Once the public comment period ends, the staff plans to respond to comments and to finalize the RIS. Subsequently, the guidance in the final RIS will be used to begin develop phased-in approaches for implementing NRC's jurisdiction for military radium. A Radium Implementation Plan would be prepared based on consultations with each military service to identify the initial actions and questions needed to begin licensing/permitting. The implementation phase is expected to be completed during FY 2012.

In FY 2011, staff began a multi-year effort to review, consolidate, and update over 130 uranium recovery decommissioning guidance documents as part of the IDIP improvement process. This progress will continue throughout FY 2012, and, when completed, this document will be published as Volume 4 of the Consolidated Decommissioning Guidance, NUREG-1757.

In FY 2012, staff expects to complete a database of site activities and issues for UMTRCA Title I and Title II sites. When completed, the database will contain basic information about each site, information for DOE/Native American points of contact, and a list of both historical and current site issues. This database will allow staff to better track the review of incoming groundwater and data validation information submittals.