

# **Status of the Decommissioning Program**

**2022 Annual Report**

**Division of Decommissioning, Uranium  
Recovery, and Waste Programs  
Office of Nuclear Material Safety  
and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001**

# CONTENTS

|       |   |    |
|-------|---|----|
| 1     | INTRODUCTION .....  | 1  |
| 2     | DECOMMISSIONING SITES .....   | 2  |
| 2.1   | Nuclear Power Reactor Decommissioning .....   | 2  |
| 2.1.1 | Summary of Fiscal Year 2022 Activities .....  | 3  |
| 2.1.2 | Fiscal Year 2023 Areas of Focus .....   | 4  |
| 2.2   | Research and Test Reactor Decommissioning .....   | 8  |
| 2.2.1 | Summary of Fiscal Year 2022 Activities .....  | 8  |
| 2.2.2 | Fiscal Year 2023 Areas of Focus .....   | 8  |
| 2.3   | Complex Materials Facility Decommissioning .....  | 10 |
| 2.3.1 | Summary of Fiscal Year 2022 Activities .....  | 10 |
| 2.3.2 | Fiscal Year 2023 Areas of Focus .....   | 14 |
| 2.4   | Uranium Recovery Facility Decommissioning .....   | 16 |
| 2.4.1 | Summary of Fiscal Year 2022 Activities .....  | 16 |
| 2.4.2 | Fiscal Year 2023 Areas of Focus .....   | 19 |
| 2.5   | Fuel Cycle Facility Decommissioning .....   | 22 |
| 2.5.1 | Summary of Fiscal Year 2022 Activities .....  | 22 |
| 2.5.2 | Fiscal Year 2023 Areas of Focus .....   | 22 |
| 3     | GUIDANCE AND RULEMAKING ACTIVITIES.....   | 23 |
| 4     | RESEARCH ACTIVITIES .....   | 25 |
| 5     | INTERNATIONAL ACTIVITIES.....   | 29 |
| 6     | PROGRAM INTEGRATION AND IMPROVEMENT .....   | 31 |
| 7     | AGREEMENT STATE ACTIVITIES .....  | 32 |
| 8     | FISCAL YEAR 2023 PLANNED PROGRAMMATIC ACTIVITIES.....   | 36 |
|       |   |    |
|       | Table 2.1-a Power and Early Demonstration Reactors Undergoing Decommissioning.....                        | 5  |
|       | Table 2.1-b Decommissioned Power Reactors that Have Independent Spent Fuel Storage<br>Installations ..... | 7  |
|       | Table 2.4-a Decommissioning Title I Uranium Recovery Sites.....   | 20 |
|       | Table 2.4-b Decommissioning Title II Uranium Recovery Sites .....   | 21 |
|       | Table 2.4-c Title II Uranium Recovery Sites—DOE Licensed Under 10 CFR 40.28.....                          | 21 |
|       | Table 7-a Agreement State Complex Decommissioning Sites .....   | 33 |
|       | Table 7-b Agreement State Uranium Recovery Sites .....  | 35 |

## ABBREVIATIONS

|          |   |
|----------|---|
| ACL      | alternate concentration limit   |
| ADAMS    | Agencywide Documents Access and Management System                     |
| ANL      | Argonne National Laboratory   |
| CATX     | categorical exclusion   |
| CERCLA   | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR      | <i>Code of Federal Regulations</i>                                    |
| CO       | confirmatory order  |
| COVID-19 | Coronavirus Disease 2019  |
| CRR      | completion review report  |
| CY       | calendar year   |
| DECON    | active decommissioning  |
| DG       | draft regulatory guide  |
| DoD      | U.S. Department of Defense  |
| DOE      | U.S. Department of Energy   |
| DOE-WVDP | DOE West Valley Demonstration Project                                 |
| DOJ      | U.S. Department of Justice  |
| DP       | decommissioning plan  |
| DRP      | discrete radioactive particle   |
| EIS      | environmental impact statement  |
| EPA      | U.S. Environmental Protection Agency                                  |
| ESADA    | Empire State Atomic Development Associates                            |
| EVESR    | ESADA Vallecitos Experimental Superheat Reactor                       |
| FR       | <i>Federal Register</i>   |
| FSSR     | final status survey report  |
| FUSRAP   | Formerly Utilized Sites Remedial Action Program                       |
| FY       | fiscal year   |
| GCAP     | ground water corrective action program                                |
| GEH      | GE Hitachi  |
| GETR     | GE Test Reactor   |
| GIS      | geographic information system   |
| GPS      | global positioning system   |
| HMC      | Homestake Mining Company of California                                |
| IAEA     | International Atomic Energy Agency                                    |
| IMC      | inspection manual chapter   |
| ISFSI    | independent spent fuel storage installation                           |
| LAR      | license amendment request   |
| LTP      | license termination plan  |
| LTSP     | long-term surveillance plan   |
| MARSSIM  | Multi-Agency Radiation Survey and Site Investigation Manual           |
| MPC      | multipurpose canister   |
| MOU      | memorandum of understanding   |
| MPPB     | Main Plant Process Building   |
| N/A      | not applicable  |
| NEA      | Nuclear Energy Agency   |
| NEI      | Nuclear Energy Institute  |
| NMSS     | Office of Nuclear Material Safety and Safeguards                      |
| NOW      | New Opportunities of Waterbury, Inc.                                  |
| NPS      | U.S. National Park Service  |

|         |   |
|---------|---|
| NRC     | U.S. Nuclear Regulatory Commission                                    |
| NRR     | Office of Nuclear Reactor Regulation                                  |
| NYSERDA | New York State Energy Research and Development Authority              |
| PNNL    | Pacific Northwest National Laboratory                                 |
| PSDAR   | post shutdown decommissioning activities report                       |
| RAMP    | Radiation Protection Computer Code, Analysis, and Maintenance Program |
| RAR     | research assistance request   |
| RASCAL  | Radiological Assessment System for Consequence Analysis               |
| RDFA    | Reactor Decommissioning Financial Assurance                           |
| RES     | Office of Nuclear Regulatory Research                                 |
| RG      | regulatory guide  |
| SAFSTOR | long-term storage   |
| SDMP    | site decommissioning management plan                                  |
| SER     | safety evaluation report  |
| SLDA    | Shallow Land Disposal Area  |
| SSSB    | Surface Ship Support Barge  |
| TBD     | to be determined  |
| TCEQ    | Texas Commission on Environmental Quality                             |
| TRIGA   | Training, Research, Isotopes General Atomics                          |
| UMS     | Universal Multipurpose Systems  |
| UMTRCA  | Uranium Mill Tailings Radiation Control Act                           |
| UNC     | United Nuclear Corporation  |
| UNR     | user need request   |
| U.S.    | United States   |
| USACE   | U.S. Army Corps of Engineers  |
| VBWR    | Vallecitos Boiling Water Reactor                                      |
| VSP     | Visual Sample Plan  |
| WNI     | Western Nuclear Incorporated  |

# 1 INTRODUCTION

This report summarizes decommissioning activities at nuclear facilities in the United States (U.S.). 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) 2022, including the decommissioning of power reactors, research and test reactors, complex materials sites, uranium recovery facilities, and fuel cycle facilities. As such, this report discusses the current progress and accomplishments in the NRC's Decommissioning Program, gives contact information supplied by Agreement States on the decommissioning sites within their States, and identifies key Decommissioning Program activities that the NRC staff will undertake in the coming year. The information in this report is current as of September 30, 2022.

As of September 30, 2022, 26 nuclear power and early demonstration reactors, 2 research and test reactors, 8 complex materials facilities,<sup>1</sup> 5 Title II<sup>2</sup> uranium recovery facilities, and part of 1 fuel cycle facility are undergoing decommissioning or are in long-term safe storage under NRC jurisdiction.<sup>3</sup> Of the 26 power and early demonstration reactors in decommissioning, 9 have elected the SAFSTOR (long-term storage) option and 17 have elected the DECON (active decommissioning) option. In FY 2022, NRC terminated the license for the Humboldt Bay Power Plant Facility, Unit 2, and continued its review of the amendment requests to terminate the licenses for the La Crosse Boiling Water Reactor, and Zion Unit 1 and Unit 2. The NRC terminated the Humboldt Bay Unit 3 license under 10 CFR Part 50, "Domestic Licensing for Production and Utilization Facilities," on November 18, 2021. The inventory of decommissioning power reactor sites remained at 26, with the termination of the license for the Humboldt Bay Power Plant Facility and the Palisades Nuclear Plant permanently ceasing power operations. The licensee for two additional reactors which had previously announced the intent to shut down by 2025: Diablo Canyon Power Plant, Units 1 and 2 (2024 and 2025, respectively), has requested the NRC staff to resume review of their license renewal application for continued operation by letter dated October 31, 2022 (ML22304A691). In addition, 19 of the 22 UMTRCA Title I legacy uranium recovery sites and 6 UMTRCA Title II sites are under a general license held by the U.S. Department of Energy (DOE).

---

<sup>1</sup> Complex material sites are defined as sites where the complexity of the decommissioning process will require more than minimal technical and administrative support.

<sup>2</sup> "Title I" in this report refers to facilities under the Uranium Mill Tailings Radiation Control Act of 1978, as amended (UMTRCA), that were inactive, unregulated processing or disposal sites when the act was passed, while "Title II" refers to facilities that were licensed by the NRC or an Agreement State in 1978 or after UMTRCA was enacted.

<sup>3</sup> Of the 22 Title I sites, 2 are former processing sites. General licenses under Title 10 of the *Code of Federal Regulations* (10 CFR) 40.27, "General license for custody and long-term care of residual radioactive material disposal sites," are not in effect at those sites because UMTRCA only addresses the licensing of mill tailings disposal sites.

## 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 under NRC authority, 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 decommissioning process, as appropriate. This report summarizes a broad spectrum of activities associated with the program's functions.

Each year, the NRC terminates approximately 100 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.

The NRC public website has status summaries for the facilities managed in the Decommissioning Program (<https://www.nrc.gov/waste/decommissioning.html>). These summaries, which are updated annually or when significant changes in status occur, describe the status of each site and identify the major technical and regulatory issues affecting the completion of decommissioning. 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 and staff availability. 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. The processes for decommissioning reactors, materials facilities, and uranium recovery sites can be found on the NRC website at <https://www.nrc.gov/waste/decommissioning/process.html>.

Through the Agreement State program, 39 States have signed formal agreements with the NRC. 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 (1) nuclear reactors, which are licensed under either 10 CFR Part 50 or 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," (2) fuel cycle facilities, and (3) Federal materials facilities in the State. Section 7 of this report discusses the NRC's coordination with the Agreement States' decommissioning programs.

### 2.1 Nuclear Power Reactor Decommissioning

The NRC's power reactor decommissioning activities include project management, technical review of licensee submittals in support of decommissioning, core inspections, support for the development of rulemaking and guidance, public outreach efforts, international assistance and cooperation, and participation in industry conferences and workshops. In addition, the NRC staff routinely processes license amendments, exemptions, and programmatic approvals (e.g., for quality assurance) to support the progressive stages of decommissioning. The Decommissioning Program staff regularly coordinates with other offices on issues regarding decommissioning power reactors, and with the Division of Fuel Management in the Office of Nuclear Material Safety and Safeguards (NMSS) about the independent spent fuel storage installations (ISFSIs) at reactor sites undergoing decommissioning.

As of September 30, 2022, the 26 nuclear power and early demonstration reactors in table 2.1-a are undergoing decommissioning. Table 2.1-a gives an overview of the status of these nuclear power reactors. Plant status summaries for all decommissioning nuclear power reactors are available on the NRC website at <https://www.nrc.gov/info-finder/decommissioning/power-reactor/index.html>. Table 2.1-b lists the decommissioned power reactors that have ISFSIs on site.

### **2.1.1 Summary of Fiscal Year 2022 Activities**

- Pacific Gas and Electric Company completed decommissioning the entire site, excluding the ISFSI, for Humboldt Bay Unit 3. The NRC staff terminated the license.
- General Atomics completed the decommissioning of the Training, Research, Isotopes General Atomics (TRIGA) Mark I and TRIGA Mark F reactor units located at GA's TRIGA Reactor facility in San Diego, California, and the NRC terminated the licenses.
- Palisades permanently ceased operations and transferred to decommissioning status. The inspection activities move from the Reactor Oversight Process to Inspection Manual Chapter (IMC) 2561, "Decommissioning Power Reactor Inspection Program," upon permanent defueling of the plant.
- Project management responsibility for the Palisades nuclear plant and the Aerotest Radiography and Research Reactor transferred from the Office of Nuclear Reactor Regulation (NRR) to NMSS.
- The staff continued to review the Zion and La Crosse FSSRs that were submitted in 2019 through 2022. In May 2022, the NRC staff reviewed and approved the release of the La Crosse FSSR associated with the Class 2 and Class 3 survey units, as well as the sole Class 1 buried piping survey unit. As a result, these survey units were removed from the La Crosse license.
- The NRC continued to implement the interagency agreement between the NRC and DOE Naval Reactors for NRC technical support services for the decommissioning of a nuclear navy surface ship, the Surface Ship Support Barge (SSSB). This is a first-of-a-kind project. Naval Reactors awarded a decommissioning contract for the SSSB to APTIM Federal Services, LLC, in June 2020. The NRC staff provided oversight consultation to the U.S. Navy in FY 2022.
- GEH changed their decommissioning schedules to meet the 60-year decommissioning completion dates. GEH has begun active decommissioning of the Vallecitos Boiling Water Reactor (VBWR) to meet the required license termination date of September 2025.
- The NRC staff hosted several hybrid public meetings to discuss and seek comments on the content of the post shutdown decommissioning activities reports (PSDARs) for various sites entering decommissioning. Specifically, the staff held a decommissioning informational meeting in June 2022, the Diablo Canyon PSDAR meeting in July 2022, and the Palisades PSDAR meeting in September 2022.
- The NRC staff participated in two government--to--government meetings related to the Diablo Canyon PSDAR to discuss the planned decommissioning of the Diablo Canyon

reactors and the regulatory requirements surrounding the potential for continued operation of the two reactor units beyond the planned shutdowns in 2024 (Unit 1) and 2025 (Unit 2).

- The NRC staff held a hybrid public meeting in Blair, Nebraska, on the Fort Calhoun Station LTP. The purpose of the meeting was to describe the content of the LTP and the NRC's LTP review and approval process, and to accept public comments on the LTP.

### Reactor Decommissioning Financial Assurance Working Group

The Reactor Decommissioning Financial Assurance (RDFA) Working Group issued a final report on May 1, 2020, which concluded that the NRC has a robust regulatory, licensing, and oversight framework for power RDFA and that the oversight framework continues to be robust for all current and anticipated approaches for accomplishing decommissioning (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20120A550). The RDFA Working Group final report also recommended the following nine enhancements to the NRC power RDFA guidance and procedures implementing the licensing and oversight processes to improve the program effectiveness, efficiency, and transparency of the RDFA program:

- Clarify Oversight of Decommissioning Trust Fund Expenditures as Part of Reviews of Annual Decommissioning Funding Status Reports.
- Develop periodic cost baselining.
- Develop 30-day notification guidance.
- Revise inspection procedures.
- Develop an RDFA spot check program for licensees of power reactors in decommissioning.
- Establish an RDFA training program.
- Clarify PSDAR update triggers.
- Clarify the applicability of the formula amount.
- Provide irradiated nuclear fuel funding guidance for use of provisional trust funds.

Updates to NRC guidance documents to incorporate these enhancements are ongoing. The staff plans to make draft interim staff guidance public by the end of calendar year (CY) 2022 and finalize it by summer 2023. The interim staff guidance will be incorporated into Regulatory Guide (RG) 1.159, "Assuring the Availability of Funds for Decommissioning Nuclear Reactors," after the decommissioning rulemaking is finalized.

#### **2.1.2 Fiscal Year 2023 Areas of Focus**

The reactor decommissioning program is adapting to the industry trend of license transfer and sale of reactor units from utilities to specialized decommissioning companies. The NRC staff will continue to internally coordinate, as necessary, to provide support with public outreach and ensure high-quality safety reviews of submittals consistent with the NRC's mission to protect public health and safety and the environment. The staff will also continue to work toward the termination of licenses at sites where physical decommissioning has been completed. This includes sites such as Zion, where the staff will review the licensee's approach for addressing discrete radiological particles, and La Crosse, where the staff is reviewing the remaining survey area (Class 1) for release.



**Table 2.1-a Power and Early Demonstration Reactors Undergoing Decommissioning**

|    | <b>Reactor</b>           | <b>Location</b>   | <b>Status</b> | <b>Date of Shutdown</b> | <b>Date PSDAR* Submitted</b> | <b>Date LTP Submitted</b> | <b>Date LTP Approved</b> | <b>Date of Decommissioning Completion**</b> |
|----|--------------------------|-------------------|---------------|-------------------------|------------------------------|---------------------------|--------------------------|---|
| 1  | Crystal River Unit 3     | Crystal River, FL | DECON         | 2/13                    | 6/19***                      | TBD                       | TBD                      | 2026–2030                                   |
| 2  | Dresden Unit 1           | Morris, IL        | SAFSTOR       | 10/78                   | 6/98                         | TBD                       | TBD                      | 2036  |
| 3  | Duane Arnold             | Palo, IA          | SAFSTOR       | 8/20                    | 4/20                         | TBD                       | TBD                      | 2080  |
| 4  | Fermi Unit 1             | Newport, MI       | SAFSTOR       | 9/72                    | 4/98                         | 2011****                  | TBD                      | 2032  |
| 5  | Fort Calhoun             | Blair, NE         | DECON         | 10/16                   | 12/19***                     | 8/21                      | TBD                      | 2026  |
| 6  | GEH- EVESR               | Sunol, CA         | DECON         | 2/67                    | 9/22***                      | TBD                       | TBD                      | 2030  |
| 7  | GEH-VBWR                 | Sunol, CA         | DECON         | 12/63                   | 9/22***                      | TBD                       | TBD                      | 2025  |
| 8  | Indian Point Unit 1      | Buchanan, NY      | DECON         | 10/74                   | 12/19***                     | TBD                       | TBD                      | 2026  |
| 9  | Indian Point Unit 2      | Buchanan, NY      | DECON         | 4/20                    | 12/19                        | TBD                       | TBD                      | 2033  |
| 10 | Indian Point Unit 3      | Buchanan, NY      | DECON         | 4/21                    | 12/19                        | TBD                       | TBD                      | 2033  |
| 11 | Kewaunee                 | Kewaunee, WI      | SAFSTOR       | 5/13                    | 5/13                         | TBD                       | TBD                      | 2073  |
| 12 | La Crosse                | La Crosse, WI     | DECON         | 4/87                    | 5/98                         | 7/16                      | 5/19                     | 2022  |
| 13 | Millstone Unit 1         | Waterford, CT     | SAFSTOR       | 7/98                    | 6/99                         | TBD                       | TBD                      | 2056  |
| 14 | Nuclear Ship Savannah    | Baltimore, MD     | DECON         | 11/70                   | 12/08                        | TBD                       | TBD                      | 2031  |
| 15 | Oyster Creek             | Forked River, NJ  | DECON         | 9/18                    | 6/18                         | TBD                       | TBD                      | 2025  |
| 16 | Palisades                | Covert, MI        | SAFSTOR       | 5/22                    | 12/20                        | TBD                       | TBD                      | 2041  |
| 17 | Peach Bottom Unit 1      | Delta, PA         | SAFSTOR       | 10/74                   | 6/98                         | TBD                       | TBD                      | 2034  |
| 18 | Pilgrim                  | Plymouth, MA      | DECON         | 5/19                    | 11/18                        | TBD                       | TBD                      | 2027  |
| 19 | San Onofre Unit 1        | San Clemente, CA  | DECON         | 11/92                   | 12/98                        | TBD                       | TBD                      | 2030  |
| 20 | San Onofre Unit 2        | San Clemente, CA  | DECON         | 6/13                    | 9/14                         | TBD                       | TBD                      | 2031  |
| 21 | San Onofre Unit 3        | San Clemente, CA  | DECON         | 6/13                    | 9/14                         | TBD                       | TBD                      | 2031  |
| 22 | Three Mile Island Unit 1 | Middletown, PA    | SAFSTOR       | 9/19                    | 4/19                         | TBD                       | TBD                      | 2079  |

| Reactor | Location                 | Status         | Date of Shutdown | Date PSDAR* Submitted | Date LTP Submitted | Date LTP Approved | Date of Decommissioning Completion** |           |
|---------|--------------------------|----------------|------------------|-----------------------|--------------------|-------------------|--------------------------------------|-----------|
| 23      | Three Mile Island Unit 2 | Middletown, PA | SAFSTOR          | 3/79                  | 12/19***           | TBD               | TBD                                  | 2037      |
| 24      | Vermont Yankee           | Vernon, VT     | DECON            | 12/14                 | 4/17***            | TBD               | TBD                                  | 2026–2030 |
| 25      | Zion Unit 1              | Zion, IL       | DECON            | 2/97                  | 3/08***            | 12/14             | 9/18                                 | 2023      |
| 26      | Zion Unit 2              | Zion, IL       | DECON            | 9/96                  | 3/08***            | 12/14             | 9/18                                 | 2023      |

\* PSDAR or DP equivalent. Before August 28, 1996, the effective date of the final rule “Decommissioning of Nuclear Power Reactors” (61 FR 39278; July 29, 1996), licensees submitted DPs (or equivalent).

\*\* Anticipated year of completion of decommissioning. For decommissioning reactors with no ISFSI or an ISFSI licensed under the specific license provisions of 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 decommissioning will result in the termination of the 10 CFR Part 50 license. For reactors with an ISFSI licensed under the general license provisions of 10 CFR 72.210, “General licensed issued,” completion of decommissioning will result in reducing the 10 CFR Part 50 license boundary to the footprint of the ISFSI.

\*\*\* Revised PSDAR with a new decommissioning schedule.

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

**Table 2.1-b Decommissioned Power Reactors that Have Independent Spent Fuel Storage Installations**

| <b>Reactor</b> |                           | <b>Onsite Fuel Status</b> | <b>Cask Vendor</b>                      | <b>Model</b>                  |
|----------------|---------------------------|---------------------------|---|-------------------------------|
| <b>1</b>       | Big Rock Point            | 10 CFR 50 ISFSI           | EnergySolutions, Inc.                   | Fuel Solutions W74            |
| <b>2</b>       | Connecticut Yankee        | 10 CFR 50 ISFSI           | NAC International, Inc                  | NAC-MPC                       |
| <b>3</b>       | Fort St. Vrain (DOE site) | 10 CFR 72 ISFSI           | Foster Wheeler Energy Applications, Inc | Modular Vault Dry Store       |
| <b>4</b>       | Humboldt Bay              | 10 CFR 72 ISFSI           | Holtec International                    | HI-STAR Version HB and MPC HB |
| <b>5</b>       | Maine Yankee              | 10 CFR 50 ISFSI           | NAC International, Inc                  | NAC-UMS                       |
| <b>6</b>       | Rancho Seco               | 10 CFR 72 ISFSI           | Transnuclear, Inc.                      | NUHOMS-24P                    |
| <b>7</b>       | Trojan                    | 10 CFR 72 ISFSI           | BNFL Transtor/Holtec International      | HI-STORM 100                  |
| <b>8</b>       | Yankee Rowe               | 10 CFR 50 ISFSI           | NAC International, Inc                  | NAC-MPC                       |

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

The NRC research and test reactor decommissioning activities include project management, technical review of licensee submittals in support of decommissioning, inspections, support for the development of rulemaking and guidance, public outreach, and participation in industry conferences and workshops. In addition, the NRC staff routinely processes license amendments and exemptions to support the progressive stages of decommissioning. As of September 30, 2022, two research and test reactors were in decommissioning status. The NRC staff terminated the licenses for the two TRIGA reactors in December 2021. The Aerotest Radiography and Research Reactor was transferred to NMSS for decommissioning in April 2022. Table 2.2 lists the research and test reactors undergoing decommissioning. Plant status summaries for all decommissioning research and test reactors are available on the NRC website at <https://www.nrc.gov/info-finder/decommissioning/research-test/index.html>.

### **2.2.1 Summary of Fiscal Year 2022 Activities**

General Atomics completed the physical decommissioning work at its two TRIGA research reactors in San Diego, California. In August 2019, independent verification surveys of the site were conducted, and several subsequent NRC inspections supported the final site status conclusions. General Atomics requested license termination of its two TRIGA licenses in January 2021. The NRC staff completed a review of the General Atomics FSSR and approved termination of the TRIGA licenses in December 2021. NMSS continues to review the DP for the Aerotest Radiography and Research Reactor that was submitted to the NRC in July 2021.

### **2.2.2 Fiscal Year 2023 Areas of Focus**

The staff will work to complete the review of the Aerotest Radiography and Research Reactor DP. The NRC staff anticipates that GEH will submit a decommissioning plan for the General Electric Test Reactor (GETR) facility in October 2023 and will interact with the licensee and plan for the review in FY 2023.

**Table 2.2 Research and Test Reactors Undergoing Decommissioning**

|          | <b>Reactor</b>                            | <b>Location</b> | <b>Date of Shutdown</b> | <b>Status</b>                 | <b>Date of Decommissioning Completion</b> |
|----------|---|-----------------|-------------------------|-------------------------------|---|
| <b>1</b> | Aerotest Radiography and Research Reactor | San Ramon, CA   | 10/10                   | Possession-Only, DP submitted | TBD                                       |
| <b>2</b> | GE-Hitachi GETR                           | Sunol, CA       | 1/85                    | Possession-Only               | 2030                                      |
| <b>3</b> | General Atomics TRIGA Mark F              | San Diego, CA   | 9/94                    | License Terminated            | 2021                                      |
| <b>4</b> | General Atomics TRIGA Mark I              | San Diego, CA   | 12/96                   | License Terminated            | 2021                                      |

## 2.3 Complex Materials Facility Decommissioning

Decommissioning activities associated with materials facilities 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 and sites in Agreement States that have exclusive Federal jurisdiction; interacting with the U.S. Environmental Protection Agency (EPA), the DOE, and 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 NRC 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, 2022, eight complex materials sites are undergoing decommissioning (see table 2.3).

Complex materials sites are defined as sites where the complexity of the decommissioning process will require more than minimal technical and administrative support. It is expected that the decommissioning work at these sites will take more than a year to complete. Examples of complex materials sites include sites with ground water contamination, sites with 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 stakeholder interest. Status summaries for the complex materials sites undergoing decommissioning are available on the NRC website at <https://www.nrc.gov/info-finder/decommissioning/complex/index.html>.

### 2.3.1 Summary of Fiscal Year 2022 Activities

- The NRC staff continued to coordinate with the USACE Pittsburgh office for the cleanup of the Shallow Land Disposal Area (SLDA) site in Vandergrift, Pennsylvania, and approved the draft workplans.
- In 2002 and again in 2016, Fansteel filed for bankruptcy protection under Chapter 11. Fansteel is still in bankruptcy. Fansteel Metals Inc., the current NRC licensee, is a wholly owned subsidiary of Fansteel and was formed in 2004 for the sole purpose of decommissioning the site. Fansteel Metals Inc. (formerly FMRI) has not itself filed for bankruptcy but is insolvent.
- The NRC terminated the license for the Sigma Aldrich Fort Mims Site in Maryland Heights, Missouri.
- The University of Missouri retracted its submitted DP. The licensee plans to resubmit the DP in the second quarter of 2023 for NRC review. NRC and licensee staff are conducting monthly pre-DP meetings to support the efficient review of a revised DP.

### Radium Activities

The Energy Policy Act of 2005 established the NRC's authority over activities associated with discrete sources of radium and associated contamination; these activities include 1) maintaining various levels of regulatory oversight at sites with identified discrete sources of radium or associated contamination; 2) examining issues and funding options to facilitate remediation of sites in non-Agreement States; 3) interacting with the States, the EPA, the U.S. Department of Defense (DoD), and the National Park Service (NPS) at their respective sites; 4) inspecting service providers at the sites that are subject to exclusive Federal jurisdiction; 5) conducting

public outreach; and 6) participating in industry conferences and workshops. NRC staff activities involve varying levels of oversight at both military and nonmilitary sites. More information on the staff's radium activities is available on the NRC website at <https://www.nrc.gov/materials/radium.html>.

### Summary of Fiscal Year 2022 Military Radium Activities

The NRC and the DoD entered into a memorandum of understanding (MOU) in April 2016 describing roles in the cleanup of radium and other unlicensed radioactive materials at military sites (ML16092A294).

In FY 2022, the NRC staff continued monitoring activities at the following ongoing cleanups:

- U.S. Army: Dugway Proving Grounds in Dugway, Utah
- U.S. Air Force: Hill Air Force Base in Ogden, Utah, and the former Kelly (Lackland) Air Force Base in San Antonio, Texas
- U.S. Navy: China Lake Naval Air Weapons Station in China Lake, California; the former Long Beach Naval Shipyard in Long Beach, California; the former Mare Island Naval Shipyard in Vallejo, California; Naval Air Station North Island in Coronado, California; Naval Base San Diego in San Diego, California; and the former Naval Station Treasure Island in San Francisco, California

The NRC completed reviews of the following military radium cleanup reports:

- a record of decision for Area 2 of Solid Waste Management Unit 11 at the Dugway Proving Grounds
- a conceptual site model update and a request for no further action on 1400-Series Housing Areas 1 and 2 for Installation Restoration Site 12 at the former Naval Station Treasure Island
- a data gaps investigation and remedial action completion report for Installation Restoration Sites 1 and 2 at the former Long Beach Naval Shipyard
- a remedial investigation report for Unexpected Ordnance Site 3 at the former Mare Island Naval Shipyard

The NRC staff also held coordination calls with the DoD to determine upcoming activities and schedules at programmatic and site-specific levels. The NRC staff has regular communication with the DoD to ensure that (1) implementation of the MOU is going well at these sites and (2) that the DoD's remedies will meet the NRC 0.25 millisieverts-per-year (25 millirem-per-year) dose criterion in 10 CFR 20.1402, "Radiological criteria for unrestricted use," for sites that will be released for unrestricted use or are consistent with the requirements in 10 CFR 20.1403(b) for sites that will be released for restricted use.

Throughout FY 2022, the NRC staff continued implementing the "stay-informed" approach described in the MOU for remediation of other sites by holding discussions about the status of, and issues associated with, site cleanup with the military, the EPA, and the States. Sites include the following:

- U.S. Army: Sharpe Depot in Lathrop, California
- U.S. Air Force: Elmendorf Air Force Base in Anchorage, Alaska, and the former McClellan Air Force Base, in Sacramento, California
- U.S. Navy: the former Alameda Naval Air Station in Alameda, California; the former Brunswick Naval Air Station in Brunswick, Maine; Marine Corps Base Camp LeJeune in Jacksonville, North Carolina; the former Hunters Point Naval Shipyard site in San Francisco, California; and Naval Weapons Station Yorktown in Yorktown, Virginia

The staff plans to continue its reliance on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process and EPA oversight at these sites.

In December 2019, the NRC responded to Greenaction for Health and Environmental Justice regarding its petition under 10 CFR 2.206, “Requests for action under this subpart,” to revoke Tetra Tech EC, Inc.’s service provider license due to falsification of records at the Hunters Point Shipyard. The NRC stated that it will hold the petition in abeyance and reassess it after the legal resolution of the DOJ’s civil complaint against Tetra Tech EC, Inc. (ML19309F257). Every 4 months, the Petition Review Board gives the petitioner and the licensee an update on the status of the DOJ’s activities for the civil complaint against Tetra Tech EC, Inc. The most recent status update was in September 2022 (ML22250A316).

#### Summary of Fiscal Year 2022 Nonmilitary Radium Activities

As of September 30, 2022, the NRC staff had dispositioned all the sites<sup>4</sup> that were identified as having potential contamination from historical radium use in non-Agreement States. Five of the sites had calculated doses from radium contamination that exceed unrestricted use standards, requiring remediation. Moving forward, the effort will continue to focus on working with the site owners on site remediation. Remediation at each of the five sites with contamination levels that exceed the NRC’s unrestricted use standards is at a different stage, as follows:

- As reported in previous FYs, the former Benrus Clock Company, in Waterbury, Connecticut, and the former Sessions Clock Company in Bristol, Connecticut, completed remediation activities, and the NRC staff issued closeout letters in March and November 2019, respectively (ML19077A037 and ML19263A650, respectively).
- Remediation activities at the former New Haven Clock Company began in August 2018 and are ongoing. Due to funding and COVID-19 pandemic issues, site cleanup is now anticipated to be completed in FY 2023. The NRC staff will coordinate any closeout activities with State of Connecticut’s Department of Energy and Environmental Protection.

---

<sup>4</sup> As described in SECY-16-0020, “Near-Term Actions to Address Non-Military Sites with Potential Radium Contamination,” dated February 5, 2016 (ML17130A774), the staff originally identified 29 historical sites in Non-Agreement States for follow up. As a site can have multiple property owners, these 29 historical sites have 47 unique site owners. Subsequently, as part of continuing coordination efforts with the States on naturally occurring and accelerator-produced radioactive material, the NRC identified 11 additional sites with potential radium contamination. State of Michigan officials informed the NRC staff of nine additional sites. During preparations for the site visit to a former clock factory in Connecticut, the NRC staff identified two additional sites in Connecticut.



- The NRC staff approved the cleanup plan for New Opportunities of Waterbury, Inc. (NOW), in Waterbury, Connecticut, in April 2019 (ML19044A522) and met with the site owner and Federal, State, and local partners to discuss the status of remediation planning and funding. In addition, the staff has been exercising a monitoring role at the portion of the NOW site formerly under the EPA's Brownfields program. The State of Connecticut asked EPA Region I to perform an emergency removal action at this site due to structural concerns about portions of the site. In January 2020, the EPA Region I staff completed a preliminary assessment of the site and determined that an emergency removal action is not warranted. Also, in 2020, the EPA began to assess the site for listing on the National Priorities List and remedial actions under CERCLA; however, the assessment was delayed due to the COVID-19 pandemic. In FY 2022, the EPA began renegotiating site access agreements to restart the assessment.
- The NRC staff received a cleanup plan in November 2019 from the site owner of the former Seth Thomas Clock Company in Thomaston, Connecticut (ML19326B980). In January 2020, the staff requested additional information on the cleanup plan (ML20030A128). In April 2020, at the site owner's request due to the COVID-19 pandemic, the staff placed its review of the cleanup plan on hold. In January, April, and August 2022, the NRC staff discussed the status of remediation planning and potential funding sources to restart remediation with the site owner and State partners.

Additionally, in FY 2022, the NRC and the NPS staffs continued to coordinate efforts, in accordance with the NRC-NPS MOU (ML20239A731), for the ongoing environmental response actions at Great Kills Park in Staten Island, New York; Spring Creek Park in Queens, New York; and Dead Horse Bay in Brooklyn, New York, where the NPS previously identified confirmed radium contamination.

The NRC staff continues to coordinate with Agreement State partners as they work to resolve nonmilitary radium issues within their jurisdictions. As of September 30, 2022, 33 of 39 Agreement States have completed their investigation activities, have dispositioned all the sites on their lists, and have no further plans for additional investigations. In May 2022, the NRC staff provided technical assistance to Nevada, at their request, on the release of a site that underwent cleanup in that State. The remaining Agreement States continued to conduct prioritized reviews of the sites within their jurisdictions, focusing on the most risk-significant sites.

### West Valley Demonstration Project

In their preferred environmental impact statement (EIS) alternative for decommissioning and long-term stewardship of the West Valley Demonstration Project (WVDP) and Western New York Nuclear Service Center near Buffalo, New York, the West Valley Reprocessing Plant licensees—New York State Energy Research and Development Authority (NYSERDA) and the U.S. Department of Energy—West Valley Demonstration Project (DOE-WVDP)—employ a two-phase approach.

Phase 1 involves the decommissioning of most WVDP site facilities, including demolition of the Main Plant Process Building (MPPB) and vitrification facility; cleanup of contaminated soil; and use of site data to inform studies to reduce uncertainties associated with decommissioning the remaining facilities (referred to as Phase 1 studies). Phase 1 of the decommissioning approach

is being conducted in accordance with the NRC-approved DP. Phase 2 involves completion of the decommissioning process and long-term management decision-making for the site.

In FY 2022, DOE-WVDP and NYSERDA continued to work toward the Phase 1 decommissioning goals, specifically by completing the preparations to demolish the above-grade portion of the MPPB and continued aggressive decontamination of the Product Purification Cell—South. The NRC evaluated the demolition readiness of the MPPB in December 2021 and confirmed it during a monitoring visit in August 2022.

DOE-WVDP has started development of a probabilistic performance assessment in support of additional decommissioning activities at the WVDP and is continuing work on the draft supplemental EIS for Phase 2 decommissioning. The State-licensed disposal area will be included in the supplemental EIS to allow a comprehensive view of dose contributions from the entire site.

### **2.3.2 Fiscal Year 2023 Areas of Focus**

- The NRC staff will coordinate with the Oklahoma Department of Environmental Quality and will work with the EPA to determine whether the Fansteel site is eligible for cleanup under CERCLA.
- The staff will continue its review of the new work plans for the SLDA.
- The NRC staff will perform the preapplication audit, acceptance review, and if appropriate, technical review for the Cimarron DP, Revision 3.
- The NRC staff will continue implementing the MOU with the DoD for military radium by prioritizing its activities based on available resources. Factors for consideration in prioritizing annual monitoring activities include (1) involvement of other regulatory agencies, (2) use of engineered controls and/or land use controls as remedies, (3) contamination in buildings for reuse, (4) amount or type of material and how transportable it is, and (5) previous monitoring activities.
- The NRC staff will continue its efforts on nonmilitary radium by working with site owners on risk-informed approaches for site cleanup. Additionally, the staff will continue to implement the MOU with the NPS as remediation activities progress at Great Kills Park, Spring Creek Park, and Dead Horse Bay.
- The NRC staff plans to focus on ensuring the demolition of the MPPB at the WVDP is conducted in accordance with the methods and assumptions reviewed by the staff. The staff will also continue reviewing the remaining areas of the Product Purification Cell—South, which are still being prepared for demolition at the WVDP. MPPB demolition is expected to take more than 30 months to complete. The NRC staff will prepare for comments and technical interactions on the draft supplemental EIS and probabilistic performance assessment.

**Table 2.3 Complex Decommissioning Sites**

|   | Name  | Location          | Date DP Submitted  | Date DP Approved | Compliance Criteria | Date of Decommissioning Accomplished |
|---|---|-------------------|--------------------|------------------|---------------------|--------------------------------------|
| 1 | Alameda Naval Air Station   | Alameda, CA       | N/A                | N/A              | MOU**               | N/A                                  |
| 2 | Cimarron (Kerr-McGee)   | Cimarron, OK      | 4/95 revised 11/18 | 8/99             | Action-UNRES***     | 2039                                 |
| 3 | Department of the Army, U.S. Armament Research, Development, and Engineering Center | Picatinny, NJ     | 11/13 revised 8/19 | 4/17             | LTR-UNRES           | TBD                                  |
| 4 | Fansteel Metals Inc. (formerly FMRI)  | Muskogee, OK      | 7/99 revised 5/03  | 12/03            | LTR-UNRES           | TBD                                  |
| 5 | Hunter's Point Naval Shipyard* (former Naval Shipyard)                              | San Francisco, CA | N/A                | N/A              | MOU**               | N/A                                  |
| 6 | McClellan* (former Air Force Base)  | Sacramento, CA    | N/A                | N/A              | MOU**               | N/A                                  |
| 7 | Shallow Land Disposal Area (BWX Technologies, Inc.)****                             | Vandergrift, PA   | N/A                | N/A              | LTR-UNRES           | TBD                                  |
| 8 | West Valley Demonstration Project   | West Valley, NY   | Phase 1 3/09       | Phase 1 2/10     | LTR-UNRES†          | TBD                                  |

\* The Hunter's Point Shipyard and Alameda Naval Air Station sites are being remediated by the U.S. Navy, and the McClellan site is being remediated by the U.S. Air Force, under the CERCLA process and EPA oversight. It is assumed that some licensable material might be present at both sites; however, the NRC has not licensed these sites. Instead, the Commission has approved a "limited involvement approach to stay informed," and the NRC staff will rely on the ongoing CERCLA process and EPA oversight. More information is available on this approach in SECY-08-0077, "Options for U.S. Nuclear Regulatory Commission Involvement with the U.S. Navy's Remediation of the Hunters Point Naval Shipyard Site in California," dated May 30, 2008 (ML080800110).

\*\* "Memorandum of Understanding Between the United States Nuclear Regulatory Commission and the United States Department of Defense for Coordination on CERCLA Response Actions at DoD Sites with Radioactive Materials," issued April 2016 (ML16092A294).

\*\*\* 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 site decommissioning management plan (SDMP) action plan criteria for site remediation.

\*\*\*\* The USACE's remediation approach for the SLDA site is to follow the CERCLA process and adhere to the MOU between the NRC and the USACE for coordination, remediation, and decommissioning of Formerly Utilized Sites Remedial Action Program (FUSRAP) sites with NRC-licensed facilities (66 FR 36606; July 12, 2001). A supplemental MOU between the USACE, the DOE, and the NRC, signed in June 2014, complements the existing MOU by incorporating the relevant requirements of 10 CFR Parts 70, 73, and 74 and stipulates the specific roles of each Federal entity throughout the remainder of the remediation process.

† The WVDP 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.

Notes:

- The compliance criteria identified in this table reflect the information in the most recent NRC-approved DP or approach. The compliance criteria may change if the NRC approves alternate compliance criteria requested by the licensee.
- "Action" refers to SDMP action plan criteria, "LTR-UNRES" refers to License Termination Rule criteria for unrestricted use.
- Reasons for multiple DP submittals range from changes in the favored decommissioning approach, to the phased implementation of decommissioning, to poor-quality submittals.

## 2.4 Uranium Recovery Facility Decommissioning

In enacting the UMTRCA, 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 (Title I). 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 (Title II). Additional information on the UMTRCA can be found on the NRC website at <https://www.nrc.gov/waste/mill-tailings.html>.

The NRC's uranium recovery decommissioning activities include project management, technical review of licensee and DOE submittals in support of decommissioning or long-term care and maintenance, the development of rulemaking and guidance, public outreach efforts, international assistance and cooperation, and participation in industry conferences and workshops.

Table 2.4-a identifies the 22 Title I sites. All but three sites—in Moab, Utah; Riverton, Wyoming; and Monument Valley, Arizona—have an NRC general license under 10 CFR 40.27. The regulation at 10 CFR 40.27 governs the long-term care of Title I disposal sites under a general license held by the DOE. The Moab, Utah, site does not yet have a general license because it is currently undergoing decommissioning. The Riverton, Wyoming, and Monument Valley, Arizona, sites do not have an NRC general license because they are not mill tailings disposal sites.<sup>5</sup> The NRC has a statutory oversight role at these sites until the ground water remedy selected by the DOE is completed. The NRC performs a similar role at several other Title I processing sites where the tailings had been moved to another location. Additional information on the status of Title I sites can be found on the DOE website at <https://www.energy.gov/lm/lm-sites>.

Table 2.4-b identifies the NRC-licensed Title II sites that are no longer operating and are in decommissioning status. As of September 30, 2022, five such Title II uranium recovery facilities are undergoing decommissioning. The regulation at 10 CFR 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 disposal sites under a general license held by either the DOE or the State in which the site is located, after decommissioning is complete. Status summaries for the Title II sites undergoing decommissioning can be found on the NRC website at <https://www.nrc.gov/info-finder/decommissioning/uranium/index.html>.

Table 2.4-c identifies the Title II sites that have been transferred for long-term care to the DOE. As of September 30, 2022, six Title II uranium recovery facilities have been transferred to the DOE. Additional information on the status of Title II sites can be found on the DOE website at <https://www.energy.gov/lm/lm-sites>.

### 2.4.1 Summary of Fiscal Year 2022 Activities

#### UMTRCA Title I Sites

- The NRC staff continued to communicate with the DOE about its evaluation of the tailings impoundment cover at the Mexican Hat site and the reviews of the ground water remedy evaluation for the Monument Valley site.

---

<sup>5</sup> Title I milling sites that do not have disposal cells are referred to as processing sites. Some of these sites are still undergoing remediation, however, especially to address groundwater contamination.

- The NRC staff worked with the DOE on the redesign of the cover system for the Crescent Junction disposal cell. The DOE provided a 90 percent design for review and comment by the NRC staff. This effort will continue into FY 2023.
- The staff continued its reviews of the ground water corrective action plans for the Gunnison and Rifle sites in Colorado and the Green River site in Utah.

The NRC staff, in conjunction with the Navajo Nation, EPA, DOE, U.S. Department of the Interior's Bureau of Indian Affairs, Indian Health Service, and Agency for Toxic Substances and Disease Registry, completed the development of a new 10-year plan in FY 2021 to address uranium contamination on the Navajo Nation. In April 2022, the NRC held a Commission brief in Gallup, New Mexico, "Discussion of the Ten-Year Plan to Address Impacts of Uranium Contamination on the Navajo Nation and Lessons Learned from the Remediation of Former Uranium Mill Sites."

The NRC staff continued to work with the Navajo Technical University to share NRC courseware in support of expanded science, technology, engineering, and mathematics offerings at the university. In addition, the staff continued participation in community outreach activities with the Navajo Nation.

#### UMTRCA Title II Sites

- The NRC staff continued inspection and review of licensee actions at the Homestake Mining Company of California (HMC) Grants Reclamation Project in Grants, New Mexico, as required by Confirmatory Order (CO) EA-16-114 issued in March 2017 and license SUA-1471. In November 2020, HMC responded to the NRC's June 2020 review of the November 2019 ground water corrective action program (GCAP) license amendment request (LAR) and submitted an updated GCAP LAR for NRC review, as required by the CO. In the updated GCAP LAR, HMC stated that it intended to submit an alternate concentration limit (ACL) LAR by June 2021. In April 2020, the NRC staff responded to the updated GCAP LAR. The NRC staff did not accept the GCAP LAR for review but did offer comments on the ground water model in the updated GCAP LAR. The NRC staff agreed to suspend the GCAP review until an ACL LAR was submitted and reviewed. In July 2021, HMC proposed an ACL submission date of December 2021 and subsequently proposed August 2022. The NRC accepted the proposed August 2022 date. HMC submitted its ACL application in August 2022. Evaporation Pond 1 relining has been deferred. Evaporation Pond 1 is still in use with approximately 5 percent reduced evaporative capacity. In May 2022, HMC submitted a LAR for the redesign of the top of the large tailings pile to change from a rock cover to an evapotranspiration cover. In September 2022, the NRC staff did not accept the LAR for review. In the nonacceptance letter for the evapotranspiration cover LAR, the NRC staff provided several comments for HMC to consider if they choose to submit an updated application.

The NRC staff participates in monthly site status calls with HMC and other regulators. The staff continues communications between the EPA, the DOE, the New Mexico Environment Department, and the New Mexico Office of State Engineer through monthly teleconferences to discuss coordination and alignment between the regulatory agencies. The staff also participates in monthly teleconferences with interested members of the community to provide an update on activities at the Grants Reclamation Project.

- The NRC staff continued to work on the transfer of the Western Nuclear Incorporated (WNI) site to the DOE for long-term care. The staff has completed its review of the DOE's preliminary final long-term surveillance plan (LTSP). The staff also completed its determination of the long-term care fee, and WNI subsequently paid the fee to the U.S. Treasury.
- The NRC staff continued to work with Rio Algom toward the completion of the characterization and subsequent remediation of byproduct surface contamination at their Ambrosia Lake West site, which is located in the San Mateo Creek Basin. Throughout the San Mateo Creek basin, the EPA is pursuing a CERCLA removal action of surface contamination from historical uranium mines. The NRC staff continued to attend regular meetings with EPA staff and larger meetings with Rio Algom, the EPA, the NRC, and the State of New Mexico to address the overlapping regulatory authority at the site for commingled contamination from the Ambrosia Lake West site and historical uranium mines within the San Mateo Creek Basin.
- The NRC staff continued to work with the Wyoming Department of Environmental Quality to identify funding sources and develop a path forward for completing the decommissioning of the American Nuclear Corporation site in Fremont County, Wyoming.
- In September 2020, the NRC issued the SER for the LAR for the United Nuclear Corporation (UNC) Church Rock, New Mexico site to construct a disposal cell for mine spoils atop the existing mill tailings cell. In October 2020, the NRC issued the draft EIS for public comment for the UNC Church Rock LAR. At the request of stakeholders, the comment period was extended several times, closing on November 1, 2021. During the extended comment period, the NRC staff engaged in innovative approaches on outreach with the Navajo Nation, which has included, but was not limited to, virtual meetings with the public and specific Navajo communities, newspaper articles, and radio broadcasts in English and Navajo. NRC senior managers also met with Navajo President Nez to discuss the draft EIS and additional ideas to effectively communicate with the Navajo Nation during the comment period. The staff expects to make its decision on the LAR in FY 2023, including issuance of a revised SER and the Final EIS.
- In April 2021, the NRC staff completed its review of Colorado's completion review report (CRR) for the Durita site and reviewed the DOE draft LTSP for the site, received in December 2021. The NRC staff identified to the DOE the open items that will need to be resolved in the LTSP in March 2022 and is working with the DOE to revise the schedule based on delays in the land transfer from the Bureau of Land Management.
- In August 2020, the NRC staff provided comments to the Texas Commission on Environmental Quality (TCEQ) on the CRR for the Panna Maria site in Hobson, Texas (ML20225A026). In 2022, the staff continued to work with the TCEQ to resolve outstanding concerns.

#### UMTRCA Title II Sites that Have Been Transferred to the DOE for Long-Term Care

- The NRC staff continues to discuss options with the DOE to resolve two technical concerns associated with the Bluewater site in Grants, New Mexico, that involve

(1) several feet of subsidence on approximately 40 acres of the cover, causing ponding of several acre-feet of water on the tailings impoundment after heavy rains, and (2) contaminants in the ground water plume from the site that have impacted a portion of a regional drinking water aquifer. The DOE is working cooperatively with the USACE on a solution to the impoundment subsidence and with the DOE national laboratories on long-term solutions for ground water characterization and assessing the impacts of contaminated ground water at and around the site. The Bluewater disposal cell repair project will be a multiyear review, construction, and tailings repair project. The DOE and NRC staffs have developed a plan and schedule for review of the disposal cell repair project, including the review duration, meeting and communication points, and the process for resolution of NRC comments. The DOE continues to maintain a cooperative agreement with the New Mexico Environment Department to sample ground water wells outside of the long-term care boundary.

- The DOE Applied Studies and Technology team and its contractor RSI are studying the erosional features currently found at the L-Bar disposal site in Seboyeta, New Mexico. L-Bar is one of several sites selected for a study on cover types, climate, site conditions, erosional features, and vulnerabilities to change. Relationships between cover design and setting (e.g., slope, aspect, climate) with observed erosional features (e.g., rills, gullies, internal erosional pipes, depressions, zones of sediment collection) will be evaluated in test pits in cover systems. The DOE is undertaking this study under its responsibility as the long-term care custodian. The NRC is reviewing and commenting on DOE work plans but does not need to approve those plans or repairs that may be conducted by the DOE.
- Throughout FY 2022, the NRC staff continued interactions with the DOE about those sites that are generally licensed under 10 CFR 40.27 and 10 CFR 40.28. The staff has continued to hold quarterly telephone conference calls with the DOE to discuss overarching policy and technical issues associated with managing the generally licensed sites. The staff also continued its participation in DOE meetings with the Navajo Nation and Hopi Tribe pertaining to the sites on the Navajo Nation and Hopi Reservation.

#### **2.4.2 Fiscal Year 2023 Areas of Focus**

The NRC staff will continue its activities associated with the Navajo Nation 10-year plan. Additionally, the staff will continue to review DOE reports and plans for the reclamation and management of sites on Indian land. The staff expects to complete its review of the UNC Church Rock LAR and continue the reviews of the ground water corrective action plans for the Gunnison and Rifle sites in Colorado and the Green River site in Utah. The staff will continue to work with the DOE to resolve issues associated with the Bluewater site and the L-Bar site and will work with the State of Wyoming to explore and implement options for decommissioning the American Nuclear Corporation site. The staff will work with the TCEQ to complete the reviews of the CRR for the Panna Maria site. The staff will also work with the DOE Office of Legacy Management to complete reviews of the LTSPs for the WNI and Durita sites, including a review of the land transfer issues for both WNI and Durita as well as the long-term care fee for Durita.

**Table 2.4-a Decommissioning Title I Uranium Recovery Sites**

|           | <b>Name</b>     | <b>Location</b>     | <b>Status</b>                               |
|-----------|-----------------|---------------------|---|
| <b>1</b>  | Ambrosia Lake   | Grants, NM          | Monitoring                                  |
| <b>2</b>  | Burrell         | Blairsville, PA     | Monitoring                                  |
| <b>3</b>  | Canonsburg      | Canonsburg, PA      | Monitoring                                  |
| <b>4</b>  | Durango         | Durango, CO         | Monitoring                                  |
| <b>5</b>  | Falls City      | Falls City, TX      | Monitoring                                  |
| <b>6</b>  | Grand Junction  | Grand Junction, CO  | Monitoring                                  |
| <b>7</b>  | Green River     | Green River, UT     | Monitoring                                  |
| <b>8</b>  | Gunnison        | Gunnison, CO        | Monitoring                                  |
| <b>9</b>  | Lakeview        | Lakeview, OR        | Monitoring                                  |
| <b>10</b> | Lowman          | Lowman, OR          | Monitoring                                  |
| <b>11</b> | Maybell         | Maybell, CO         | Monitoring                                  |
| <b>12</b> | Mexican Hat     | Mexican Hat, UT     | Monitoring                                  |
| <b>13</b> | Monument Valley | Monument Valley, AZ | Monitoring                                  |
| <b>14</b> | Moab Mill       | Moab, UT            | Reclamation                                 |
| <b>15</b> | Naturita        | Naturita, CO        | Active—surface and ground water remediation |
| <b>16</b> | Rifle           | Rifle, CO           | Monitoring                                  |
| <b>17</b> | Riverton        | Riverton, WY        | Monitoring                                  |
| <b>18</b> | Salt Lake City  | Salt Lake City, UT  | Monitoring                                  |
| <b>19</b> | Shiprock        | Shiprock, NM        | Active—ground water remediation             |
| <b>20</b> | Slick Rock      | Slick Rock, CO      | Monitoring                                  |
| <b>21</b> | Spook           | Converse Co., WY    | Monitoring                                  |
| <b>22</b> | Tuba City       | Tuba City, AZ       | Active—ground water remediation             |



**Table 2.4-b Decommissioning Title II Uranium Recovery Sites**

|          | <b>Name</b>                  | <b>Location</b> | <b>Date DP/Revised Plan Approved</b> | <b>Projected Date of Decommissioning Completion</b> |
|----------|------------------------------|-----------------|--------------------------------------|---|
| <b>1</b> | American Nuclear Corporation | Gas Hills, WY   | 10/88, revision 2006                 | TBD   |
| <b>2</b> | Homestake Mining Company     | Grants, NM      | 10/1993                              | TBD   |
| <b>3</b> | Rio Algom—Ambrosia Lake      | Grants, NM      | 2003 (mill); 2004 (soil)             | 2025  |
| <b>4</b> | Sequoyah Fuels Corporation   | Gore, OK        | 2008                                 | 2025  |
| <b>5</b> | United Nuclear Corporation   | Church Rock, NM | 3/91, revision 2018                  | TBD   |

**Table 2.4-c Title II Uranium Recovery Sites—DOE Licensed Under 10 CFR 40.28**

|          | <b>Name</b>         | <b>Location</b>   | <b>Date Transferred to the DOE</b> |
|----------|---------------------|-------------------|------------------------------------|
| <b>1</b> | Bluewater (Arco)    | Grants, NM        | 1997                               |
| <b>2</b> | Edgemont            | Edgemont, SD      | 1996                               |
| <b>3</b> | L-Bar               | Seboyeta, NM      | 2005                               |
| <b>4</b> | Maybell West        | Maybell, CO       | 2010                               |
| <b>5</b> | Sherwood            | Wellpinit, WA     | 2001                               |
| <b>6</b> | Shirley Basin South | Shirley Basin, WY | 2005                               |

## **2.5 Fuel Cycle Facility Decommissioning**

There is one fuel cycle facility undergoing partial decommissioning, the Nuclear Fuel Services (NFS) site in Erwin, Tennessee, in accordance with applicable provisions of 10 CFR 70.38, “Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas.” The NRC’s public website at <https://www.nrc.gov/info-finder/decommissioning/fuel-cycle/index.html> summarizes additional information about the NFS site and other fuel cycle facilities.

### **2.5.1 Summary of Fiscal Year 2022 Activities**

During FY 2022, NFS continued to work toward releasing different areas within its site. Decommissioning activities outside the protected area include ground water remediation of the North Site and the Industrial Park Facility. Decommissioning activities inside the protected area include decommissioning of the 234 Excavation Facility and Building 111, decommissioning in support of fuel modernization, ground water monitoring, ground water remediation, and miscellaneous decommissioning tasks. The 234 Tent houses facilities and equipment to excavate soil beneath the former 234 Wet Cell.

### **2.5.2 Fiscal Year 2023 Areas of Focus**

The NRC staff expects remediation work to continue at the NFS site.

### 3 GUIDANCE AND RULEMAKING ACTIVITIES

#### Decommissioning Rulemaking

In November 2021, the Commission issued SRM-SECY-18-0055, “Staff Requirements—SECY-18-0055—Proposed Rule: Regulatory Improvements for Production and Utilization Facilities Transitioning to Decommissioning” (ML21307A046), directing the staff to make some alterations and then proceed with the proposed rule. On March 3, 2022, the proposed rule, along with four draft regulatory guides, was published in the *Federal Register* for an extended public comment period ending August 30, 2022. The proposed rule would implement specific regulatory requirements for different aspects of the decommissioning process consistent with reduced radiological risk. These topics include emergency preparedness, decommissioning funding assurance, environmental considerations, spent fuel management planning, and record retention requirements.

The four draft regulatory guides (DGs) are as follows:

- DG-1346, Revision 1 (proposed new RG 1.235), “Emergency Planning for Decommissioning Nuclear Power Reactors” (ML21347A046)
- DG-1347, Revision 1 (proposed RG 1.184, Revision 2), “Decommissioning of Nuclear Power Reactors” (ML21347A080)
- DG-1348, Revision 1 (proposed RG 1.159, Revision 3), “Assuring the Availability of Funds for Decommissioning Production or Utilization Facilities” (ML21347A081)
- DG-1349, Revision 1 (proposed RG 1.185, Revision 2), “Standard Format and Content for Post-Shutdown Decommissioning Activities Report” (ML21347A138)

The NRC received 2,354 comment submissions, including 2,236 form letters and 118 unique comment submissions, on the proposed rule. The NRC staff is reviewing the comments and will use the feedback to develop a draft final rule for Commission review.

#### Decommissioning Guidance

In FY 2022, the NRC staff continued its multiyear effort to update decommissioning guidance documents, including NUREG-1757, “Consolidated Decommissioning Guidance,” Volumes 1 and 2.

The NRC staff is updating NUREG-1757, Volume 2, “Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria,” which it last revised in September 2006. The current update includes enhanced guidance and detailed examples of methods used to perform decommissioning dose modeling and radiological surveys. The updated guidance reflects lessons learned from recent reviews of decommissioning and license termination plans (DPs and LTPs). These updates are expected to improve the quality of licensee DPs and LTPs and enhance the efficiency of the staff’s review of these documents. Revisions related to dose modeling reviews include additional guidance on topics such as model abstraction and simplification, technical considerations for probabilistic sensitivity and uncertainty analysis, support for risk-significant parameters such as distribution coefficients, consideration of intrusion scenarios for buried residual radioactivity (RESRAD), and more

realistic consideration of elevated areas or “hot spots.” Revisions related to radiological surveys include new or updated guidance on composite sampling and subsurface surveys (e.g., surveys of open excavations and materials planned for reuse), and increased focus on Scenario B, an alternative null hypothesis that assumes a site is clean until proven dirty (useful for cases where the derived concentration guideline level is low relative to background variability). Revisions also include updated guidance on conducting “as low as reasonably achievable” reviews and surface and ground water characterization, modeling and monitoring. The staff issued the NUREG for public comment on December 8, 2020, and the comment period closed on April 8, 2021. Over 200 comments in nine comment letters were received on the draft document. The NRC staff responded to each comment in a comment response document issued October 2021 (ML21299A032), and the NRC addressed the comments in the final version of NUREG-1527, Volume 2, issued July 19, 2022 (ML22194A859). The NRC issued a *Federal Register* notice (87 FR 43906) on July 22, 2022, announcing the public availability of the final report and associated documents.

Similarly, the NRC staff continued its work updating NUREG-1757, Volume 1, “Consolidated Decommissioning Guidance: Decommissioning Process for Materials Licensees,” which it last revised in September 2006. The NRC issued draft Revision 3 of NUREG-1757, Volume 1, to the Agreement States for review in July 2020. The staff began addressing comments received from the State of New Jersey and the Organization of Agreement States. However, due to higher priority work, the NRC has delayed work on Volume 1 and currently plans to publish the document for public comment in late CY 2023.

## 4 RESEARCH ACTIVITIES

The Office of Nuclear Regulatory Research (RES) and NMSS continue to coordinate activities focused on key decommissioning issues, including updating computer codes; development of user need requests (UNRs) and research assistance requests (RARs); implementation of the Radiation Protection Computer Code, Analysis, and Maintenance Program (RAMP); supporting international activities related to decommissioning; studying the aging effects of engineered earthen covers; and developing guidance for cover construction and for surveys of subsurface residual contamination.

### Computer Codes

In FY 2022, the staff continued activities with DOE national laboratories and commercial contractors for the development or modification of computer codes useful for decommissioning analyses, including the upgrade of several codes. This included the following activities:

- RESRAD Family of Computer Codes: The NRC continues to develop, maintain, and support the RESRAD family of computer codes through an interagency agreement with Argonne National Laboratory (ANL). The RESRAD family of computer codes are distributed through RAMP.
- MILDOS Computer Code: The NRC continues to develop, maintain, and support MILDOS version 4.21 through an interagency agreement with ANL. The MILDOS computer code is distributed through RAMP.
- Visual Sample Plan (VSP) Computer Code: Pacific Northwest National Laboratory (PNNL) continues to maintain, develop, and support the VSP computer code through an interagency agreement with the NRC. VSP computer code development work in 2022 focused on tools to assist with design of subsurface surveys, as well as tools for data analysis and visualization to demonstrate compliance with decommissioning release criteria. Other code improvements include modifications to user inputs and execution of the quantile test, and importation of continuously collected data with global positioning system (GPS) data. The VSP computer code is distributed through RAMP.
- Decommissioning and Decontamination (DandD) Computer Code: Licensees use the DandD computer code to develop adequate or appropriate derived concentration guideline levels for cleanup and to demonstrate compliance with the dose criteria of 10 CFR Part 20, "Standards for Protection against Radiation," Subpart E, "Radiological Criteria for License Termination." FY 2022 activities continue to be focused on the distribution and maintenance of the code via RAMP.
- VARSKIN Computer Code: The VARSKIN plus (VARSKIN+) computer code is distributed, developed, and maintained under commercial contract with Renaissance Code Developers. The VARSKIN+ code includes three new physics dosimetry modules: (1) wound dosimetry, (2) neutron dosimetry, and (3) eye dosimetry. The skin and wound dosimetry modules implement a new alpha dosimetry model for shallow skin assessments. Additionally, the VARSKIN+ code can be used to perform wound dose assessments if the metabolic modeling and dosimetry methods are consistent with NRC regulations (e.g., use of 10 square centimeters averaging area for skin dose assessments and tissue or organ weighting factors as defined in 10 CFR 20.1003). FY 2022 activities include dosimetry analyses for discrete radioactive particles (DRP) at

nuclear power plant decommissioning sites. The VARSKIN+ code is distributed through RAMP.

RAMP continues to provide the nuclear energy, radiation protection, and decommissioning community with access to radiation protection computer codes, including RESRAD, VSP, DandD, MILDOS, and VARSKIN, while ensuring sustainability of code development. In FY 2022, RES and NMSS added the TableCalculator low-level radioactive waste tool to the RAMP suite of decommissioning computer codes and tools. TableCalculator is a user-friendly tool developed by the NMSS staff to facilitate a more comprehensive understanding of the calculations used to develop the low-level radioactive waste classification tables in 10 CFR 61.55, "Waste classification." Additionally, RES continues to support the NMSS staff through UNR—NMSS-2021-003, "Decommissioning and Uranium Recovery Computer Code (RESRAD, VSP, DandD & MILDOS) Maintenance" (ML21083A118), for the support, maintenance, and distribution of these through RAMP. Additionally, RES and NMSS continue to work through the tasks on RAR—NMSS-2021-002, "VSP Code Improvements (GPS/GIS and Scoping Subsurface)" (ML21076A237), for the development of new features in the VSP code to support GPS/geographic information system (GIS), autonomous vehicle data analysis tools, and subsurface radiological survey design and analysis tools.

#### Discrete Radioactive Particles in Decommissioning

The RES staff worked with the decommissioning staff to develop a new RAR—NMSS-2022-004, "Dosimetry Analysis Support for Discrete Particles (Decommissioning)" (ML22077A016). The purpose and driver of the RAR is to provide the NRC staff with dosimetry and regulatory framework support for discrete radioactive particles (DRPs) at decommissioning nuclear power plant sites. This includes technical support for DRPs during decommissioning activities and inspections under 10 CFR Part 20 and 10 CFR Part 50. The RAR primary tasks include an evaluation of an NRC staff white paper on DRPs, dosimetry calculations and analysis to support DRPs, and technical support for the fall 2022 DRP workshop. Additionally, RES provided technical advice on ulceration doses to the gastrointestinal tract and provided VARSKIN+ calculations to support licensing reviews for ZionSolutions.

#### Future Focus Research: Drones Used in Decommissioning

The staff concluded the future focus research to transform and innovate decommissioning with state-of-the-art processes and practices with an examination of the use of autonomous systems (i.e., drones) in PNNL-32519, Revision 1, "Drones for Decommissioning: Proof-of-Concept," issued July 2022 (ML22196A040). The results of this future focus research provided a proof-of-concept evaluation of alternative surveying techniques for decommissioning sites.

#### **Additional Research and Guidance Document Support**

The RES staff continues to work on a research program to study the effects of changes in properties of in-service engineered earthen covers over uranium mill tailings as these covers age. The purpose of this study is to evaluate the impact of aging of the covers (they have a design life of up to 1,000 years, consistent with 10 CFR Part 40, "Domestic Licensing of Source Material," Appendix A, "Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content") on the hydraulic conductivity and gaseous diffusivity of radon barriers, how these properties and soil structure vary with the depth and thickness of the radon barrier, and how structure influences transmission of radon and seepage carrying ground water contaminants. This research is a collaborative effort between

the DOE Office of Legacy Management and the NRC. Radon-222 flux measurements were made at the sites and soil samples taken from four mill tailings sites: Falls City in Texas, Bluewater in New Mexico, Shirley Basin South in Wyoming, and Lakeview in Oregon. All were constructed about 20 years ago. The analysis determined hydraulic conductivity; soil water characteristic curves; soil texture and chemistry; root counts; and profiles of density, moisture, and lead-210. The final report, NUREG/CR-7288, "Evaluation of In-Service Radon Barriers over Uranium Mill Tailings Disposal Facilities," was published in March 2022. A paper is in press at the *Journal of Environmental Radioactivity*, titled "Radon Fluxes at Four Uranium Mill Tailings Disposal Sites After About 20 Years of Service."

The DOE Office of Legacy Management is planning to build evapotranspiration covers over some uranium mill tailings disposal sites, and this type of cover is a likely design for closure of low-level radioactive waste sites. To prepare risk-informed, performance-based guidance on these cover designs, RES has contracted with the U.S. Geological Survey to develop a report on evapotranspiration cover design, especially moisture and radon transport within the cover and models that simulate those processes.

The RES staff also continued to provide direct assistance to NMSS efforts through participating in the Multi Agency Radiation Survey and Site Investigation Manual (MARSSIM) Interagency Working Group. The working group has finished draft revisions to the MARSSIM guidance document, and the document was issued for public comment in July 2021. Over 60 comments in 17 comment letters were received. The EPA's Science Advisory Board peer reviewed the draft document and finalized its comments in February 2022. The MARSSIM working group is currently addressing public and Science Advisory Board comments. The NRC manages an editorial and technical support contract to support finalization of MARSSIM, Revision 2. The contract is being funded jointly by the NRC and the EPA under an interagency agreement.

The NRC guidance for characterization and final status surveys of residual radioactive material in surface soils and building structures appears found in MARSSIM (NUREG-1575) and in NUREG-1757. MARSSIM guidance is only for contaminants in surficial materials (e.g., the top 15 centimeters of soils) and is not appropriate for use on subsurface soils (below 15 centimeters). However, most complex decommissioning sites have significant quantities of subsurface residual radioactivity that must be addressed on a case-by-case basis. Based on a Division of Decommissioning, Uranium Recovery, and Waste Programs user request, RES contracted with SC&A, Inc. to develop a technical white paper that details different approaches to optimize surveys of the subsurface given the relative inaccessibility of subsurface materials to survey. The NRC held two virtual public workshops July 14–15, 2021, and May 11, 2022, to discuss technical issues and proposed approaches related to subsurface investigations. Over 190 and 120 people participated in the first and second annual subsurface workshops, respectively, including State and Federal agencies, industry, members of the public, and international organizations. Workshop materials are available in ADAMS (ML21208A206 and ML22117A070). Topics discussed at the workshops included the following:

- use of geospatial tools to support radiological survey design
- dose modeling considerations for development of subsurface soil cleanup levels
- the importance of elevated areas in the subsurface
- Nuclear Energy Institute (NEI) ground water protection initiative NEI 07-07

- innovative technologies for subsurface characterization, such as electrical resistivity tomography
- case studies and lessons learned from subsurface surveys

### **Collaboration and Outreach**

The RES staff supports international activities through participation in the Information System on Occupational Exposure management board through the North American Technical Center that oversees the Working Group on Radiological Aspects of Decommissioning Activities in Nuclear Power Plants. This working group's objective is to provide a forum for experts to develop a process to better share operational radiation protection data and experience for nuclear power plants in some stage of decommissioning, or in preparation for decommissioning.

The NRC hosted the fifth Domestic RAMP Virtual Users Group Meeting October 25–29 and November 1–4, 2021. The NRC welcomed the largest number of RAMP meeting attendees thus far with over 360 registered participants, instructors, and support staff. Representatives from 22 international regulators and organizations attended, including representatives from Australia, Austria, Canada, Denmark, Finland, France, Ghana, Israel, Italy, Japan, Jordan, Malaysia, Mexico, Nigeria, Poland, South Africa, South Korea, Spain, Taiwan, Ukraine, United Arab Emirates, and the United Kingdom. The domestic and international attendees included multiple Federal government and State agencies, national laboratories, universities, and the nuclear industry. The meeting featured computer code training sessions and discussions on the VARSKIN+ computer code, a “boot camp” training session on the VSP computer code, and four days of interactive training and user discussions on the Radiological Assessment System for Consequence Analysis (RASCAL) computer code. The meeting also featured three technical symposiums: “Dosimetry Analysis Symposium,” “Non-LWR Health Physics Symposium,” and RAMP’s first “Student Symposium.”

The sixth International RAMP Virtual Users Group Meeting took place virtually April 4–7, 2022. The NRC, PNNL, and the Australian Radiation Protection and Nuclear Safety Agency co-hosted the meeting. The meeting welcomed over 207 registered participants, instructors, and support staff from 20 international regulators and organizations. The international participants included representatives from Australia, Austria, Canada, Denmark, France, Ghana, Israel, Italy, Nigeria, South Africa, South Korea, Spain, Taiwan, United Arab Emirates, and the United Kingdom. The domestic and international attendees included multiple Federal and State agencies, national laboratories, universities, and the nuclear industry. This meeting featured computer code overviews and discussions on specific RAMP codes, including NRC-RADTRAN, VARSKIN+, MILDOS, the RESRAD family of codes (including RESRAD–Onsite, –Offsite, –RDD, and –Biota), GENII, and VSP. The code developers from PNNL, ANL, and Renaissance Code Developers discussed the features and models of each of the RAMP codes. The meeting also featured two technical symposia: “Handling Legacy Sites Symposium” and “Dosimetry Analysis in an Industrial Setting.”



## 5 INTERNATIONAL ACTIVITIES

The NRC's international activities regarding decommissioning are wide ranging, encompassing treaty implementation, nuclear nonproliferation, export-import licensing for nuclear materials and equipment, international safeguards support and assistance, international safety cooperation and assistance, international regulatory/safety information exchange, and cooperative safety research. International activities are integral to the NRC's public health and safety and common defense and security mission and directly support U.S. foreign policy objectives. The NRC staff actively engages in the review and development of International Atomic Energy Agency (IAEA) safety standards and guidance documents. The NRC also supports activities and projects at the Organization for Economic Co-operation and Development's Nuclear Energy Agency (NEA), such as the Committee on Decommissioning and Legacy Management. In addition to the multinational activities, the NRC participates in bilateral cooperative and assistance activities with its international regulatory counterparts. This includes bilateral technical exchanges, hosting international assignees, participating in technical workshops, and providing assistance to countries in building technical capacities and regulatory programs.

The NRC is recognized in the international nuclear community as an experienced leader in the regulation and safety of decommissioning, spent fuel management and storage, radioactive waste management and disposal, site remediation, and environmental protection. Interaction with international organizations and governments allows the NRC to share insights about lessons learned and successful, safe, and effective decommissioning approaches. In addition, the staff gains insight into approaches and methodologies, lessons learned, and new technologies used in the international community and considers these approaches as it continues to risk-inform the NRC Decommissioning Program and gain further insights into the decommissioning process.

Specific international activities in FY 2022 included (1) conducting reviews and updates of IAEA standards related to decommissioning and low-level waste during the Waste Safety Standards Committee 52nd and 53rd review cycles, (2) participating in the annual meetings of the NEA's Regulators Forum, Committee on Decommissioning and Legacy Management, and Radioactive Waste Committee, and (3) participating in the development of safety publications about uranium production facilities, including their operation and decommissioning as well as the decommissioning of small facilities. Additionally, the NRC hosted several technical meetings with international regulatory counterparts and support organizations, supported international workshops hosted by other U.S. Federal agencies, and provided opportunities for staff from international regulatory agencies to observe inspections at facilities undergoing decommissioning.

The NRC staff also participated in many activities to support the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention). The Joint Convention establishes a peer review process among contracting parties and is the only international legally binding instrument to address the safety of spent fuel and radioactive waste management. U.S. participation in the Joint Convention helps demonstrate the importance of having a high level of safety in spent fuel and radioactive waste management, including decommissioning activities. The peer review process culminates in a triennial review meeting of the contracting parties. For the current Joint Convention cycle, the review meeting originally scheduled for May 2021 was postponed due to the COVID-19 pandemic until June 27–July 8, 2022. The NRC staff engaged with partner Federal agencies, including the DOE (lead agency for the Joint Convention), the U.S. Department of State, and the EPA, to conduct peer reviews of other contracting parties, answer questions about the U.S. spent fuel

and radioactive waste management programs, and complete other activities in support of the 2022 review meeting.

## 6 PROGRAM INTEGRATION AND IMPROVEMENT

Given the scope of the decommissioning functional area, the Decommissioning Program has undertaken many initiatives to improve its efficiency and effectiveness.

### Power Reactor Decommissioning Program Improvements

The staff continued to risk-inform its licensing and oversight activities while documenting and sharing key lessons learned. Examples include sharing lessons learned from the Humboldt Bay and General Atomics license termination activities during a counterparts meeting, and communicating operating experience and inspection observations related to Fire Protection and OSHA related activities.

In response to a U.S. Government Accountability Office's recommendation, the staff is implementing a formal communication with licensees after NMSS financial analysts complete their review of licensee's annual decommissioning trust fund reports.

### Materials and Uranium Recovery Decommissioning Program Improvements

The NRC staff has continued the implementation of an enhanced Comprehensive Decommissioning Program, which allows the staff to compile, in a centralized location, information on the decommissioning status of complex sites and uranium recovery sites in the United States.

The NRC staff continued to risk-inform IMC 2602, "Decommissioning Oversight and Inspection Program for Fuel Cycle Facilities and Materials Licensees." Region IV is leading the IMC 2602 working group to include Agreement State, NRC Headquarters, and regional representatives on further risk-informing the inspections of fuel cycle and materials sites undergoing decommissioning. The NRC staff also revised IMC 2801, "Uranium Recovery and 11e.(2) Byproduct Material Facility Inspection Program." The revised IMC 2801 and associated inspection procedures for operating uranium recovery facilities were issued in October 2021 and will undergo minor revisions in early FY 2023.

### Evaluation of Materials and Waste Business Lines

During FY 2022, the NRC staff continued to implement several recommendations from the evaluation of the Materials and Waste Business Lines to improve the effectiveness of licensing and oversight. Examples of these improvements include adjustments to the uranium recovery inspection program through the extension of inspection intervals, revisions to inspection procedures for decommissioning power reactors, continuing to implement the updated process for completing financial surety reviews for uranium recovery licenses, and streamlining review processes for new uranium recovery application reviews. For example, the staff used risk insights from existing NRC guidance and first-hand experience to focus uranium recovery facility inspection activities on risk-significant activities such as spill response, radiological emergencies, yellowcake dryer operations and accidents, and ground water contamination. These revisions also enhance the oversight program by adding more performance-based concepts to the inspection guidance and providing more direction to inspectors on where to focus their time.

## 7 AGREEMENT STATE ACTIVITIES

In addition to the sites undergoing decommissioning that are regulated by the NRC, many complex materials sites are being decommissioned under the regulatory oversight of Agreement States. Thirty-nine States have signed formal agreements with the NRC and assumed regulatory responsibility over certain byproduct, source, and/or small quantities of special nuclear material, including the decommissioning of some complex materials sites.

In September 2021, the NRC staff held a virtual workshop on the development and review of CRRs and SA-900, "Termination of Uranium Milling Licenses in Agreement States." The NRC participated in open discussion with the States of Colorado, Utah, Washington, Wyoming, and Texas and the DOE Office of Legacy Management on the processes for the review of CRRs and uranium recovery site license termination. In addition, the staff discussed revisions to SA-900. Throughout FY 2022, the NRC staff maintained communication with these States about CRRs and SA-900 and planned for a second workshop, which was held in October 2022.

The NRC staff worked with the Agreement States to revise the information in this annual decommissioning report about complex materials decommissioning sites that are under the regulatory purview of the Agreement States. Rather than detailed site summaries, table 7-a lists decommissioning sites and a site contact in each Agreement State so that current, up-to-date information about a site from the Agreement State can be obtained.

The NRC staff also worked with the Agreement States to revise the information in this annual decommissioning report about uranium recovery decommissioning sites that are under regulatory purview of the Agreement States. As for the complex materials decommissioning sites, this report includes a list of the sites and a site contact in each Agreement State (table 7-b). Site summaries using available public information can found on the NRC website at <https://www.nrc.gov/info-finder/decommissioning/uranium/index.html>.

**Table 7-a Agreement State Complex Decommissioning Sites**

| <b>State</b>   | <b>Site Name</b>                               | <b>Contact</b>   | <b>Contact Information</b>           |
|----------------|--|------------------|--------------------------------------|
| Alabama        | Greenfield Environmental Multistate Trust, LLC | Myron Riley      | Myron.Riley@adph.state.al.us         |
| Alabama        | Kennametal, Inc                                | Undria McCallum  | Undria.Mccallum@adph.state.al.us     |
| Alabama        | OSP, LLC                                       | Undria McCallum  | Undria.Mccallum@adph.state.al.us     |
| California     | Eberline Services                              | Thomas Moore     | Thomas.Moore@cdph.ca.gov             |
| Illinois       | Weston Solutions (formerly Kerr-McGee)         | Kelly Horn       | Kelly.Horn@illinois.gov              |
| Kansas         | Beta Chem                                      | Kim Steves       | Kim.Steves@ks.gov                    |
| Kansas         | Raytheon Aircraft Corporation                  | Kim Steves       | Kim.Steves@ks.gov                    |
| Kentucky       | Clariant                                       | Allyson Stout    | Allyson.Stout@ky.gov                 |
| Kentucky       | Transport Logistics International              | Allyson Stout    | Allyson.Stout@ky.gov                 |
| Massachusetts  | Norton/St. Gobain                              | Jack Priest      | Jack.Priest@mass.gov                 |
| Massachusetts  | Starmet Corp. (formerly Nuclear Metals)        | Jack Priest      | Jack.Priest@mass.gov                 |
| Massachusetts  | Texas Instruments                              | Jack Priest      | Jack.Priest@mass.gov                 |
| Massachusetts  | Wyman-Gordon Co.                               | Jack Priest      | Jack.Priest@mass.gov                 |
| New Jersey     | Shieldalloy Metallurgical Corp.                | James McCullough | James.McCullough@dep.nj.gov          |
| New Mexico     | Thermo Eberline, LLC                           | Michael Ortiz    | Michael.Ortiz1@state.nm.us           |
| Ohio           | Advanced Medical Systems, Inc.                 | Michael Rubadue  | Michael.Rubadue@odh.ohio.gov         |
| Ohio           | Ineos USA (formerly BP Chemical)               | Michael Rubadue  | Michael.Rubadue@odh.ohio.gov         |
| Oklahoma       | Haliburton – Osage Road                        | Michael Reid     | Michael.Reid@deq.ok.gov              |
| Oregon         | PCC Structurals, Inc.                          | Todd Carpenter   | Todd.S.Carpenter@dhsosha.state.or.us |
| Oregon         | TDY Industries d/b/a Wah Chang                 | Todd Carpenter   | Todd.S.Carpenter@dhsosha.state.or.us |
| Pennsylvania   | Curtiss-Wright                                 | Bryan Werner     | brwerner@pa.gov                      |
| Pennsylvania   | Keystone Metals Reduction                      | Bryan Werner     | brwerner@pa.gov                      |
| Pennsylvania   | Global Tungsten & Powders Corp.                | Bryan Werner     | brwerner@pa.gov                      |
| Pennsylvania   | Remacor  | Bryan Werner     | brwerner@pa.gov                      |
| Pennsylvania   | Superbolt (formerly Superior Steel)            | Bryan Werner     | brwerner@pa.gov                      |
| Pennsylvania   | Safety Light Corp.                             | Bryan Werner     | brwerner@pa.gov                      |
| Pennsylvania   | Westinghouse Electric Corp.                    | Bryan Werner     | brwerner@pa.gov                      |
| Pennsylvania   | Whittaker Corp.                                | Bryan Werner     | brwerner@pa.gov                      |
| Pennsylvania   | Shallow Land Disposal Area                     | Bryan Werner     | brwerner@pa.gov                      |
| South Carolina | Starmet CMI                                    | Stacey French    | frenchsl@dhec.sc.gov                 |

| <b>State</b> | <b>Site Name</b>   | <b>Contact</b> | <b>Contact Information</b>    |
|--------------|--|----------------|-------------------------------|
| Texas        | Solvay USA Inc   | Gehan Flanders | Gehan.Flanders@tceq.texas.gov |
| Texas        | Kensington Title Service, Site Owner; formerly U.S. Radiopharmaceuticals, formerly Trace Life Sciences | Gehan Flanders | Gehan.Flanders@tceq.texas.gov |
| Texas        | Thomas Maloney   | Gehan Flanders | Gehan.Flanders@tceq.texas.gov |
| Texas        | Pearland-Manvel Landfill   | Gehan Flanders | Gehan.Flanders@tceq.texas.gov |
| Texas        | Ascent Performance Materials (formerly Solutia)  | Gehan Flanders | Gehan.Flanders@tceq.texas.gov |

**Table 7-b Agreement State Uranium Recovery Sites**

| <b>State</b> | <b>Site Name</b>                                    | <b>Contact</b> | <b>Contact Information</b>    |
|--------------|---|----------------|-------------------------------|
| Colorado     | Cotter Uranium Mill—Colorado Legacy Land (licensee) | Shiya Wang     | Shiya.Wang@state.co.us        |
| Colorado     | Hecla Mining Company—Durita                         | Shiya Wang     | Shiya.Wang@state.co.us        |
| Colorado     | Umetco Uravan                                       | Shiya Wang     | Shiya.Wang@state.co.us        |
| Texas        | Intercontinental Energy Corporation                 | Gehan Flanders | Gehan.Flanders@tceq.texas.gov |
| Utah         | Former Lisbon Valley Uranium Mill                   | Phil Goble     | PGoble@utah.gov               |
| Washington   | Dawn Mining Company                                 | Bryony Stasny  | Bryony.Stasny@doh.wa.gov      |
| Wyoming      | Anandarko Bear Creek                                | Omar Nusair    | 307-777-7057                  |
| Wyoming      | UMETCO Gas Hills                                    | Brandi O'Brien | 307-777-6435                  |
| Wyoming      | Orano/Areva Lucky Mc                                | Brandi O'Brien | 307-777-6435                  |
| Wyoming      | ExxonMobil Highland                                 | David Adams    | 307-777-7757                  |
| Wyoming      | Western Nuclear Inc                                 | David Adams    | 307-777-7757                  |

## **8 FISCAL YEAR 2023 PLANNED PROGRAMMATIC ACTIVITIES**

The power reactor decommissioning program evaluation resulted in a set of recommendations, including the recommendation to review all guidance and policy documents within the program to identify guidance documents in need of updating as well as other potential improvements. Subsequently, NMSS management reviewed the tasks identified in this program evaluation to promote programmatic enhancement and set task priorities. Throughout FY 2023, the staff will continue to work on these programmatic enhancements and evaluate their applicability to the materials decommissioning program. The staff will also continue its multiyear effort to update decommissioning guidance documents, including the consolidated decommissioning guidance in NUREG-1757, Volume 1, and interim staff guidance on residual material in subsurface soil.

In FY 2023, the NRC staff will complete the revisions to risk -inform IMC 2602 for fuel cycle and materials decommissioning facilities. The staff anticipates issuing IMC 2602 and its implementing procedures early in FY 2023.