



# IN-SITU DECOMMISSIONING

## A Strategy for Environmental Management

U.S. Department of Energy

Office of Engineering and Technology

### What is In-Situ Decommissioning?

ISD: Permanent entombment of a facility that contains residual radiological and/or chemical contamination.

### Overall Avoided Costs Through ISD

ISD offers considerable cost avoidance over demolition and complete removal of the structure and its contents, including the cost of transport and disposal. The range of avoided cost varies considerably because there is a wide variation in the facilities that may be decommissioned via ISD.

Avoided cost is judged to range from \$5 million each for a large number of small facilities to as much as \$300 million for a few large facilities. The combined total is potentially as much as \$2 billion. An additional estimated \$0.5 billion may be avoided in waste cell savings.\*

125 Potential ISD Candidate Facilities  
Total avoided cost for ISD = ROM \$2–3 Billion

\* Conceptual Rough Order of Magnitude estimate

### REDUCING THE FOOTPRINT OF THE COLD WAR

For over a decade, the Department of Energy has focused on reducing the footprint of 60 years of nuclear research and weapons testing and production. While these facilities are no longer needed, they exist with varying degrees of radiation contamination from years of operation.

Deactivation & Decommissioning (D&D) is the process of closing down a nuclear facility and placing it in a state that reduces or eliminates risk to the public and the environment. This generally includes demolition and transport of the debris to a disposal facility. Another alternative is to dispose of the facility in place (i.e., in-situ).

The concept of In-Situ Decommissioning (ISD) is not new. ISD is the practice of permanent entombment of a facility where it stands. ISD may involve various accepted methodologies. In some cases a building may be collapsed, its remaining spaces filled with grout, and then capped with an earthen or concrete cover. In others, the building may be completely covered to create a large mound. In any ISD technology, radioactive contaminants and chemical residuals are entombed to mitigate release and migration

consistent with the regulatory requirements and demonstrated by risk-based performance analysis. The potential for accessing and spreading contaminants is essentially eliminated, ensuring long-term effectiveness.

### DOE-EM GUIDANCE

DOE-Environmental Management's Office of Engineering and Technology is completing a study to establish guidance for implementing ISD projects.

### REGULATING ISD

The regulatory approval to decommission a facility through ISD is authorized primarily by the Environmental Protection Agency under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). In addition, sites have Federal Facility Agreements and local stakeholder agreements that influence ISD approval and oversight.

### POST-DECOMMISSIONING MANAGEMENT

Long-term management considerations for ISD facilities include monitoring of physical closure; ground water monitoring; permanent markers and/or intruder deterrents. Investigations have been initiated to determine technologies for these purposes.

### Below-Grade ISD at Idaho

ISD has previously been implemented at Idaho National Lab. The above-ground portion of the Loss of Fluid Test facility (left) was decommissioned and removed prior to ISD of the sub-grade portion.



## What Facilities Meet the Criteria for ISD?

Not all contaminated structures can be decommissioned via ISD. Selection criteria for ISD candidates include:

- Facility Hazard Category
- Physical size and suitability for permanent entombment (robust concrete structures)
- Contamination types and levels
- Estimated cost savings
- Non-urban location

Typical facilities that could be considered as ideal for ISD are:

- Process canyons
- Large reactors
- Small reactors below grade
- Other robust concrete facilities

80–90 DOE facilities have been identified as strong candidates for ISD through the Facilities Information Management System database.

100–125 DOE facilities Complex-wide are judged to be possible ISD candidates.

## ISD May Be the Best Alternative for a Significant Number of DOE Facilities

- ISD is an effective decommissioning practice offering a safe and environmentally favorable alternative to completely demolishing a facility and transporting its debris elsewhere for disposal.
- ISD is generally less complex to implement than typical D&D and results in better utilization of resources.
- ISD limits radiation exposure and industrial hazards to workers more so than for larger scale cleanout and demolition.
- ISD has been successfully accomplished at INL facilities.
- The regulatory framework for ISD is already in place and some projects are in the process of CERCLA approval.

## ISD PROJECTS

### Savannah River P-Area Production Reactor

At Savannah River Site, the P-Reactor Area Closure Project has received an Early Action Record of Decision (EAROD) for the concept. P-Reactor is one of five reactors at the site. The EAROD achieves agreement on the final end state for reactor facilities; this will allow subsequent engineering efforts and regulatory decisions to focus only on closure alternatives that are appropriate for that end state and allow for consolidation of remediation waste inside the P-Reactor Building.



SRS P-Reactor Area Closure Project

### Hanford U-Plant Canyon

The U-Canyon at the Hanford Site is a very large, reinforced concrete structure that will be partially cleaned out and decontaminated. U-Plant was selected as the pilot for the DOE Canyon Disposition Initiative in 1996.



Hanford U-Canyon

The top portion of the canyon will be partially demolished and collapsed in, the lower spaces and basement filled with grout, and the remainder of the structure covered with a soil mound and/or engineered barrier cap (Figure 1).

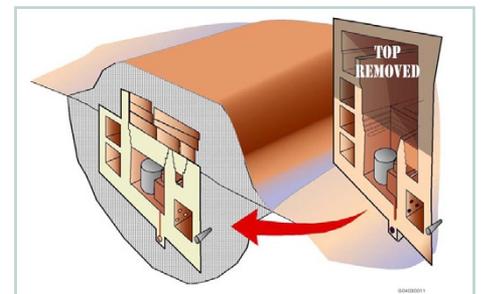


Figure 1

The ROD for Hanford U-Plant D&D was finalized in 2005. There are a number of engineering and operation decisions to implement for ISD.

### Idaho National Lab

ISD methodologies have already been successfully employed at Idaho. There remain a number of INL facilities that may be candidates for ISD. Post-closure monitoring and maintenance is conducted under a HWMA/RCRA<sup>1</sup> post-closure permit issued by the Idaho Department of Environment Quality.



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<sup>1</sup> Idaho Hazardous Waste Management Act