



Quality Assurance

Introduction

Sandia National Laboratories Nuclear Waste Management Program (NWMP) has a long history of involvement in significant national programs directed at solving the national problem of managing the disposal of various forms of nuclear wastes. The NWMP has had a significant responsibility on the Waste Isolation Pilot Plant (WIPP), the Yucca Mountain Site Characterization Project (YMP), the Hanford Tank Waste Remediation System (TWRS), and the Greater Confinement Disposal (GCD) programs. In addition, the NWMP activities have also played major roles in nuclear waste transportation, and in several environmental remediation and restoration programs, including those at Fernald, Ohio, and Hanford, Washington.

The key to the success of our activities on these programs, particularly for WIPP, YMP, TWRS, and GCD, was the development and application of quality assurance for program activities. Another important aspect of our success was the implementation of systems-based configuration management systems essential to the control and traceability of modeling analyses used to demonstrate regulatory compliance.

Quality Assurance

Over nearly two decades, the NWMP has developed an extensive experience base in the development and application of quality assurance to scientific and engineering activities in the regulatory environment of major nuclear waste programs. This development has involved interaction with and acceptance of the programs by several regulatory agencies, including, most significantly, the U.S. Nuclear Regulatory Commission and the U.S. Environmental Protection Agency, as well as various state and other stakeholder organizations.

Among more notable successes of this work has been the adaptation of quality assurance to the nature of activities involved in the characterization, selection, and performance analyses associated with programs involving nuclear waste management. Quality assurance requirements originated from a need to control and assure the quality of nuclear power plant design, construction, and operations; modifying these concepts to scientific investigation and characterization activities was a necessary and beneficial effort that has proven successful for nuclear waste management.

Decades of experience under the scrutiny of independent audits, identifying quality deficiencies, and taking effective corrective action have resulted in a number of valuable lessons learned. The application of quality assurance to the conduct of scientific investigation in a regulatory environment has been continuously improved. Full, verifiable compliance to requirements characterizes the quality assurance introduced into these programs by the improvements which Sandia pioneered. These improvements have resulted in cost-efficient and streamlined programs, that also benefit from customer and staff acceptance.



Approaching the implementation of quality assurance as a system, rather than a set of unrelated and poorly-integrated processes, also has provided additional benefits in areas such as the associated infrastructure support systems for training, document control, and records and data management.

Configuration Management

The need to automate, control, and efficiently manage the information used to demonstrate regulatory compliance and the scientific basis underlying program positions was recognized and addressed by the NWMP as a major component to the success of the WIPP Compliance Certification Application process. The successful negotiation of legal and regulatory barriers resulted in the approval and initiation of operations for the nation's first licensed underground nuclear waste repository.

A fundamental challenge of this information management process was developing consensus on the modeling parameters used for the analysis of the expected performance of the disposal system. This requirement involved interactions between those responsible for collecting and interpreting site characterization data and those using the data to perform predictive analyses. A formal program to control and document these interactions and manage the subset of data and parameters selected for use in licensing was developed and implemented by Sandia. It proved essential in maintaining traceability, consistency, and reproducibility of modeling results and conclusions. In addition to the formal control of parameters selected for licensing analyses, this system also maintained full traceability to supporting documentation. This traceability allowed the ready retrieval of associated records, provided a transparent means to evaluate the process by which conclusions were developed, and determined the adequacy of program positions.

In combination with this process of reaching consensus and managing parametric information, Sandia developed a system to automate and manage the software codes and input datasets used to execute licensing analyses. This system was extremely valuable in providing the capability to reproduce analysis results consistently and with minimal resource expenditure, to address regulatory concerns, and to ensure stringent control of the quality analyses.

Another component of the configuration management system, which proved essential to the success of WIPP, was the development of a system to identify, prioritize, and allocate resources to critical licensing issues. Under tight deadline and budget constraints, it became critically important to focus project resources on the most important questions for which greater confidence could be established. Based on results of sensitivity and uncertainty analyses of licensing models, areas in which uncertainty could be reduced within the boundaries of these constraints were identified and resources allocated accordingly. Increased confidence in the system performance results paved the way for regulatory and stakeholder acceptance and eventual approval of the proposed disposal system.

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