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NUCLEAR DECONTAMINATION AND DECOMMISSIONING OPERATIONS AT THE IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY (INEEL)

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INTRODUCTION

The Idaho National Engineering and Environmental Laboratory (INEEL) has had a long and successful history in the nuclear industry. It has played an important role in the peaceful use of atomic energy as a reactor research complex. Many of the INEEL nuclear facilities have reached the ends of their useful lives however and must now be decontaminated and decommissioned (D&D). The INEEL has also played an important role in this new phase of the nuclear industry. It is a pleasure to be here today to share with you some of the successes we have enjoyed in the safe decontamination and decommissioning of the INEEL's nuclear facilities.

INEEL HISTORY AND BACKGROUND

The INEEL is located in the western part of the United States, in the State of Idaho. It is located in typical eastern Idaho high desert country having an average altitude of about 1483 m (4865 ft). It covers an area of 2,315 km² (893 mi²). The region receives little rainfall and is remotely located from nearby towns and cities. This combination of characteristics makes it ideally suited for the operation of nuclear facilities. The location of the INEEL within the State of Idaho is shown in Figure 1, while a more detailed layout of the site is shown in Figure 2.

The INEEL site was originally a Navy Gunnery Test Range and when the United States Atomic Energy Commission (USAEC) needed a location to build and test nuclear reactors as part of a program to develop nuclear power sources the gunnery range in southeast Idaho was selected. This occurred in the late 1940's, and by the early 1950's a considerable amount of construction activity was underway. Over the years this activity led to the construction of 52 reactors at the Idaho site. In addition to the reactors, a full range of support facilities were also constructed. These included nuclear fuel processing facilities, waste management facilities, laboratories, hot cells, and other nuclear research facilities. All of these facilities operated very successfully for many years and each played important roles in the development and use of nuclear power as a new energy source.

Over the many years that this nuclear site has been in operation the emphasis on the type of work done there has gradually changed from the development of safe nuclear power, to large engineering development and environmental restoration activities. Even the name of the government program which sponsored the work has changed. It started in 1947 as the Atomic Energy Commission's National Reactor Testing Station. In 1963 the AEC became the Energy Research and Development Administration, which eventually became the United States Department of Energy. The National Reactor Testing Station was renamed the Idaho National Engineering Laboratory and in 1997 this name was changed to the Idaho National Engineering and Environmental Laboratory to better reflect the emphasis placed on environmental work currently being done. Although the name has been changed several times, an emphasis has always been placed on the performance of safe, efficient, high quality work which supports the needs of the world.

DECONTAMINATION AND DECOMMISSIONING PROGRAM

Although facilities had been shut down and even removed earlier, the formal D&D program at the INEEL officially started in August of 1977. At that time one of the first tasks of this new program was to identify all of the surplus, contaminated facilities which existed at the INEEL. The criteria used for identification of these facilities were that they were surplus to the needs of the government, and that they were contaminated with nuclear materials to the extent that Health Physics control was necessary when working in the building. The initial search for these facilities revealed that approximately 70 of them existed at the INEEL at that time. The 70 facilities ranged from items as simple as a contaminated concrete waste storage pad, to very large and complex materials and engineering test reactors. A very wide variety of test reactors had been built at the INEEL. These included Organic Moderated Reactors, liquid metal cooled reactors, pressurized water reactors, boiling water reactors, heavy water reactors, and a gas cooled reactor. A large number of reactor fuel processing and waste management facilities were also included. Laboratory facilities, contaminated soil areas, underground radioactive waste storage tanks, and stored reactor components such as pressure vessels and heat exchangers were also included in the inventory of surplus facilities.

Following identification of the surplus contaminated facilities the next step was the preparation of a Long Range Plan for D&D of these facilities. This plan (Reference 1) contained the list of surplus contaminated facilities identified and brief descriptions of each facility. It also defined the management practices which would be applied to the INEEL D&D program and described the documentation required for the performance of D&D work. Funding requirements and a schedule for decommissioning the backlog contaminated facilities were also included in the long range plan. Waste management requirements and the process or criteria used to establish the D&D priority ranking for each facility were addressed.

The INEEL D&D Long Range Plan has been revised and updated on a regular basis over the years. As more is learned about these facilities the plan is revised to reflect this new information. Budget and schedule revisions are also reflected in the revisions. Recent editions contain reference lists of all documentation relating to the decommissioning of these facilities and actual costs for those facilities which have been decommissioned. Following identification of the D&D facilities and preparation of the Long Range Plan, an effort was made to characterize each of the facilities. This was done to provide more complete and accurate information about the physical, radiological, and chemical nature of the facilities and the contamination they contained. A "characterization library" was established for the surplus INEEL facilities. The characterization information proved invaluable in providing accurate cost and waste volume information to D&D planners. Characterization data provided the basis for the preparation of Decommissioning plans for each facility.

Following completion of the first D&D plan and supporting safety, environmental, and procedure documentation, work was started on the first INEEL D&D project. This was the Organic Moderated Reactor Experiment (OMRE) and two years were required to remove the

facility and all contamination and return the area where it stood to a natural condition. Photographs of the OMRE facility at the beginning of the D&D project, and after it was completed are shown in Figures 3 and 4 respectively. This work was performed in 1977 and 1978 and accomplished mostly by hand using wrenches and gas torches to unbolt and disassemble the building. Photographs of recent D&D projects reveal that most of this work is now performed using large mobile shear equipment which is much safer and faster. Recent building disassembly activity is depicted in Figure 5.

At the present time about 30 of our surplus contaminated facilities have been decontaminated and decommissioned. These facilities have either been completely removed and the area restored to a natural condition, or the buildings have had all radioactive materials removed and they have then been released for unrestricted use by other INEEL projects. All of this work has been accomplished without a single serious accident or incident and no workers have been injured.

DOCUMENTATION IS A KEY TO THE SUCCESS AND SAFETY OF THESE D&D OPERATIONS

A variety of documents are required for the performance of D&D activities. The generation of high quality documents which accurately describe the work to be done in sufficient detail to be easily understood by reviewers and workers alike will help insure the safe completion of these projects. The use of standard guidelines in the preparation of D&D documentation will insure consistency in the documents themselves, and in the results obtained during actual operations. Following is a list of the primary documents used to manage the INEEL D&D Program. Some of these apply to the overall program, while others are applicable to each individual D&D project.

- INEEL D&D Long Range Plan
- INEEL D&D Project Managers Handbook
- ASTM Standard Guides on Decommissioning
- Characterization and Decision Analysis Report
- D&D Plan
- Health and Safety Plan
- Safety Analysis Report
- Environmental Documentation
- Quality Assurance Plan
- Internal Work Documentation
- Detailed Operating Procedures
- Worker Training Documentation

THE SELECTION AND USE OF APPROPRIATE TECHNOLOGIES ALSO PLAYS AN IMPORTANT ROLE IN D&D PROJECTS

Many new technologies are now available which are safer, more cost effective, and faster to use than conventional technologies which were used on early D&D projects. There are also several sources of information relative to the performance of these new technologies. This information is very useful in helping D&D project managers select technologies which are appropriate to their needs. Following are brief descriptions of some of these sources.

D&D Technology Logic Diagrams: Technology Logic Diagrams (Reference 2) have been prepared to assist D&D personnel in identifying and selecting the most appropriate technologies for the various problems or needs associated with INEEL D&D projects. This three volume set of documents identifies technology needs associated with the decommissioning of INEEL facilities. It then presents a list of all applicable technologies which might meet these needs. The technologies are then evaluated in terms of their expected performance. Sources for obtaining the technologies and contacts who can supply more information about them are also presented.

D&D Large Scale Technology Demonstration Projects: The US Department of Energy is sponsoring a series of D&D technology demonstrations at actual D&D projects. The intent of these demonstrations is to directly compare the performance of standard or baseline technologies to that of new and improved technologies in actual D&D field operations conditions. To date three large scale demonstration projects have been selected and testing is underway. These include a test reactor at the Chicago CP-5 facility, a uranium facility at the Fernald site, and a production reactor at the Hanford site in Washington. A fourth demonstration project has recently been selected at the glove box facilities in the Rocky Flats Plant and work on this project is just getting underway. Information from these technology demonstration projects is readily available and is of great use in planning future D&D projects.

THE INEEL SUPPORTS THE DEVELOPMENT OF NEW TECHNOLOGIES FOR D&D AND ENVIRONMENTAL RESTORATION ACTIVITIES

Several unique and interesting technologies are currently under development at the INEEL. These have the potential to make significant improvements in cost, safety, and efficiency of D&D and environmental restoration operations. These include a biodecontamination process for the decontamination of concrete, the use of a laser for the decontamination of surfaces, and a laser enhanced ultra high pressure liquid nitrogen zero added waste cutting, abraiding, and drilling system. We are also currently involved in the development of an optimal waste handling and packaging system which will significantly reduce the volume of waste resulting from D&D projects.

CURRENT AND FUTURE INEEL D&D PROJECTS

We continue to be actively working on the backlog of surplus contaminated facilities at the

INEEL. We are in the process of completing D&D operations at three Auxiliary Reactor Area (ARA) facilities and at the Boiling Water Reactor Experiment (BORAX) facility. Work on planning and document preparation started this year for decommissioning of the Test Area North Liquid Waste Treatment System, and at the Engineering Test Reactor. Work on these facilities is expected to continue for the next several years.

REFERENCES

1. INEL D&D Long Range Plan, INEL-95/0453, September 1995.
2. Idaho National Engineering Laboratory Decontamination and Decommissioning Technology Logic Diagram (Volumes I, II, and III), EGG-WTD-11104, R. H. Meservey, et. al., January 1994.