YUCCA MOUNTAIN: WORKING TOWARD SOLVING AN EXISTING ENVIRONMENTAL PROBLEM

Many experts throughout the world agree that the most feasible and safe method for the disposition of spent nuclear fuel and high-level radioactive waste is in an underground repository. Based on this consensus, Congress passed the Nuclear Waste Policy Act in 1982. The Act directs the Department of Energy to find a suitable underground disposal site and to build and operate a repository. In 1987, Congress amended the Act to eliminate studies on two of three potential repository sites. The remaining site is at Yucca Mountain, Nevada, 90 miles north of Las Vegas. At that time, Congress deemed the State of Nevada and ten counties in Nevada and California as "affected" and granted special oversight rights and responsibilities for the proposed repository site.

When defining the Act, Congress did not foresee the complexity of the scientific and regulatory challenges that, in reality, increased the scope of the Yucca Mountain Site Characterization Project. In the years following the passage of the Act, the Project was subject to many legislative changes, regulatory revisions, and fluctuating funding levels. In addition, evolving (and often conflicting) needs and expectations of diverse interest groups added unforeseen difficulties. These scope changes resulted in higher costs and extended schedules that greatly exceeded initial expectations.

In 1996, the Project saw its budget reduced from \$522M to \$315M. In addition, Congress stopped funding the state and affected counties for oversight activities. This reduction

forced officials to develop a new, more flexible approach to studying Yucca Mountain, which focused remaining resources on answering the most critical scientific questions. The 1997 Energy and Water Development Appropriations Act directed DOE to accomplish the necessary activities to assess the viability of Yucca Mountain by late 1998. The "Viability Assessment" is to include four products: 1) a design for the critical elements of a repository and waste package; 2) an evaluation of the predicted performance of the repository system; 3) a schedule and cost estimate for remaining work required to complete a license application; 4) a cost estimate for construction and operation of a repository.

Since the site characterization began in the 1980s, scientists have made considerable progress in their extensive study of Yucca Mountain's geology, hydrology, biology, and climate. Many of these studies have confirmed various early hypotheses about the ability of the mountain to safely contain waste. An important milestone in this effort has been the completion of the third in a series of Total System Performance Assessments. This analytical technique uses sophisticated computer models that represent all of the significant features within the repository. These models estimate the future behavior of natural and engineered systems against specified performance standards. Scientists and engineers are using the insights produced by the Total System Performance Assessments to refine their repository safety strategy. This strategy will focus future scientific and engineering efforts on important technical issues that still must be resolved.

Another important project milestone was the April 1997 completion of the Exploratory Studies Facility (ESF) -- a five-mile, U-shaped tunnel approximately 300 meters below the crest of Yucca Mountain. The ESF is an underground laboratory that provides experts direct access to the proposed repository level for testing and data collection.

With the completion of the ESF, scientists are conducting most of the remaining characterization studies underground. One major study - - the Drift Scale Test - - was started in December 1997. This test involves heating a 47-meter (155-foot) long tunnel to temperatures of up to 200 degrees Celsius (392 degrees Fahrenheit), which is the anticipated temperature from waste in a repository. The tunnel is the same size and shape as those planned for actual waste storage. Researchers will maintain these temperatures within the test tunnel for about four years. They will then monitor the rock and hydrology as the tunnel gradually cools. The Drift Scale Test will provide scientists important data on the effects of heat within the proposed repository.

Also in December 1997, workers began excavation of another significant tunnel, called the cross-drift. This tunnel will cut through the entire stratigraphic section of the potential repository, giving a more complete three-dimensional view of Yucca Mountain. The cross-drift tunnel will also allow scientists to gain additional insight into fracture patterns, potential faults, distinct rock layers, and hydrologic characteristics of the repository area. A significant component of these tests will be a comparison of the predictive reports with the true conditions encountered in the cross-drift.

The scientific strategy for evaluating the ability of the repository to isolate waste has matured significantly due to the integration of available scientific knowledge from the ESF. The Project has completed a comprehensive analysis of expected repository performance that will increase understanding of key safety issues. Three developments will contribute to additional refinement of the strategy: 1) much has been learned about Yucca Mountain; 2) engineered barrier designs have matured; and 3) the Environmental Protection Agency is expected to create a new risk- or dose-based standard for the Project to operate under.

Current outstanding issues of concern relate to the long-term behavior and processes of the natural geologic and hydrologic system that might impact the engineered systems currently being designed for the repository. While some tests are being conducted in support of the viability assessment due in late 1998, others are being conducted to further confirm hypothesis underlying the repository safety strategy.

As part of the site recommendation and license application process, the Project will issue a Draft Repository Environmental Impact Statement (EIS) for public review and comment in 1999. Project officials plan to issue the Final Repository EIS and record of decision in 2000.

The Secretary of Energy will make a determination in 2001 whether to recommend Yucca Mountain as the repository to the President. The Secretary will base his decision on data obtained from site characterization, repository and waste package designs, the Final Repository EIS, and preliminary comments from the Nuclear Regulatory Commission (NRC) and State of Nevada. If

the Secretary decides in favor of a formal site recommendation, the Department will issue to the President (and make available to the public), comprehensive statement describing the basis for the recommendation. If the President approves the Secretary's request, he will recommend the site to Congress. Congress must then pass a resolution for siting a repository at Yucca Mountain before the Department can proceed with licensing and construction. If approved, a license application will be submitted to the NRC in 2002. This schedule will allow the Project to meet its long-term goal of waste emplacement in 2010.

Biographical Information:

Dr. J. Russell Dyer is the Project Manager of the U.S. Department of Energy's (DOE) Yucca Mountain Project in Las Vegas, Nevada, and has worked for DOE for nine years. As Project Manager, he has the overall responsibility for the study of Yucca Mountain as a potential site for the nation's first spent fuel and high-level radioactive waste repository.