



Lessons Learned on Documentation for D&D Projects

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Statement:

The early years of nuclear energy development (R&D, construction, and operation) left a considerable legacy of contaminated facilities, the majority of which are military, scientific and demonstration facilities, both in the United States and throughout the world. Old, contaminated facilities pose continuing risks until they are deactivated and decommissioned (D&D). People involved in decommissioning must often address challenges which include incomplete facility histories and inadequate information about the state of sites and equipment. In fact, the United Kingdom's Nuclear Decommissioning Authority has reported that some facilities "do not have detailed inventories of waste, some lack reliable design drawings [and] many were one off projects."

The difficulties of dealing with these older facilities are exacerbated by the fact that some original documentation may be non-existent or difficult to retrieve and the original designers and staff have retired in most cases. This is further complicated when the organization tasked with the cleanup did not design, build, nor operate the contaminated facilities. Having no institutional knowledge, they are totally reliant on data gathered and records retained by other organizations. Therefore, the retention of design, system, and product information about facilities and equipment, even long after their mission has been accomplished, is critical to the successful planning and execution of future D & D projects.

Discussion:

Decommissioning is not simply demolition. It is the systematic deconstruction of a contaminated, sometimes complex nuclear facility made up of many large components, piping, deteriorating buildings, pumps and tanks, and supporting systems along with even greater volumes of construction materials. This type of deconstruction requires considerable time and funding, detailed planning, and precise execution on a level similar to that required to build a nuclear facility. In addition, early waste disposition practices at some of these sites resulted in further contamination in, under, and around the facilities foundations and properties. Thus decommissioning requires a similar degree of technical expertise and regulatory control to their construction.

Many nuclear sites are extremely old, and over time their missions have changed substantially. In some cases, numerous physical changes to waste tanks, piping, and other equipment were made over the years without proper change documentation so that the current site personnel may not know how older systems were operated or what material was carried by a particular piece of piping, for example. In more recent years, some sites, anticipating a finite mission with the need to perform D&D upon project completion, planned for such tasks.

The West Valley Demonstration Project (WVDP) is one project that planned for eventual D&D. Constructed between 1989 and 1995, WVDP's Vitrification Facility (VF) contained a large, fully lined cell in which the vitrification systems would operate. Anticipating future deactivation, the assembly of in-cell processing equipment was performed with remote tools. Vitrification of the site's High Level Waste (HLW) liquids and solids was performed in this structure between 1996 and 2002, contaminating the vitrification system components. The initial deactivation of the building's processing systems (the removal of in-cell piping and vessels) was performed between 2003 and 2006 by remotely operated tools, filling 160 waste containers. Both vitrification operations and initial deactivation contaminated the cell's impermeable liner, but the liner appears to have contained this contamination. During the years since initial deactivation, the vitrification cell has been used successfully for Transuranic Waste (TRU) processing and packaging. Continuing deactivation of the facility initiated in 2011 required the stabilization or removal of unused process piping / building systems located in the Vitrification Facility aisles. Among the deactivation scopes to be completed were the de-energizing of electrical cabinets and unused systems, electrical isolation of instrument racks, and removal of electrical pressure and level transmitter circuit boards and power supplies from racks, as well as other devices that contained circuit boards and interface modules. In all, 20 instrument racks were deactivated; and over 200 circuit boards, 26 digital meters, and 83 electronic modules were disconnected and removed. In addition, over 200 plumbing lines were breached and internal radiological surveys performed to verify their lack of contamination. In the course of executing the work, a careful review of design documentation and critical equipment listings was performed, enabling the planners to verify the lack of hazardous constituents in buildings systems, notably the lack of polychlorinated biphenyl (PCB) in lighting ballasts. Radiological surveys verified the lack of contamination throughout the systems located in the building aisles.

The experience with D&D of the Separations Process Research Unit (SPRU) contrasts with WVDP Vitrification Plant D&D. SPRU is located at the Knolls Atomic Power Laboratory (KAPL) site managed by the Office of Naval Reactors (NR). SPRU was built in the late 1940s and operated through the early 1950s to conduct pilot tests for recovery of uranium and plutonium. The nuclear facilities at SPRU consist of a process research and office building (G2); a waste processing building (H2); and associated tanks, tunnels, and outbuildings. Following cessation of SPRU operations, KAPL converted some of Building G2 to office space and continued using Building H2 for waste processing. In 1999, KAPL announced that it had no further use for the SPRU facilities. The following year EM began characterizing the SPRU areas as part of the SPRU Disposition Project. Available information on the operation of SPRU was provided to support the planning and execution of D&D of the SPRU facilities.

While SPRU operations ceased in the early 1950s, the Historic Site Assessment (HSA) stated that the piping and equipment were utilized again in the 1960s to transfer radioactive liquid waste including radioactive material that had been stored in the underground tank farm. Further, the HSA noted that "the tunnels and the piping in the tunnels potentially require additional characterization prior to demolition activities because there is little information regarding contamination in the tunnels and piping." As noted above, waste processing was continued into the 1990s before the facilities were transferred for D&D. The original SPRU mission ended more than 50 years before D&D was to begin, but subsequent use of the facilities continued to impact the contamination levels of the facilities and systems within them. With that many years between the initial utilization and D&D, written records would be the key source of technical data about the processes and constituents. The accuracy and completeness of the records impact the ability to plan D&D to achieve environmental compliance, and the environmental standards of the more recent years were not readily recognized a half a century ago. Thus the risks to cost and schedule would need to be identified for waste quantities and type, increased safety measures to protect workers and the environment, differing disposition path based on waste type, etc.

Analysis:

A project's ability to plan, readiness to begin, and its ultimate success are often directly affected by the site's previous operational habits and discipline. The lack of procedure, plans or drawings of systems and components make planning for their deactivation and deconstruction extremely difficult. If the facility is extremely old, there may be few staff available that have experience or an understanding of systems operations. In the case of the WVDP, the careful design and construction of the vitrification facility, in anticipation of intended use, and the radiological controls that were implemented and maintained in the aisles, allowed the future D & D planner to understand and document the absence of hazardous materials and wastes that would have complicated and increased the cost of deactivation. The operational contamination control that had been carefully observed over the years resulted in aisle components also being free of radioactive contamination. It is estimated that this careful planning saved the project several millions dollars in known cost, and perhaps much more by avoiding the problems many sites with little or no documentation have experienced.

Actions:

The following are actions that current or new projects should consider to ensure that the problems of inaccurate or insufficient documentation at the time to D&D the facility are mitigated:

- Design facilities anticipating the future of having to perform D&D activities on systems and components.
- Ensure that the operations of facilities are done in accordance with their intended design, using approved operating procedures and plans.
- Ensure that documentation of both the facility design and the operational history of systems are maintained until the facility is decommissioned.

At existing facilities that are scheduled for D&D, here are some actions that can be taken should inadequate documentation of systems not be available:

- Perform detailed walk downs of systems and perform literature searches on components as needed by DOE and site contractors.
- Review other D&D activities at the site or review similar equipment at other sites to gain knowledge of systems operations.
- Review pilot studies and case studies to gain more knowledge of unknown equipment.
- Interview personnel, if available, that were present during the design or operations of the facility in order to close data gaps and better understand system processes.

Critical Decision(s): CD-1 to CD-4

Facility Type(s): All

Work Function(s): Contracts, Project Management

Technical Discipline(s): All



WVDP Vitrification Cell



WVDP Vitrification Cell D&D Activities



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