Decommissioning and Technology Development

Program Overview

Program Description

Decommissioning a nuclear power plant requires expertise in safe industrial dismantling and demolition, nuclear power plant operations, radiation protection, radiological characterization, environmental protection, radwaste management, and other specialized disciplines. Because of the complex, multi-disciplinary activities involved in decommissioning nuclear power plants, experience must be captured to serve as guidance for ongoing and future decommissioning projects around the world. Also, experience shows that various events and actions that occur during operations, such as soil and groundwater contamination, can impact decommissioning waste generation, cost, and schedule. Understanding these impacts and operating the plant to minimize impact on decommissioning can benefit the entire nuclear power plant life cycle.

The Decommissioning and Technology Development program provides a structured approach for capturing lessons learned from decommissioning efforts and incorporating them into guidance for the entire nuclear power industry. Several nuclear power plants, for example, have gained experience in addressing both technical and regulatory challenges. These challenges include minimizing contamination, final site surveys and site release criteria, license termination planning, transition of regulations from operation to decommissioning plants, plant structure demolition, reactor vessel segmentation, and waste disposal.

Research Value

The Decommissioning and Technology Development program develops guidance and technologies that can assist in the safe, cost-effective decommissioning of a nuclear power plant. Program participants gain access to the following:

- Data and information leading to safe decommissioning with lower costs and risks
- Enhanced planning tools to guide decommissioning
- Lessons learned from decommissioning activities at other plants
- Application results from the use of advanced technology
- Guidance on unresolved issues in groundwater and soil protection and remediation, low-level waste management, site characterization, radiation dose modeling for site release, and license termination plans

Approach

The Decommissioning and Technology Development program evaluates industry practices to distill generic guidance that nuclear plant owners can incorporate into decommissioning plans. Participants use lessons-learned reports and advanced technologies to operate plants to minimize downstream impacts on decommissioning and to establish and implement efficient decommissioning programs at plant sites. Participants also enhance technology transfer through participation in Electric Power Research Institute (EPRI) decommissioning workshops and plant-specific decommissioning support meetings.

- Archive experience and lessons learned related to decommissioning regulations and technology
- Assess strategies for operating plants that could minimize subsequent site contamination and waste generation during decommissioning
- Identify critical elements associated with developing and maintaining an effective decommissioning plan
- Evaluate options for disposing wastes from decommissioning plants
- Develop and demonstrate advanced technologies and improved methodologies for decommissioning
- Anticipate and address needs arising from premature (unplanned) shutdown of nuclear units
The Decommissioning and Technology Development program is a supplementally funded activity.

**Accomplishments**

The Decommissioning and Technology Development program supports activities to operate nuclear power plants to minimize impacts on decommissioning and to safely and cost-effectively decommission nuclear power plants. EPRI has archived best practices, lessons learned, and technology experiences ranging from decommissioning planning and execution to final site release and license termination. This information is available through technical reports and through direct interaction with decommissioning experts.

- Evaluated the use of in-situ gamma spectroscopy for characterizing potential radionuclide contamination of soil, concrete, and bedrock prior to site release.
- Defined a trial program to evaluate a new technology called "nibble and vacuum" for removing reactor graphite by remote in-situ size reduction and vacuum transfer.
- Developed guidance on program change management during decommissioning. The guidance defines decommissioning in terms of a sequence of major milestones and then identifies the plant programs, associated plans and actions, and staff for each milestone.
- Documented full system chemical decontamination experience at Spain's José Cabrera Nuclear Power Plant, capturing new practices and useful lessons learned.
- Captured lessons learned and good practices involved in managing radiologically impacted soils, sediments, and bedrock at decommissioning nuclear power plants.
- Developed decommissioning pre-planning and planning guidance reports and waste management software tools.
- Compiled decommissioning experience reports on reactor vessel and internal segmentation, concrete radiological characterization and remediation, final status survey and license termination, and groundwater protection.

**Current Year Activities**

Decommissioning and Technology Development program research and development for 2012 will focus on continued collection and evaluation of industry decommissioning experience to derive effective guidance for future plant decommissioning efforts. Project topics may include the following:

- Software for the automatic estimation of the radiological inventory for the dismantling of nuclear facilities
- Technical justification for the development and application of derived concentration guidance levels
- Decommissioning lessons learned, experiences, and their impacts on decommissioning costs and other resources
- International experience in segmentation of reactor internals and vessels
- Software for the collection and analysis of site characterization and final status survey data to show compliance with site release criteria
- Waste source term assessments and updated base material specifications for activated metals to assist with decommissioning waste management
- Behavior of chlorine-36 and tritium in irradiated graphite wastes

**Estimated 2012 Program Funding**

0.7 million

**Program Manager**

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Summary of Projects

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<td>P41.09.02.01</td>
<td>Decommissioning Technology Development (supplemental)</td>
<td>The EPRI Decommissioning Technology Development project provides technical support and technology development for cost-effective, safe, and environmentally sound decommissioning of nuclear power plants.</td>
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Decommissioning Technology Development (supplemental) (052386)

Key Research Question

Nuclear power plant decommissioning requires expertise in safe industrial dismantling and demolition, nuclear power plant operations, radiation protection, radiological characterization, environmental protection, radwaste management, and other specialized disciplines. U.S. and international experience in decommissioning nuclear power plants can guide decommissioning efforts around the world. Several nuclear power plants have gained experience in both technical and regulatory challenges, such as final site surveys and site release criteria, license termination planning, transition of regulations from operation to decommissioning plants, plant structure demolition, reactor vessel segmentation, and waste disposal. Applying lessons learned and experiences from previous projects to the planning and execution of current and future projects will provide opportunities to optimize costs, increase safety, and reduce waste and impact on the environment.

Approach

This project assists members in minimizing the cost and risks of decommissioning through enhanced planning, applying lessons learned from other retired plants, and using advanced technology. Guidance is developed on unresolved issues in low-level waste management, site characterization, radiation dose modeling for site release, and license termination plans. Key project objectives include anticipating and addressing the needs arising from premature (unplanned) shutdown of nuclear units and capturing the lessons learned from current decommissioning work. Best practices, lessons learned, experiences, and recommendations are documented in EPRI technical reports. This information also is available to members through direct interactions with decommissioning experts at technical workshops and through site-specific member support. As new technologies are developed to address challenges from past decommissioning projects and as new technical challenges create the need for new technologies, EPRI works with technology vendors and utilities to evaluate and demonstrate technologies for application in nuclear power plant decommissioning.

Impact

The successful decommissioning of nuclear power plants demonstrates responsible management of a nuclear power plant's complete life cycle. Applying the lessons learned and experiences of previous decommissioning projects will allow current and future nuclear power plants to plan and execute successful decommissioning projects that are cost-effective, safe, minimize waste, and minimize impact on the environment, while increasing public acceptance and support for nuclear power. Potential benefits include the following:

- Access to experience and lessons learned related to decommissioning regulations and technology
- Reduced costs in developing and maintaining an effective decommissioning plan
- Reduced costs associated with disposing wastes from decommissioning plants
- Reduced implementation costs for advanced decommissioning technologies
How to Apply Results

Members use lessons-learned reports and advanced technologies to establish and implement efficient decommissioning programs at plant sites. Members also enhance technology transfer through participation in EPRI decommissioning workshops and plant-specific decommissioning support meetings. Plant-specific decommissioning support meetings allow members to tailor technical support to site-specific concerns.