

DOE/RW--0502

# DOE/RW ANNUAL REPORT to CONGRESS

Fiscal Year 1997



MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

U.S. DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

This publication was produced by the U. S. Department of Energy's Office of Civilian  
Radioactive Waste Management (OCRWM).

For further information, contact:

Office of Civilian Radioactive Waste Management  
National Information Center  
600 Maryland Avenue, SW  
Washington, DC 20024

or call:

1-800-225-NWPA (6972)  
in Washington D.C.: 202-488-6720

or visit:

the OCRWM Home Page  
<http://www.rw.doe.gov>

### **DISCLAIMER**

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

## **DISCLAIMER**

**Portions of this document may be illegible  
electronic image products. Images are  
produced from the best available original  
document.**

DOE/RW-0502

JULY 1998

O C R W M  
**ANNUAL  
REPORT to  
CONGRESS**

---

**Fiscal Year 1997**



**U.S. DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
WASHINGTON, DC 20585**



Printed with soy ink on recycled paper

## ***OCRWM Performance in Brief***

### **From the Secretary's Fiscal Year 1997 Performance Agreement with the President**

**OCRWM commitment:** FINDING SOLUTIONS TO SPENT NUCLEAR FUEL STORAGE AND FUNDING ISSUES. Refocus the Civilian Radioactive Waste Management Program to provide meaningful deliverables that are consistent with reduced funding and revised policies.

#### ***Success Measure 1***

Completing the excavation of the Exploratory Studies Facility main 5-mile loop and selected scientific instrumentation alcoves to support studies for a viability assessment of the Yucca Mountain site in September 1998 and subsequent site suitability determination and licensing.

##### ***Fiscal Year 1997 results***

*Excavation of the Exploratory Studies Facility main 5-mile loop was completed on April 25, 1997. The thermal test alcove was completed in January 1997. The Northern Ghost Dance Fault alcove was completed May 9 and testing was initiated May 23, 1997.*

#### ***Success Measure 2***

Submitting the Topical Safety Analysis Report to the Nuclear Regulatory Commission for a non-site specific Phase I interim storage facility design to assist in maintaining a readiness capability should interim storage be authorized by legislation.

##### ***Fiscal Year 1997 results***

*The Topical Safety Analysis Report was submitted to the Nuclear Regulatory Commission (NRC) on May 1, 1997. The NRC performed its acceptance review and found the submittal to be complete enough to begin its detailed technical review.*

#### ***Success Measure 3***

Issuing a Revised Notice of Proposed Policy and Procedures under Section 180(c) of the Nuclear Waste Policy Act, which provides for technical and financial assistance to States and Indian Tribes for training public safety officials through whose jurisdictions spent nuclear fuel and high-level radioactive waste would be transported, in preparation for an orderly transportation activity.

##### ***Fiscal Year 1997 results***

*A Revised Notice of Proposed Policy and Procedures under Section 180 (c) of the Nuclear Waste Policy Act was issued on July 17, 1997.*

#### ***Success Measure 4***

Issuing a draft request for proposals to provide waste acceptance and transportation services and equipment for commercial spent nuclear fuel, to carry on collaboration with the nuclear utilities and other stakeholders to resolve issues, and develop the management and logistical capability in the private sector.

##### ***Fiscal Year 1997 results***

*An initial draft request for proposals was issued in December 1996. Based on comments received, a revised draft was issued in December 1997.*

# Contents

---

<i>From the Director .....</i>	<i>v</i>
<i>Program Profile .....</i>	<i>vii</i>
<i>Summary .....</i>	<i>1</i>
<i>Introduction: Why This Program Matters.....</i>	<i>9</i>
<i>Chapter One — Yucca Mountain Site Characterization Project.....</i>	<i>13</i>
Overview .....	13
The Project Meets a Pivotal Milestone .....	13
Work Proceeds on the Viability Assessment .....	16
The Repository Safety Strategy Evolves .....	17
Scientific Studies Further Our Understanding of the Site .....	18
Design Work Advances .....	22
Performance Assessment: Key to Site Suitability and Licensing .....	29
Regulatory Issues Remain Open .....	32
Coordination with the Nuclear Regulatory Commission.....	32
Protecting People and the Environment .....	34
Relations with Other Parties .....	36
International Collaboration .....	38
<i>Chapter Two - Waste Acceptance, Storage and Transportation Project .....</i>	<i>39</i>
Overview .....	39
Developing a Market-Driven Strategy .....	39
The Debate over Interim Storage Continues .....	40
Non-Site-Specific Storage Planning .....	41
Relations with Utilities .....	41
Technical Developments .....	43
Institutional Developments .....	43
<i>Chapter Three - Program Management .....</i>	<i>47</i>
Adapting to Budget Cuts .....	47
Managing Our Human Resources .....	48
Managing Contractor Support .....	48
Integrating our Planning, Budgeting, and Reporting Functions .....	49

# *Contents (continued)*

---

Strengthening Program Management and Integration .....	50
Preparing to Accept Government-Managed Nuclear Materials .....	53
Consolidating Quality Assurance Functions .....	58
Getting the Most from Information Technologies .....	59
<b>Chapter Four - Working with External Parties .....</b>	<b>63</b>
Review, Regulation, and Oversight .....	63
Soliciting the Public's Views and Sharing Information .....	65
Public Information and Outreach .....	66
<b>Chapter Five - Financial Management .....</b>	<b>69</b>
Program Funding .....	69
Long-Range Financial Planning .....	71
Civilian Radioactive Waste Research and Development Account .....	72
<b>Appendix A</b>	
Financial Statements .....	73
<b>Appendix B</b>	
Key Federal Laws and Regulations .....	105
<b>Appendix C</b>	
Fiscal Year 1997 Congressional Testimony and Meetings with Regulators and Oversight Bodies .....	109
<b>Appendix D</b>	
OCRWM Publications, Fiscal Year 1997 .....	113
<b>Appendix E</b>	
Selected Publications from Other Organizations, Fiscal Year 1997 .....	115



# From the Director

---

The "daylighting" of the tunnel boring machine, on April 25, 1997, completed the 31-month-long excavation of the 8-kilometer (5-mile) loop that houses the Exploratory Studies Facility—the underground laboratory we are constructing inside Yucca Mountain. Our scientific investigations of the site are centered in this laboratory, which gives scientists direct access to the potential repository horizon. This enables them to analyze actual geologic and hydrologic conditions and, by using heaters to simulate heat emitted by radioactive waste, to determine thermal, mechanical, hydrologic, and chemical effects on what would be the repository environment. What they are learning shapes our designs for a repository tailored to this setting.

Fiscal Year 1997 was the most productive year yet for the Yucca Mountain Site Characterization Project, keeping us firmly on track. As directed by Congress, we continued to focus site characterization on work essential to determining whether Yucca Mountain is suitable for a repository. The results of years of scientific investigations, design, and performance assessments are converging as we work to assemble the viability assessment, an initiative that Congress endorsed in its 1997 appropriation. The assessment will present timely information that decision-makers can use to assess the prospects for, and probable costs of, licensing, constructing, operating, and closing a repository at the Yucca Mountain site. It will also serve as a common frame of reference for deliberations over the program's future direction and funding levels.

The viability assessment will not constitute the basis for a decision about the suitability of the site; that formal determination requires the development of more data and analyses than are now at hand. But work we are doing to prepare the assessment is further focusing what remains to be done to make the determination of site suitability.

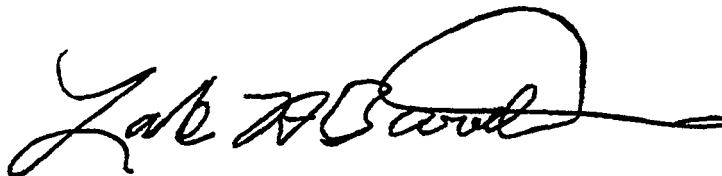
While scientists, engineers, cost estimators and schedule planners, regulatory compliance specialists, and other experts were working hard on site characterization tasks in Nevada, legislative debate and litigation over interim storage issues continued in Washington, D.C. As Congress considered bills proposing interim storage solutions, the Administration remained steadfast in holding that any potential decision on the siting of an interim storage facility should be informed by the results of the Yucca Mountain viability assessment and grounded in objective, science-based criteria. As utilities

pressed their case in court, the Secretary of Energy and I met with representatives of utilities and State utility rate commissions to explore administrative remedies under the Department's *Standard Contract* with utilities.

Meanwhile, we pursued non-site-specific contingency planning for an interim storage facility, to maintain capability if such a facility is authorized and sited. We also held a presolicitation conference to convey to commercial vendors information about our large-scale, long-term procurement of waste acceptance and transportation services. And continuing coordination with other offices in the Department moved us closer to integrating Government-managed nuclear materials, principally defense wastes, including surplus weapons-grade plutonium, into our waste management system.

In recent years, as budget pressures have focused our work more narrowly and challenged us to do more with less, awareness of the importance of our Nation's commitment to geologic disposal has grown within the policy community. That commitment *matters*—to utilities with mounting inventories of spent nuclear fuel; to public utility commissions responsible for representing ratepayers' interests; to the Department's ability to clean up its nuclear sites and exercise responsible stewardship of its radioactive wastes; to our Nation's strategic interests in nuclear nonproliferation; and to other nations looking to us for leadership on this issue.

The Introduction to this Annual Report sums up the importance of OCRWM's mission and the substantial benefits yielded to date by the policies established in the Nuclear Waste Policy Act of 1982 and its amendments. The Nation's investment in this program is paying off—in the steady scientific progress, achieved in an open forum, that alone can earn public acceptance.



Lake H. Barrett, Acting Director  
Office of Civilian Radioactive  
Waste Management



# Program Profile

---

## Statutory Authorities and Mission

The Nuclear Waste Policy Act of 1982 (Public Law 97-425) established the Office of Civilian Radioactive Waste Management (OCRWM) within the U. S. Department of Energy (DOE) to develop and manage a Federal system for disposing of all spent nuclear fuel from commercial nuclear reactors and high-level radioactive waste resulting from atomic energy defense activities. The statute provides detailed direction for the scientific, technical, and institutional development of the system, and it requires that waste management facilities be licensed by the U.S. Nuclear Regulatory Commission (NRC).

Under the Act, commercial spent nuclear fuel is to be permanently emplaced in a deep geologic repository. In 1985, under provisions of the Nuclear Waste Policy Act, the President determined that a separate repository for high-level radioactive waste from atomic energy defense activities would not be required; they could be disposed of along with commercial spent nuclear fuel in the civilian repository. The Nuclear Waste Policy Amendments Act of 1987 (Public Law 100-203) directed the Secretary of Energy to characterize only the Yucca Mountain site in Nevada to determine if it is suitable for a repository. Under OCRWM's current schedule, waste emplacement at the repository would begin in 2010.

The Act authorized the Secretary to enter into contracts with the generators and owners of commercial spent nuclear fuel and high-level radioactive waste, for acceptance of legal title to the waste, subsequent transportation, and disposal. A *Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste* was promulgated in 1983 in 10 CFR Part 961. Individual contracts based on the *Standard Contract* have been executed between the Department and those parties. The Act also directs OCRWM to develop a nationwide system for transporting commercial spent nuclear fuel to Federal facilities.

OCRWM's Fiscal Year 1997 activities were governed by its May 1996 draft revised *Program Plan*. A *Total System Description*, issued in June 1997, provides a top-level description of the waste management system OCRWM is developing.

Section 304(c) of the Nuclear Waste Policy Act requires OCRWM's Director to submit to Congress each year a comprehensive report on the activities and expenditures of the Office. This Annual Report, the 14th, covers the period from October 1, 1996, through September 30, 1997.

## Funding Sources and Budget

The Nuclear Waste Policy Act of 1982 provides that the costs of disposing of spent nuclear fuel and high-level radioactive waste are to be borne by the parties responsible for their generation. Fees levied on the owners and generators of commercial spent nuclear fuel are defined in the *Standard Contract*. The fees are deposited in the Nuclear Waste Fund, a separate account in the U.S. Treasury that is managed and administered by DOE. OCRWM can only expend monies from the Fund that are appropriated by Congress. Amounts not appropriated for current expenses are invested in U.S. Treasury securities and managed strategically to ensure that the long-term costs of waste disposal can be met.

The Act directed that if civilian and defense wastes are emplaced in the same repository, each party must pay its proportional share of costs. The Department developed a methodology for allocating civilian and defense costs and published the result in the *Federal Register* in August 1987. Funding to meet the costs of disposing of defense wastes in the repository is provided through a Defense Nuclear Waste Disposal Appropriation from the general (taxpayer-supported) fund of the U.S. Treasury. Those costs are currently estimated to be about 20 percent of total costs. The combined Fiscal Year 1997 civilian and defense appropriation for the program was \$382 million.

## Program Organization

OCRWM is headquartered in Washington, D.C., in the Department of Energy's Forrestal Building. Its Director reports to the Secretary through the Deputy Secretary. OCRWM carries out its mission through two business centers, or projects, and a management center:

- The Yucca Mountain Site Characterization Project is located in Las Vegas, Nevada. It is responsible for all work leading up to and including licensing of a geologic repository.
- The Waste Acceptance, Storage and Transportation Project is located at OCRWM headquarters. It is responsible for all work leading up to and including acceptance, storage, and transportation of spent nuclear fuel and high-level radioactive waste.
- The Program Management Center, also located at OCRWM headquarters, consists of the Office of Program Management and Administration, and the Office of Quality Assurance. It supports the two business centers and the OCRWM Director.

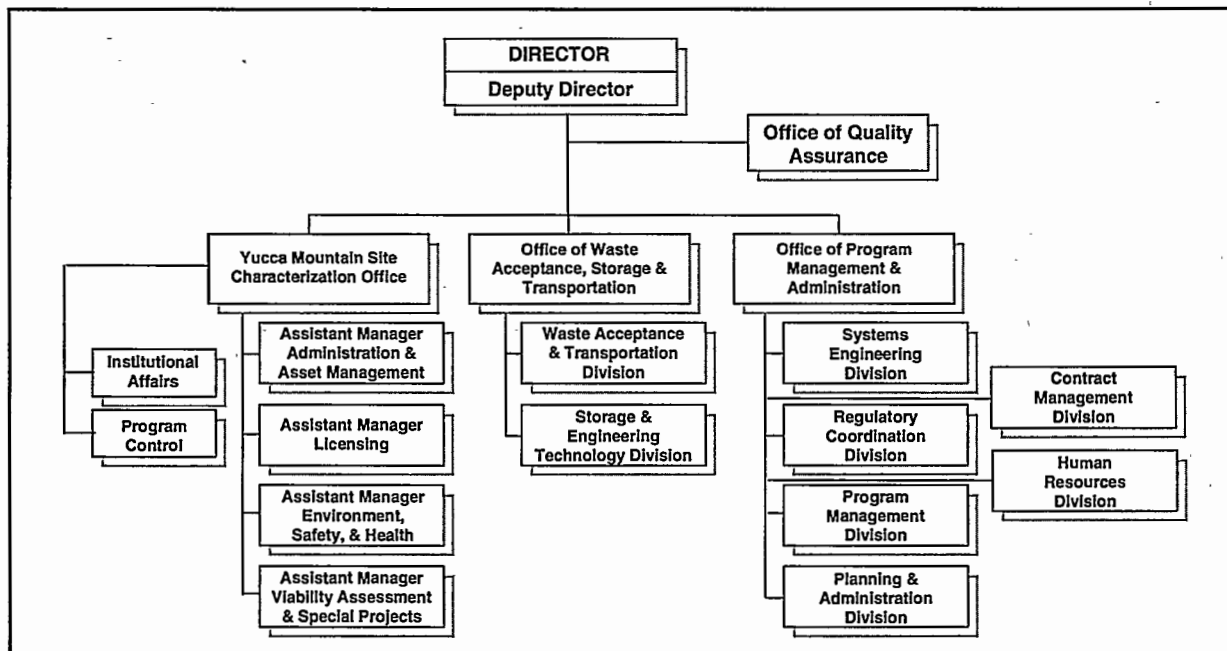
In Fiscal Year 1997, OCRWM's Federal staff numbered 202 full-time equivalents, with 106 positions at

headquarters and 96 at the Yucca Mountain Site Characterization Project. Of the positions at headquarters, 29 were assigned to the Waste Acceptance, Storage and Transportation Project.

## Clarification of Terms

In this report, we most often use the term *high-level radioactive waste* narrowly to refer to the wastes that result from reprocessing spent nuclear fuel. These wastes are Government-managed. Technically, the term also encompasses all wastes with high levels of radioactivity, and in a few instances we use the term inclusively. We use *Government-managed nuclear materials/wastes* to refer to all materials destined for geologic disposal other than commercial spent nuclear fuel. *DOE spent nuclear fuel* includes spent nuclear fuel generated by DOE and spent nuclear fuel irradiated in commercial reactors but now managed by DOE; the latter category includes foreign research reactor fuel.

Because the Nuclear Waste Policy Act refers to *high-level radioactive waste resulting from atomic energy activities* and the Defense Nuclear Waste Disposal Appropriation applies to *defense nuclear waste*, when we are discussing the Act and the appropriation, we sometimes use these terms. Overall, we trust that the context in which terms are used will clarify them for the reader.



OCRWM Organization Chart

# Summary

---

## **Site Characterization Meets Key Milestone; Waste Acceptance Issues Remain Open**

### **Overview**

Fiscal Year 1997 saw intense effort that produced advances programwide. By the year's end, we had met all commitments made in the Fiscal Year 1997 Performance Agreement between the Secretary and the President, and we were moving steadily toward major statutory decisions.

On schedule, we completed the main loop of the underground Exploratory Studies Facility that gives scientists direct access to the repository block at the Yucca Mountain site. Scientific studies proceeded above and below ground, and design of engineered barriers progressed. We worked to assemble the viability assessment for development of a repository at the site. We launched a major initiative to strengthen the total system performance assessment that is key to the viability assessment, to determining site suitability, and to licensing. We published proposed amendments to our repository siting guidelines. For the environmental impact statement that will support decisions about the site, we published a summary of scoping comments and our responses, and we began work on the draft statement.

Non-site-specific contingency planning for interim storage continued, as we submitted to the Nuclear Regulatory Commission (NRC) a generic Topical Safety Analysis Report that could facilitate development of a centralized interim storage facility, should national policy change. We issued a draft Request for Proposals to procure waste acceptance and transportation services. We further refined the policies and procedures for providing funding and technical assistance to States and Native American Tribes for training public safety officials along transportation routes.

Preparations to accept Government-managed nuclear materials (primarily defense wastes) crosscut the

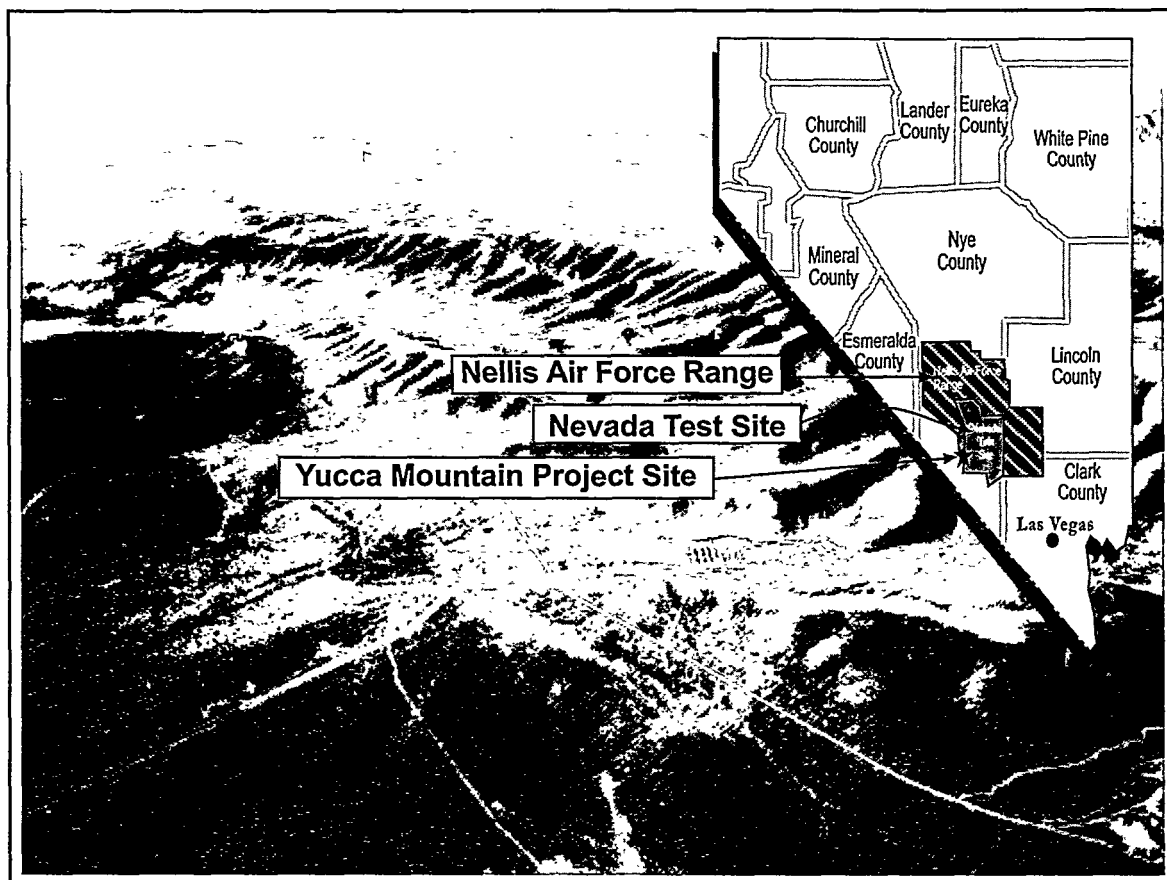
program and involve coordination with the Offices of Environmental Management and Naval Reactors on detailed agreements that will govern our interfaces and on implementation of quality assurance procedures; coordination with the Office of Environmental Management on transportation planning; and consultation with these offices and the Office of Fissile Materials Disposition to factor data about their wastes into waste package design, performance assessments, and environmental impact statement analyses. Work to further integrate DOE and Naval spent nuclear fuel into waste management system planning and initiation of a change to incorporate surplus weapons-grade plutonium waste forms into the program baseline signaled our significant progress in this area.

Debate over proposed interim storage legislation continued, as utilities and States pursued legal remedies for the hardships they claim will result from our inability to start accepting spent nuclear fuel in 1998. The Secretary and our Acting Director met with representatives of utilities and State utility regulatory commissions to explore how individual contract amendments might address these problems.

As statutory cuts in funding for the Waste Acceptance, Storage and Transportation Project and the Program Management Center challenged us to do more with less, we further strengthened and streamlined our management capabilities and consolidated our quality assurance functions.

### **Yucca Mountain Site Characterization Project**

In the Department's Fiscal Year 1997 appropriation, Congress endorsed our approach to site characterization and our plans for a viability assessment. Congress also specified the components of the assessment, directing us to complete it by September 30, 1998. It authorized the full \$325 million



Aerial view of Yucca Mountain with Inset Map of Nevada Showing Location of Yucca Mountain Project Site

for the Yucca Mountain Site Characterization Project that we requested—an increase of \$75 million over the prior year. In keeping with congressional direction and our revised *Program Plan*, we focused on key technical issues related to the viability assessment and determination of site suitability.

***At the Exploratory Studies Facility, the main loop is completed; planning accelerates for the cross-drift***

On April 25, 1997, we completed the 31-month-long excavation of the 8 kilometer (5-mile) main loop of the underground Exploratory Studies Facility, meeting a major milestone. Our safety record continued to exceed mining industry performance; worker safety remains our top priority.

Running along the eastern side of the potential repository block, the main loop gives scientists direct access to the block and enables them to gather data they

can use to model natural processes at the site and to design a repository and waste package tailored to the site. These models and designs are used to conduct performance assessments of how the natural site, together with engineered barriers, will perform under a range of conditions, over thousands of years.

Studies had been conducted in test alcoves within the Exploratory Studies Facility for several years, and hydrologic studies were initiated in niches in Fiscal Year 1997. With the main loop of the tunnel completed and construction support equipment removed, the tunnel functions primarily as the underground laboratory it was designed to be. Because the Ghost Dance Fault is a major geologic feature, scientists want to better understand water movement and chemistry in that zone. We completed the Northern Ghost Dance Fault Alcove, and we began testing in it and in the access tunnel to the Southern Ghost Dance Fault Alcove, which was later completed in October 1997.

We accelerated planning for a smaller-diameter cross-drift (a short tunnel) above the repository horizon. By traversing the strata of the potential repository block, the cross-drift will provide a more complete three-dimensional view of the mountain. Testing there will further reduce uncertainties about the site and help us better understand processes critical to site suitability and repository construction. We plan to use observational data gathered from within the drift to support the viability assessment.

***Most surface-based testing is completed; underground studies expand our understanding of the site***

Well over 80 percent of the surface-based testing needed for licensing had been completed by the end of the fiscal year. With completion of the main loop of the Exploratory Studies Facility, the focus of underground work shifted to investigations of the Ghost Dance Fault and to hydrologic and thermal studies.

Using surface-based boreholes, monitoring wells, and boreholes drilled from within the Exploratory Studies Facility, we continued to study how water moves through the mountain, above and below the water table. Data indicate that there may be more moisture percolating in some locations within the mountain than we had previously thought; the significance of this information and the consequences for repository performance are still being analyzed. We also continued to collect data to characterize seismicity, weather, and pneumatic pathways. And we drilled another borehole to the depth of the water table west of the Exploratory Studies Facility, in what would be the repository block, to study rock properties, deep stratigraphy, and the saturated zone. These data will support three-dimensional geologic and hydrologic modeling.

Because radioactive waste emits heat, it is important to understand how cycles of heating and cooling might affect the thermal, mechanical, hydrologic, and chemical characteristics of the proposed repository environment. Three studies using electric heaters to simulate heat emitted by waste are being conducted for this purpose. The first study, a large-scale underground test, used a single heater to heat a 25-cubic-meter (883-cubic-foot) volume of rock to 100 degrees Celsius; more than 300 thermometers distributed throughout the

test alcove are measuring the effects. The test began in August 1996; the heater was turned off in May 1997. Data were collected as the rock heated up and are being collected as it cools down.

The second study involves heating a large block of rock carved from the same geologic formation as the potential repository. Because the rock is a discrete block, we can more closely control and monitor test parameters. This study began in February 1997.

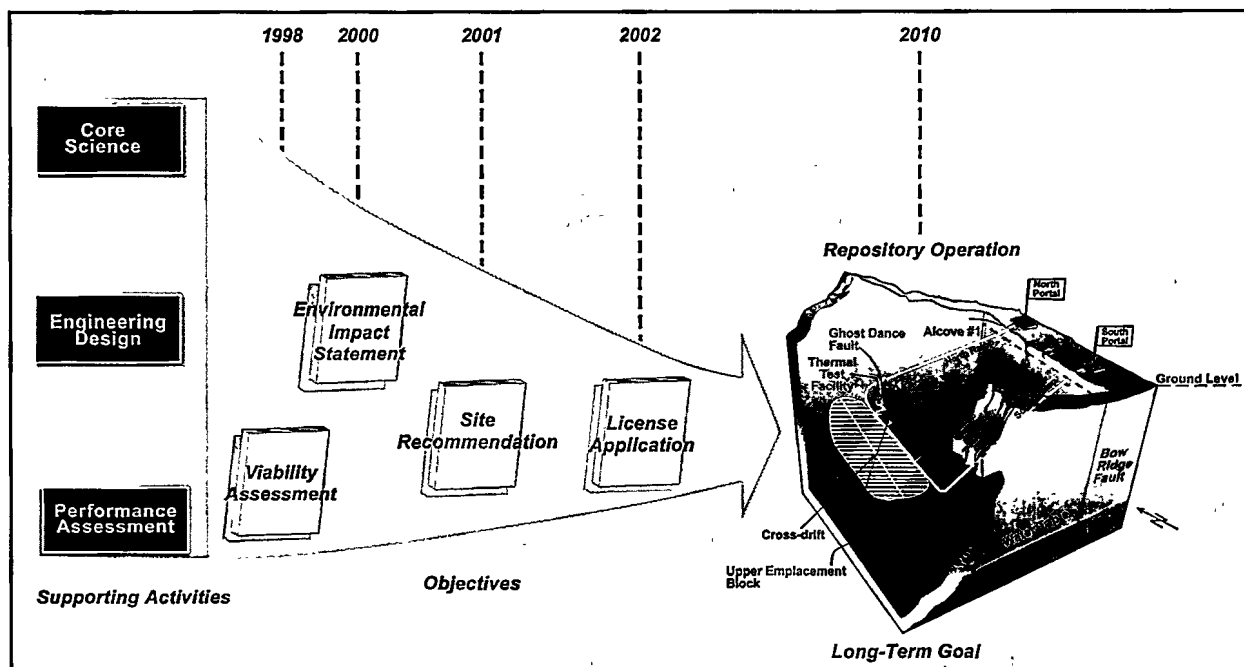
The third study, one thousand times larger in volume than the single-heater test, is the largest underground thermal test ever conducted. To provide information on a scale more representative of repository conditions, it will simulate conditions in an actual waste emplacement tunnel by heating an underground alcove about 48-meters (157-feet) long over several years. In Fiscal Year 1997, we finished excavating the alcove and installed instrumentation. Testing began in December 1997 and will continue through a 4-year heat-up period and a 4-year cool-down period.

Initial data from all three thermal studies will be used in the total system performance assessment for the viability assessment.

***Viability assessment proceeds***

The viability assessment involves shaping the results of many years of work into documentation that presents: (1) preliminary design concepts for critical elements of the repository and waste package; (2) a total system performance assessment that synthesizes scientific, design, and engineering information to predict the repository system's probable performance under a range of conditions and various design options, over thousands of years; (3) a plan for developing a license application and an estimate of what executing that plan would cost; and (4) an estimate of what it would cost to construct, operate, and close a repository, based on the preliminary design concepts.

This comprehensive compilation of what has been learned from site characterization will provide decision-makers with timely information and a common frame of reference for deliberations over appropriate funding levels and future direction for our program.



The Viability Assessment is the Next Step in a Careful Process

***Total system performance assessment: key to site suitability and licensing***

Because understanding the probable performance of the repository system is key to decisions about the viability, suitability, and licensability of the site, we convened a multidisciplinary panel of distinguished independent peer reviewers to monitor and review our performance assessment models and techniques. The panel's 2-year review will serve the goals of (1) making the total system performance assessment transparent to technical peers, regulatory and oversight bodies, and departmental and congressional decision-makers; and (2) ensuring the traceability of decisions and assumptions that support that assessment. The panel's recommendations are being factored into the viability assessment, as appropriate.

To further strengthen total system performance assessment tools, we conducted formal, documented expert elicitations to quantify uncertainties in some models of natural processes at the site. We also conducted a series of nine workshops, observed by staff from the NRC, the Nuclear Waste Technical Review Board, the Environmental Protection Agency, and others, to strengthen the technical validity of our models.

***Repository and waste package designs advance***

Information from surface and underground site investigations, laboratory studies, and performance assessments continued to shape our designs for the repository and waste package, and we used systems studies to examine design options and improve the total repository system. Considerations of safety, performance, operations, and cost governed this work, along with a strategy that relies on multiple barriers with diverse properties and failure modes over a range of repository conditions.

We refined the repository concept of operations, and we incorporated into the design of the repository and waste package certain features that will enhance performance and may lower costs. The results will be included in the viability assessment. We also completed viability assessment designs for surface facilities, the underground operations area, and the engineered barrier system. Cost estimates based on these designs were begun for the viability assessment. Design focused on thermal management; performance confirmation design; waste handling emplacement and retrieval; development of systems, structures, and components important to safety that have no precedent; and design-basis event analyses. Site-scale models of geologic



processes were used to bound uncertainties in anticipated environmental conditions. Design options for the license application were evaluated.

For the waste package, design focused on developing the methodology for criticality analysis; preliminary thermal, structural, and shielding analyses; fabrication of containment barriers; analyses of closure; and conceptual design and selection of materials for tunnel floors. Long-term corrosion tests, which will be used to refine waste package material selection, continued. Using data provided by producers and custodians of Government-managed nuclear materials, we factored data provided by producers and custodians of Government-managed nuclear materials into waste package and repository design and performance assessment modeling.

#### ***We propose amendments to repository siting guidelines***

Since we published our repository siting guidelines in 1984, Congress has narrowed the search for a repository site to Yucca Mountain, and we have gained a more sophisticated understanding of what is required to assess repository performance. On December 16, 1996, we published a Notice of Proposed Rulemaking in the *Federal Register* proposing to amend our siting guidelines to reflect the fact that only one site is under consideration and to streamline the determination of site suitability for repository development to focus on overall repository system performance, rather than on independent technical considerations of individual features of the site. This reflects our belief that judgments about the Yucca Mountain site should be based on the site's ability to protect public health and safety and the environment as measured by overall system performance.

On January 23, 1997, we held a public hearing on our proposal in Las Vegas, Nevada. We twice extended the public comment period, to a total of 151 days.

#### ***Regulatory and oversight bodies play key roles***

**Nuclear Regulatory Commission.** To prepare for licensing proceedings, we continued our twice-yearly, comprehensive briefings to the NRC and our frequent interactions with Commission staff. Reflecting the increasing importance of total system performance

assessment, the focus of our interactions shifted from past years' concern with how individual features of the repository system will perform in isolation, toward the goal of achieving a common understanding of the issues important to overall repository performance and of the adequacy of proposed methodologies and approaches to key technical issues.

**Nuclear Waste Technical Review Board.** The Board continued to actively oversee our work, holding three Full Board meetings to discuss a range of issues related to our program. The Board's panels met as well. The Board's March 1996 *Report to the U.S. Congress and the Secretary of Energy* presented recommendations on issues related to interim storage, standardization of waste canisters to be used in the waste acceptance and transportation initiative, and technical aspects of the repository system. Our October 1997 response to the Board's recommendations addressed our consideration of repository design alternatives, construction of the cross-drift above the Exploratory Studies Facility, and the use of peer review in expert elicitations.

#### ***Work resumes on the environmental impact statement***

In Fiscal Year 1996, budget cuts forced us to suspend our work on the environmental impact statement that will, if the Yucca Mountain site is found suitable, accompany the Secretary's site recommendation to the President. In Fiscal Year 1997, we prepared a summary of the public comments we had received during scoping hearings. The summary includes responses that indicate how we plan to approach issues but do not constitute a formal agency position. The comments fell within four categories: transportation, repository performance, legal issues, and policy issues, with transportation drawing the most concern.

We also began to prepare the draft environmental impact statement that will be published in Fiscal Year 1999. An Executive Committee, which consists of Departmental Secretarial Officers, and a Management Council, which includes representatives of the Office of Environmental Management with responsibility for Government-managed nuclear materials, are helping us guide development of the statement and ensure coordination within the Department.

## Waste Acceptance, Storage and Transportation Project

### *Policy debate and litigation continue*

Throughout Fiscal Year 1997, congressional debate over interim storage legislation continued. The Administration's position remained constant: any decision about interim storage should be based on objective, scientific criteria and should be informed by the results of the Yucca Mountain viability assessment. The Nuclear Waste Technical Review Board stated its belief that a primary centralized interim storage facility should not be sited at Yucca Mountain until the site's suitability for a repository has been determined.

In July 1996, the U.S. Court of Appeals for the District of Columbia Circuit held that the Department has an obligation to commence spent nuclear fuel disposal by January 31, 1998, but stated that it was premature to address the remedy available because the Department had not yet failed to meet its obligation. On December 17, 1996, the Department notified holders of the *Standard Contract* that it did not expect to be able to start accepting spent nuclear fuel by January 31, 1998, and it solicited their views on how best to accommodate this delay. Soon after his confirmation, in April 1997, the Secretary met with utility executives to discuss options for addressing the Department's delay in spent nuclear fuel acceptance. However, no agreements were reached. In January 1997, a coalition of utilities and a coalition of State agencies filed a petition for the court to issue a writ of mandamus enforcing its earlier decision and compelling the Department to begin accepting spent nuclear fuel by January 31, 1998.

While litigation proceeded, the Department explored with some contract holders how it might alleviate the impacts of a delay on a case-by-case basis, by modifying individual contracts under clauses of the *Standard Contract*. Under existing delivery schedules, 14 of 59 contract holders have 1998 delivery dates.

On November 14, 1997, the U. S. Court of Appeals for the District of Columbia Circuit concluded that "the remedial scheme of the standard contract offers a potentially adequate remedy." The court did not direct the Department to start accepting waste on January 31,

1998, nor did it allow contract holders to escrow Nuclear Waste Fund payments until waste acceptance begins. It did issue a writ precluding the Department from excusing its failure to accept waste on the grounds that it had not yet established a permanent repository or an interim storage program.

In December 1997, the Department filed a petition for rehearing, arguing that the D.C. Circuit Court lacks jurisdiction to decide the adequacy and appropriateness of contractual remedies, since such issues are committed to the Court of Federal Claims. In February 1998, State regulators and utilities petitioned the court on several issues. They asked the court to bar the Department from using the Nuclear Waste Fund to compensate utilities, authorize utilities to escrow their fee payments, order the Department to file a plan for immediately beginning spent nuclear fuel disposal, and appoint a Special Master to oversee the Department's activities. On May 5, 1998, the court denied the Department's December 1997 request for a rehearing and the February 1998 petitions filed by the States and utilities.

As of May 31, 1998, no utility has sought the contractual remedy the court discussed in its November 1997 opinion, which would require the Department to process claims pursuant to the *Standard Contract*. Two utilities, however, have filed claims in the Court of Federal Claims for partial breach of contract.

In an attempt to end the litigation, on May 18, 1998, the Department proposed a settlement for utilities that have standard contracts with the Department. The Department proposes that utilities limit Nuclear Waste Fund payments to the proportionate share of fees needed to administer the civilian radioactive waste program. The remaining portion of the fee, normally paid quarterly, would be postponed until the Department is ready to accept spent nuclear fuel. A utility would remain obligated to pay the withheld fees, with interest at the Treasury rate, when receipt of spent nuclear fuel begins. Until then, a utility would be able to invest the withheld funds at higher interest rates and use the extra earnings to pay for its costs resulting from the contract delay. The Department estimates a benefit of approximately \$2.8 to \$5 billion to all utilities. The utilities, through the Nuclear Energy Institute, contend that the proposal is inadequate because it does not provide a mechanism for the Department to meet its

obligation to accept spent nuclear fuel and does not directly provide funds for continued on-site storage.

***We pursue only contingency planning for interim storage***

In accordance with congressional and Administration direction, we maintained capability to develop a centralized interim storage facility if one is authorized and sited. On May 1, 1997, we submitted to the NRC a Topical Safety Analysis Report for a non-site-specific facility that would handle canistered commercial spent nuclear fuel using commercially available storage-and-transportation casks. We expect that the Commission will complete its review of the report in late 1998. This work could support preparation and review of a Topical Safety Analysis Report for a specific interim storage site, if one is designated.

***We prepare to acquire waste acceptance and transportation services***

Acceptance and transportation of commercial spent nuclear fuel to Federal facilities will require a nationwide shipping campaign that must run smoothly for decades. In Fiscal Year 1996, we determined that, rather than develop a Federal capability to accept and transport this spent nuclear fuel, we would take advantage of private sector technical and management capabilities. To acquire the necessary equipment and services from commercial vendors, we designed a procurement approach that will stimulate the market to develop the equipment and services we need and that will foster competition and innovative approaches. This procurement will also involve managing the potentially significant market risks and uncertainties that both vendors and the Department will face.

To develop an approach that will attract vendors and serve the government's best interests, we have consulted with private sector vendors and other program stakeholders. On December 27, 1996, we published a draft Request for Proposals in the *Federal Register*, inviting public comment. On February 25, 1997, we held our second presolicitation conference, announced in the *Federal Register* and *Commerce Business Daily*, in Washington, D. C., to solicit stakeholder views on technical and contractual issues. Approximately 1,000 comments received from the attendees and other stakeholder organizations helped us

prepare a revised draft Request for Proposals which was published on November 24, 1997.

***We revise our proposed policies and procedures for training and technical assistance***

Section 180(c) of the Nuclear Waste Policy Act mandates that the Department provide funding and technical assistance to States and Native American Tribes for training of public safety officials in jurisdictions along transportation routes. We have been working closely with many parties for many years to resolve issues related to eligibility for and timing of grants and the definition of activities allowable under the Act. On July 17, 1997, we published a Notice of Revised Proposed Policy and Procedures in the *Federal Register* inviting comments through September 15, 1997. Based on those comments another Notice of Proposed Policy and Procedures was published in the *Federal Register* on April 30, 1998.

***We prepare to accept Government-managed nuclear materials***

Under current planning assumptions, four categories of Government-managed nuclear materials are destined for disposal in the repository: DOE spent nuclear fuel and high-level radioactive waste, managed by the Office of Environmental Management; surplus weapons-grade plutonium waste forms, managed by the Office of Fissile Materials Disposition; and Naval spent nuclear fuel, managed by the Office of Naval Reactors. We have been working with the Offices of Environmental Management and Naval Reactors to develop memoranda of agreement that will govern the logistical, technical, financial, and administrative aspects of the process by which their nuclear materials will be transferred to our custody. In Fiscal Year 1997, we further defined respective roles and responsibilities.

From those offices and the Office of Fissile Materials Disposition, we obtained information that we need for waste package design, performance assessments, and analyses for the repository environmental impact statement. To facilitate close coordination, liaison personnel from the Office of Naval Reactors and the Idaho Engineering and Environmental Laboratory National Spent Nuclear Fuel Program were stationed at the Yucca Mountain Site Characterization Office.

We worked to further integrate DOE and Naval spent nuclear fuel, already in the program baseline, into waste management system planning. We conducted an assessment of the impacts of incorporating proposed surplus weapons-grade plutonium waste forms into the baseline, and we determined that impacts would be manageable and acceptable. We initiated a change proposal to modify the baseline accordingly.

### Program Management

OCRWM's Director, Daniel A. Dreyfus, the third permanent Director of our program, resigned effective January 18, 1997. Lake H. Barrett, Deputy Director, was appointed Acting Director, the ninth person to hold the position since the program's inception in 1983.

Our Fiscal Year 1997 appropriation further reduced funding for program management and administration. Actual dollars shrank by almost 50 percent from Fiscal Year 1995 to Fiscal Year 1997. The consequence was a major, continuing challenge to adapt to budget cuts and manage with greatly reduced contractor support, while preserving the integrity of our work.

We completed the organizational realignment we had begun in 1996 to better carry out congressional direction, restructuring our organization and narrowing work scope, and we strengthened our ability to direct and monitor activities across the program. The award in February of a new management and technical support services contract contributed to better program integration. Consolidating quality assurance efforts under one existing contractor strengthened the independence of quality assurance, yielded more consistency in its application, eliminated redundancies and excessive infrastructure, and reduced costs.

A task team was formed to develop the safeguards and security program policy required for successful design, licensing, and operation of the repository. The Offices of Environmental Management and Naval Reactors will participate in this effort.

Preparing for formal implementation of the Government Performance and Results Act of 1993, we developed a preliminary draft *OCRWM Program Plan, Revision 2*, that will integrate and directly link OCRWM and departmental plans and milestones. Programwide, our advanced information technology

applications were in routine use, offering ready access to data bases of higher caliber, promoting greater efficiencies and sounder management processes, and reducing overall program costs. Benefits included the ability to learn more quickly about policy, legislative, technical, scientific, and institutional matters and to respond more quickly and fully to congressional and other requests for information.

We issued the annual report on fee adequacy in October 1996. It found the fee paid by utilities to be adequate to cover the full costs of the program, based on the 1995 total system life-cycle cost estimate. We began work for a 1998 estimate that will use cost estimates prepared for the Yucca Mountain viability assessment and will reflect changes that Congress has directed in the program, advances in repository and waste package design, and improvements in performance assessment.

### Conclusion

Under the Nuclear Waste Policy Act, the year 1998 was to mark the start of repository operations. That milestone is now scheduled for 2010, but the year 1998 is acquiring new significance. As a result of work performed under our revised program approach, the elements of the viability assessment are converging in what will constitute the first major assessment of the prospects for geologic disposal at the Yucca Mountain site since the 1987 amendments to the Nuclear Waste Policy Act directed us to characterize only that site.

Completion of the main loop of the Exploratory Studies Facility, findings from scientific studies conducted in that facility, advances in design and related cost estimates, rigorous peer review of total system performance assessment and greater reliance on expert elicitations—all are contributing to comprehensive documentation that the Administration and Congress can use in directing our program.

OCRWM's restructured program has now been tested, under demanding conditions, over the course of 2 years, and it has proved sound. Our management structure is leaner and stronger; our program controls are better integrated; our information systems are more responsive; and our technical work is more focused. Given adequate funding, staff, and stability, we can continue to do quality work, on schedule—moving steadily closer to an operational waste management system.

# Introduction: Why This Program Matters

## What Is the Extent of “the Waste Problem”?

Decisions made decades ago to pursue a nuclear weapons program and develop nuclear energy for civilian use committed the Nation to perpetual custody of a large and growing inventory of radioactive materials. The potential risks posed by these materials demand continuous, responsible long-term management.

capacity and will need additional storage. Based on current projections, by 2035, when the last of the existing 118 commercial power reactors completes its initial 40-year license period, spent nuclear fuel containing a total of about 87,000 MTU will have been generated.

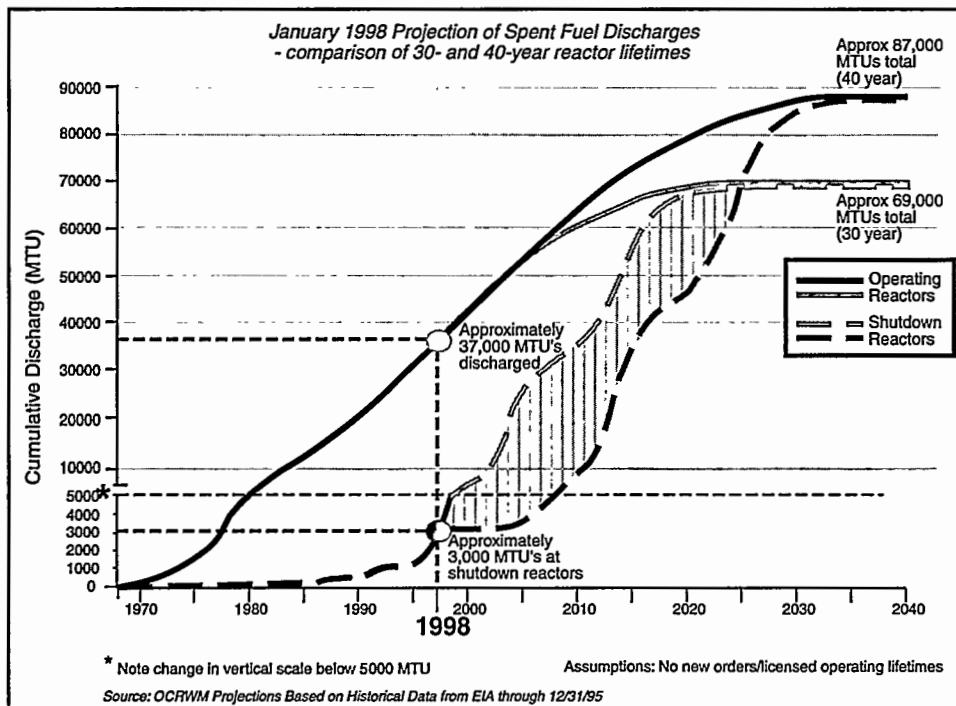
Most Government-managed nuclear materials destined for geologic disposal result from atomic energy defense activities; others are of commercial origin but are now

under DOE management.

They primarily include DOE spent nuclear fuel from weapons production, domestic research reactors, and foreign research reactors; high-level radioactive waste from reprocessing spent nuclear fuel; surplus weapons-grade plutonium; and Naval spent nuclear fuel. Chapter Three provides detailed information on these materials.

## What Is at Stake?

With large and growing inventories of nuclear materials requiring safe, permanent disposal, large interests ride on OCRWM's work:



Projection of Commercial Spent Fuel Discharges

As of December 31, 1997, spent nuclear fuel containing approximately 37,000 metric tons uranium (MTU) was stored at 72 commercial power reactor sites and one storage site in 33 States. Of the 118 reactors at these sites, 107 were operating and 11 were shut down. Of the shut-down reactors, 8 were at sites that were completely shut down and awaiting decommissioning. Nine operating commercial power reactor sites have exhausted their existing storage pool capacity and added on-site dry storage; others are approaching full

- There are mounting inventories of spent nuclear fuel at nuclear utility sites.
- Orderly operation of the nuclear reactors that supply 20 percent of the Nation's electricity rests on NRC licensing, which in turn relies on a waste-confidence decision review that the NRC conducts every 10 years to assess the prospects for timely disposal of commercial spent nuclear fuel. Without progress toward a repository,

continued reactor operations and license renewals could be jeopardized.

- Economic conditions could accelerate the shutdown of some nuclear power reactors, leaving the utilities that own them responsible for maintaining custody of their spent nuclear fuel until the Federal Government can accept it.
- A geologic repository is on the critical path for the accelerated environmental cleanup of numerous DOE sites around the country. That cleanup serves not only an environmental, but a fiscal goal: reduction of the huge mortgage costs that are the legacy of the Cold War.
- The Navy needs to dispose of its spent Naval reactor fuel to ensure the continued operation of its nuclear-powered fleet. Currently stored in Idaho under a consent agreement with the State, the fuel must be removed from the State by 2035.
- Internationally, permanent geologic disposal is the consensus position on management of commercial spent nuclear fuel. The Administration fully maintains our Nation's commitment to this position, which is the technical foundation for our international policy on nuclear non-proliferation. That policy assumes that fuel originating in the U.S. and used in foreign research reactors will be disposed of in the U.S. repository, and it undergirds our advocacy of limiting the international trade in weapons-grade nuclear materials.
- Finally, in an unstable world, a grim reality drives the consensus position: the longer that weapons-grade plutonium remains above ground, the greater the risk that terrorists will divert some of it and use it to fabricate nuclear devices. Even one crudely made "dirty" bomb could cause catastrophic damage. The U.S. commitment to permanent disposal clearly signals our larger commitment to the stringent nuclear safeguards and security that we want to promote worldwide.

## **What Have We Achieved to Date?**

The "waste problem" presents a unique and daunting set of challenges: (1) the complexities of managing a large project in a Federal setting subject to multiple regulatory, planning, and reporting requirements, stringent oversight, changes in congressional direction, and fluctuations in funding; (2) the uncertainties associated with operating on a scientific frontier; (3) the need to integrate an unusually broad array of scientific, technical, and managerial disciplines; (4) the demands of a complex licensing proceeding; and (5) the political sensitivities of carrying out an inherently controversial mission.

Over the past 15 years, many Congresses, several Administrations, regulatory and oversight bodies, diverse stakeholders, OCRWM's own staff and contractors, and other program participants have worked steadily toward the goal of geologic disposal. Today, more than 50 years after nuclear weapons were first developed and 40 years after the first commercial nuclear power reactor was built, the United States is closer to solving its waste problem than any other nation on earth. A measure of the U.S. achievement is the fact that officials from the nuclear waste management programs of other nations continue to look to the U.S. program as a model for their own efforts. Among our valuable assets are the following:

- The Nuclear Waste Policy Act of 1982, as amended, which codified the commitment of the Federal Government to solve "the waste problem" and created a financial mechanism to pay for the solution.
- A promising potential repository site at Yucca Mountain.
- A recently completed underground laboratory at the site that provides direct access to the proposed repository rock formations.
- An increasingly sophisticated body of scientific, engineering, and performance assessment expertise needed to (1) design site investigations that yield needed data, (2) design facilities tailored to the site and NRC licensing, and

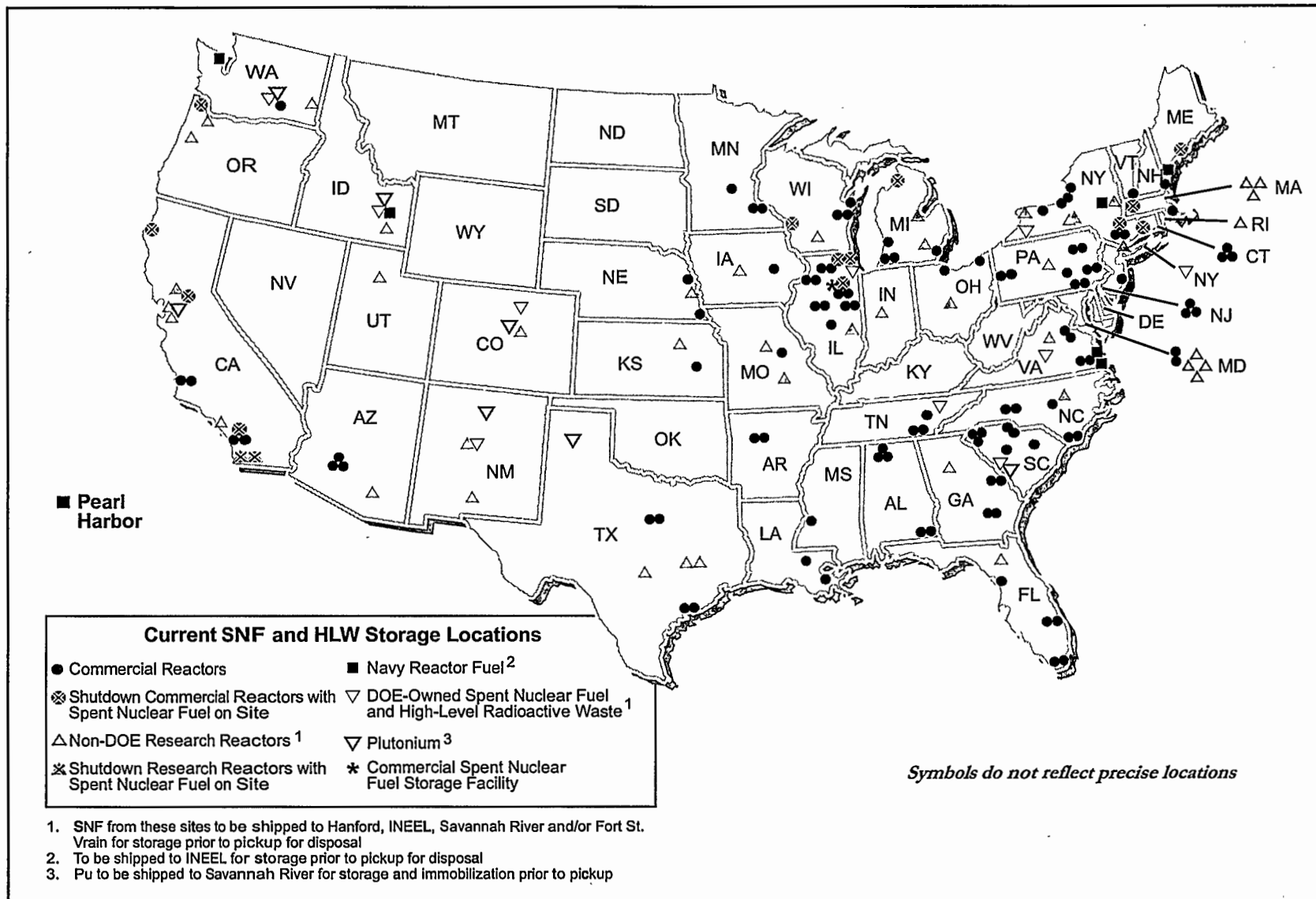
(3) couple data generated from site investigations with design, to develop models simulating the performance of the repository under a range of conditions over thousands of years.

- The regulatory expertise to prepare for a complex licensing proceeding that could take at least 3 years, and the firm foundation for licensing that results from years of work by DOE and the NRC to align their approaches to technical and procedural matters.
- A sound and tested strategy and program plan, and the mature program infrastructure and seasoned managers that can integrate the work of scientists, engineers, performance assessment modelers, and regulatory experts.
- Extensive knowledge, gained through years of Departmental and commercial experience, of the

technical, institutional, contractual, and logistical requirements of creating a nationwide system to safely transport radioactive waste.

- The long-standing and productive working relationships with oversight bodies, the larger technical and scientific communities, and a host of stakeholders that can help earn public acceptance for OCRWM's program.

As Fiscal Year 1997 ended, the benefits of years of effort were converging in the viability assessment that will give policy makers comprehensive, timely information about the prospects for repository development at the Yucca Mountain site. That assessment will also move the program closer to a definitive determination of site suitability and—if the site proves suitable—on to a site recommendation and the world's first licensing proceeding for a deep geologic repository.



Locations of Spent Nuclear Fuel and High-Level Radioactive Waste Destined for Geologic Disposal



# Chapter One

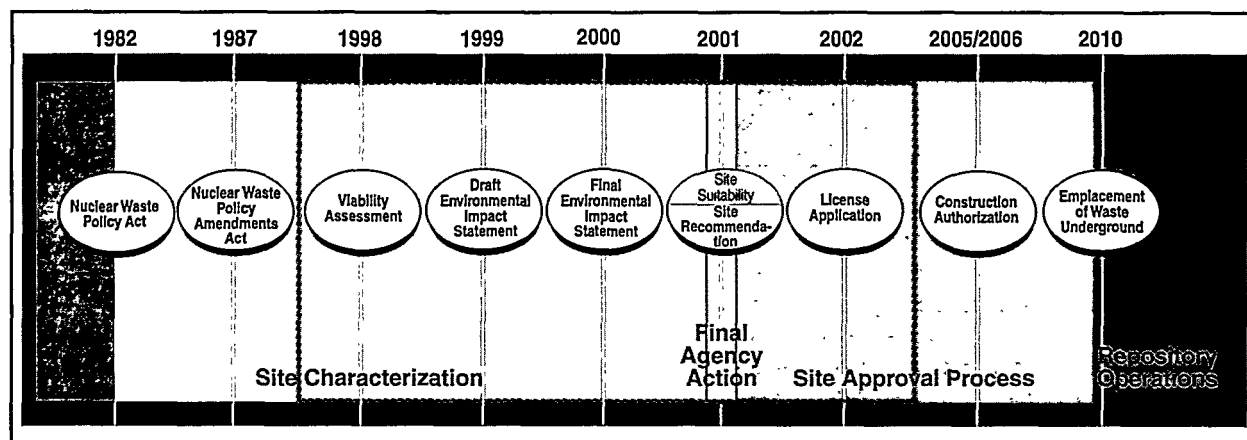
## Yucca Mountain Site Characterization Project

### Overview

In the Department's Fiscal Year 1997 appropriation, Congress endorsed our approach to site characterization and our plans for a viability assessment, specifying the components of the assessment and directing us to complete it by September 30, 1998. Congress also authorized all the funding for the Yucca Mountain Project that we requested—an increase of \$75 million over the prior year's \$250 million.

on an environmental impact statement. Coordinating closely with producers and custodians of Government-managed nuclear materials, we worked to factor data about those materials into waste package designs, performance assessments, and environmental impact statement analyses.

In addition to preparing the plan for developing a license application that is required for the viability assessment, we prepared a more-detailed, long-range licensing plan that includes a schedule, supporting



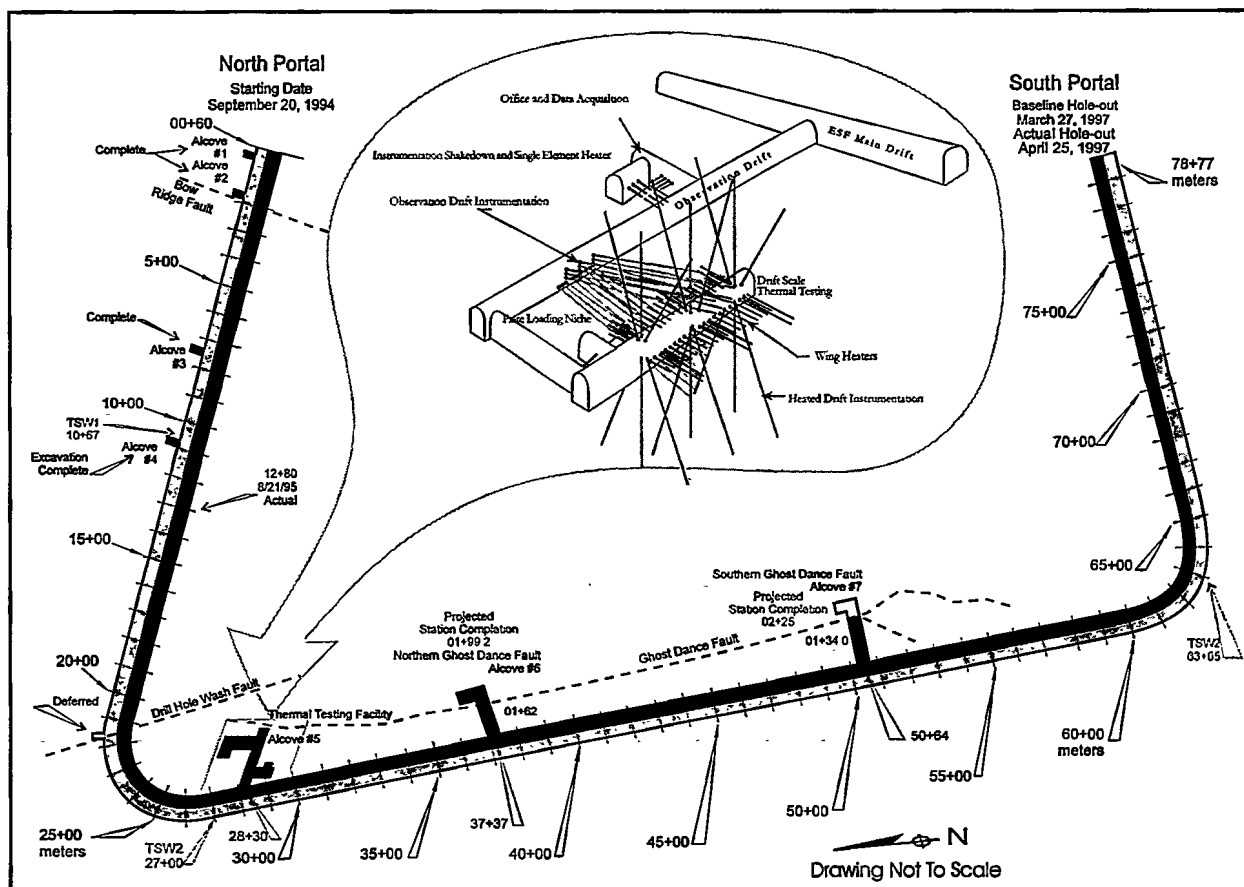
Schedule and Steps for Potential Repository Development

In keeping with congressional direction and our revised *Program Plan*, we focused on key issues related to the viability assessment and determination of site suitability. We completed the main loop of the Exploratory Studies Facility, acquired valuable data from scientific investigations, refined designs for the repository and waste package, launched a concerted effort to increase the transparency and technical validity of total system performance assessment, proposed amendments to our siting guidelines, and resumed work

schedule logic, and milestones. This plan will guide our daily work if Congress continues to support development of a repository at the Yucca Mountain site and the site is determined to be suitable. The schedule for potential repository development is depicted below.

### The Project Meets a Pivotal Milestone

On April 25, 1997, we completed the 31-month excavation of the main loop of the underground



Exploratory Studies Facility

Exploratory Studies Facility. The event was of pivotal importance to the success of site characterization because this underground laboratory gives scientists direct access to the proposed repository block, enabling them to gather data that can be used to model the natural processes at the site. The models, in turn, are used to design the repository and waste packages and for assessments of the likely performance of the repository system that will support key decisions leading to and through licensing.

While scientists had been conducting underground studies in the portions of the facility already excavated, completion of the main loop gave them access to critical underground portions of the site, such as the Ghost Dance Fault, and enabled them to collect important data on movement of water and thermal stress effects within the host rock. They used these data to verify data obtained earlier from surface-based

testing, strengthening predictions of the performance of a repository at the site scale.

Successful and timely completion of the main loop and of several test alcoves maintained our schedule for proposed repository development. It met a commitment made in the Secretary's Performance Agreement with the President for Fiscal Year 1997, and it met several milestones in our revised *Program Plan*. Completion of the loop also brought the Yucca Mountain Site Characterization Project the Secretary of Energy's first *Pride Award*.

#### *A custom-built machine performs well*

The 8-kilometer (5-mile) main loop was excavated with a tunnel boring machine 7.6 meters (25 feet) in diameter. Designed to meet scientific and regulatory requirements, this \$13 million machine has features not

normally found on commercial equipment, including a large mapping gantry. The machine tunneled through varied geologic units and several faults. During Fiscal Year 1997, its average tunneling rate was 73 meters (240 feet) per week, and excavation set an industry record for a single day's advance for a machine this size despite encountering large areas of blocky ground adjacent to these faults. Most important, our safety record in constructing the facility exceeded the mining industry's safety performance.

With the main loop completed, the tunnel boring machine was removed and made available for sale through the General Services Administration.

Because the main loop runs along the eastern side of the potential repository block and would provide access to it if a repository is constructed at the site, the tunnel was engineered to standards appropriate to the planned lifetime of the repository. Consequently, internal ground support extended the full length of the tunnel, far exceeding typical industry practices. While this increased costs, costs declined as we gained experience. The direct cost of tunneling the main loop totaled \$123 million for Fiscal Years 1994-97. To increase efficiency and reduce the costs of site characterization and potential repository construction, we are applying the lessons learned from excavating the main loop to our planning for the cross-drift (a smaller-diameter, shorter tunnel), described below, and for excavation of emplacement drifts for waste packages.

***We excavate more alcoves and niches to use for studies***

While studies had been conducted in test alcoves within the Exploratory Studies Facility for several years, in Fiscal Year 1997, two primary test alcoves and niches were completed, and a third alcove was nearing completion. The Ghost Dance Fault is a major geologic feature just outside the eastern boundary of the repository block. The Northern and Southern Ghost Dance Fault Alcoves intersect it. Hydrologic niches enable project scientists to investigate how moisture



Test Alcove

moves through the repository block. The start of hydrologic testing in these alcoves met a milestone in our revised *Program Plan*.

The final phase of the Thermal Test Facility (Alcove 5) was completed in March 1997. This alcove is the location for the single-heater and drift-scale heater tests described below.

***We accelerate plans for a smaller-diameter cross-drift***

To better understand site processes and reduce uncertainties about site suitability and repository construction, we planned an integrated construction and testing program. The underground component of this program will consist of alcoves, niches, and a drift that crosses above the repository block; the surface component will consist of two deep boreholes.

The Nuclear Waste Technical Review Board had recommended that data from an east-west drift be included in a determination of site suitability. Although our original plan to construct a cross-drift in Fiscal Year 1999 supported our milestone for site recommendation, we chose to accelerate this effort by scheduling it for Fiscal Year 1998. On July 18, 1997, we provided the Board with an interim planning report on this initiative.

To determine the optimal configuration of the cross-drift and surface boreholes, we prioritized data needed to determine site suitability and selected the cross-drift configuration that would yield the most high-priority data. Top priority was assigned to understanding the vertical variability of the hydrologic character of the Topopah Spring unit. We concluded that the drift should traverse the repository block from northeast to southwest, to provide the information needed. This configuration will (1) give us access to areas underneath zones that are infiltrated, variously, by high and low levels of moisture from the surface; (2) intersect the Solitario Canyon Fault where the displacement and complexity of faulting should be optimal for study; (3) traverse all geologic subunits included in the potential emplacement horizon; (4) provide an opportunity to directly observe variations in north-to-south fracture characteristics; and (5) allow access to the Calico Hills formation at a later date, if warranted.

By further reducing uncertainties about the site, testing conducted in the cross-drift will help us better understand processes critical to site suitability and possible repository construction. We plan to use observational data gathered from within the drift to support the viability assessment.

## **Work Proceeds on the Viability Assessment**

### *What the viability assessment will tell us*

Assembling the viability assessment requires shaping the results of many years of work into documentation that clearly explains the site characterization project and the significance of the data we have acquired to date. The documentation will present the following:

- The preliminary design concepts for the critical elements of the repository and waste package, including a concept of operations that identifies appropriate available technologies.
- A total system performance assessment, based on the design concepts and available scientific data and analyses, that describes the probable behavior of a repository at Yucca Mountain

under a range of conditions and various design options, over thousands of years.

- An estimate of the costs to construct, operate, and close a repository, based on the preliminary design concepts.
- A plan and a cost estimate for the remaining work required to complete a license application.

The information we are assembling comes from multiple sources: (1) what we have learned from years of investigating the geologic features of and natural processes at the site, (2) laboratory testing, (3) work to develop designs for engineered barriers (the waste package and repository) compatible with the characteristics of the site, and (4) assessments of the performance of the total repository system—both engineered and natural barriers and the interactions between them. Performance assessments will be based on reasonable assumptions about the range of site processes and conditions, consistent with the available data and information.

The viability assessment will inform deliberations over future program direction and funding, by helping decision-makers in the Administration and Congress understand what kind of facility can be built in this specific geologic setting, how it would perform, what it would cost to develop and operate, and what work would have to be completed to continue the process laid out in the Nuclear Waste Policy Act for submittal of a license application, should the site be found suitable.

The viability assessment is also serving as a valuable management tool by further focusing scientific investigations and design work, advancing performance assessment, and contributing to preparation of a formal site recommendation and development of an environmental impact statement and a license application.

### *What the viability assessment will not tell us*

While the viability assessment will be a valuable product, it alone cannot support a go/no-go decision by the Department on repository development. To

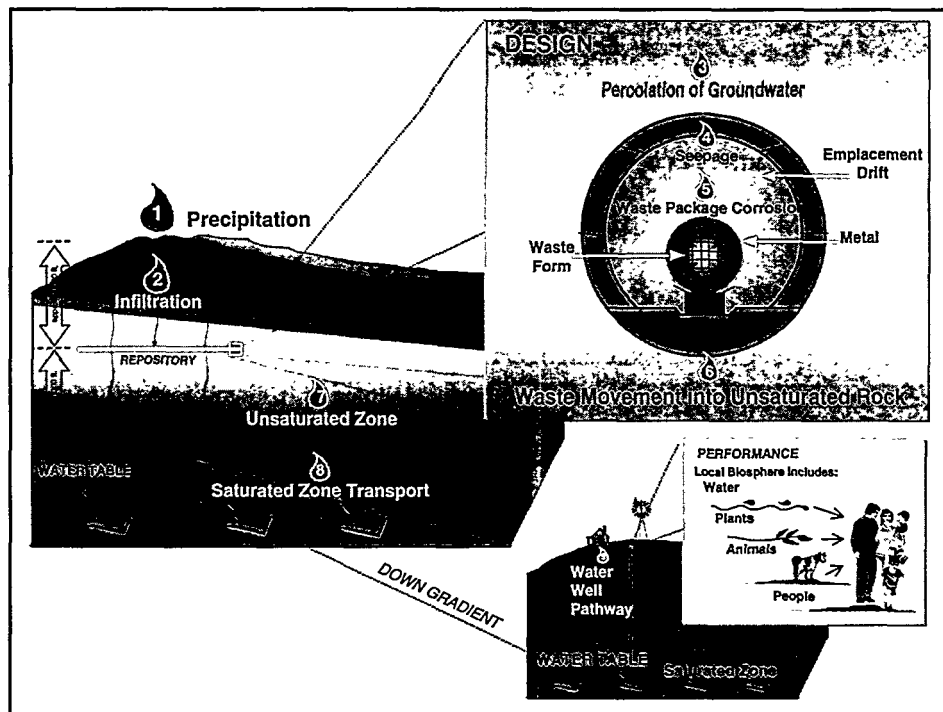
determine the suitability of the site for recommendation to the President, more information will be needed from scientific investigations. And as required by the National Environmental Policy Act (NEPA) and the Nuclear Waste Policy Act, we are preparing an environmental impact statement that will inform decisions made in the determination of site suitability and the site recommendation process. The environmental impact statement would accompany a site recommendation. To prepare a license application, still more scientific investigations and detailed design work would be needed.

In fact, the information we assemble for the viability assessment will point to the additional work needed to support the site recommendation process and prepare a license application. Similarly, NRC comments on the sufficiency of information in the viability assessment, including our approach to licensing, will be a valuable aid to us in preparing for a site recommendation and licensing.

### ***The role of confirmatory testing***

If the program proceeds to submittal of a license application, site investigations and analyses will continue throughout repository license review and, if the repository is licensed, throughout construction and operations. The Nuclear Waste Policy Act of 1982 and NRC regulations require a performance confirmation program that uses the results of continued testing to confirm the assumptions that are the basis for the safety case that will support our license application.

In Fiscal Year 1997, we developed a performance confirmation management plan that will guide that



Multiple Natural and Engineered Barriers Working Over the Millennia

testing program. The focus of testing will be determined largely by what the NRC says about the sufficiency of our site characterization work in its formal comments on (1) the environmental impact statement accompanying a site recommendation, (2) the site recommendation, and (3) the license application.

### **The Repository Safety Strategy Evolves**

The purpose of a repository is to dispose of wastes in a safe and environmentally protective manner. To accomplish this, the repository must contain radionuclides for many thousands of years. Our strategy for protecting the public and the environment relies on a combination of natural and engineered barriers to first contain radionuclides within waste packages and then to limit their release and transport.

The strategy is informed by what we have learned from years of studies, investigation of the site, and work done to develop the engineered system. Our understanding was enhanced by the total system performance assessment iterations completed in 1991, 1993, and 1995, and by considerable recent design work.

The strategy rests on working hypotheses that we can test to assess how a waste isolation system at Yucca Mountain will perform. Formulated from information that had already been collected about the site, they relate to specific attributes of the natural system, as well as to specific physical characteristics of materials that may be part of the engineered system, and to the important interactions between the natural and engineered systems. The hypotheses enable us to design the engineered barriers that can augment the features of the site in retarding radionuclide migration. Taken separately, the hypotheses provide the bases for organizing, managing, and explaining the rationale for the work that will lead to a determination of site suitability. Together, they constitute a conceptual framework for rigorously assessing the waste isolation capability of a repository at Yucca Mountain.

In Fiscal Year 1997, we refined the strategy we had issued in 1996 to take into account recent information on site conditions, new repository and waste package designs, updated performance models and predictions; and expected changes in the regulatory framework. The updated strategy relies on four assumptions that are expected to be the basis for the safety case that will support our license application to the NRC:

- The amount and distribution of moisture coming into contact with the waste packages will be limited.
- The period of radionuclide containment by the waste packages will be long.
- The rate of radionuclide release from the waste packages following loss of containment will be slow.
- The concentration of radionuclides in groundwater where compliance must be evaluated will be low, due to natural processes that delay transport or lower the concentration as a result of dispersion or dilution.

The strategy enables us to concentrate our efforts on a more limited testing program to answer questions about a small number of specific hypotheses that may be crucial to the viability assessment. Using our knowledge of the site, our designs for engineered barriers, and our understanding of sensitivities

indicated by total system performance assessments, we evaluated each of these assumptions and identified particular aspects of each that raise uncertainties that (1) are significant to a judgment about safety, and (2) can be mitigated through additional work. This information will shape our future testing, design, and analysis plans.

We presented briefings on the strategy to the NRC, its Advisory Committee on Nuclear Waste, and the Nuclear Waste Technical Review Board. The updated strategy, to be termed a repository safety strategy, will be issued in 1998.

## Scientific Studies Further Our Understanding of the Site

Congress directed us to focus on technical issues that must be resolved to determine site suitability. Our site investigations are designed to yield data that we can use to test the four basic assumptions of our repository safety strategy by modeling the contributions to the performance of the total repository system that would be made by each of the engineered and natural barrier systems.

### *What we studied in Fiscal Year 1997: focusing on open issues*

Site investigations are organized along lines of inquiry designed to further our understanding of individual and coupled natural processes at the site: for example, hydrological, geological, geochemical, and geomechanical processes related to stratigraphic zone stability and moisture migration under ambient and elevated temperature conditions. The lines of inquiry we pursued in Fiscal Year 1997 were the following:

- *Hydrologic studies:* percolation flux through the repository block, groundwater flow in the Yucca Mountain area, infiltration and percolation of precipitation, the characteristics of the aquifer, the presence of chlorine-36 at different locations, and the nature of groundwater chemistry
- *Geologic studies:* heterogeneity of the repository block and geologic structures such as faults and fractures, fracture frequencies, and fracture apertures

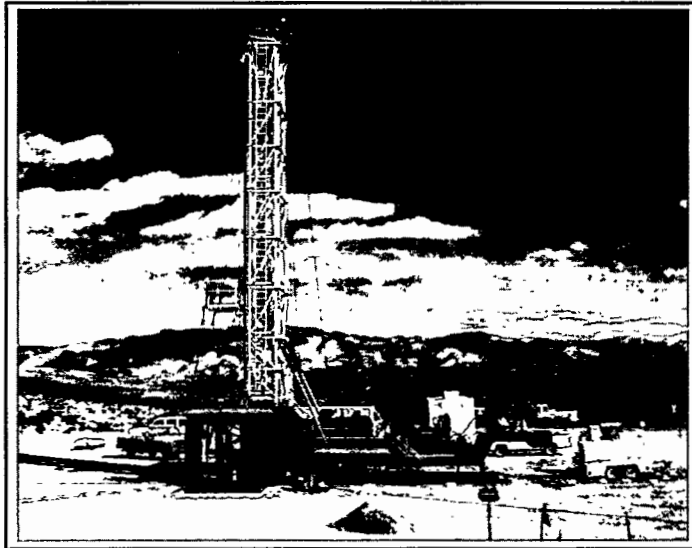
- **Geochemical studies:** effects of repository construction on natural barriers, effects of heat from waste packages and of water chemistry on the engineered barriers, and pathways and mechanisms of radionuclide transport through the natural barriers
- **Geomechanical studies:** in situ properties of the host rock, such as rock hardness, geologic structures, distribution of faults, and response of the host rock to stress and heat
- **Underground testing** focused on geologic, geomechanical, and geochemical data obtained in the Exploratory Studies Facility test alcoves and niches. With completion of the main loop of the facility, we were able to complete conversion of important test locations from construction sites to fully operational underground laboratories. Conversion of the main loop

### *How and where we gathered data*

Site investigations are also organized in terms of how and where we gather data. A variety of methods are used and, because the site is not homogeneous, *where* we gather data is important; we want samples and test data to be as representative of key features as possible.

During Fiscal Year 1997, field and laboratory data were collected from a variety of sources: surface and subsurface drilling operations, routine water-level measurements of monitor wells, aquifer pumping tests, laboratory analysis of water samples, and laboratory analysis of drilling cores. Once instrumentation for continuous tests was installed, to ensure data quality, scientists, engineers, and technicians engaged in around-the-clock maintenance, testing, data collection, and monitoring. Building on prior years' work, the testing program involved the following:

- **Surface-based testing** focused on obtaining a variety of hydrologic and geologic information from boreholes and surface access test locations. Field-scale studies of groundwater flow and radionuclide dilution and sorption are conducted at the C-well complex; water elevation and water chemistry properties are measured through a network of surface-drilled boreholes. Surface-based testing is important for determining the potential for transport of radionuclides in the saturated zone. A large-block thermal experiment, described below, is being carried out at Fran Ridge.
- **Off-site laboratory testing** focused on strengthening our understanding of the near-field environment that would surround the engineered barrier system. The question of how heat emitted by waste would affect radionuclide migration to the accessible environment was of key importance. Tests were conducted by scientists and technicians from the U.S. Geological Survey and several national laboratories, including



Strat-o-Master Drill Rig at the C-Well Complex

involved constructing and instrumenting one alcove for a long-duration, drift-scale thermal test; two alcoves for hydrologic and geologic tests in the Ghost Dance Fault; and two niches for a study of percolation flux. We also drilled many underground core and instrument test holes. From within the main loop, test alcoves, and niches, we observed key site features and collected critical site-specific data.

### **Water: Resolving a Key Issue for Site Suitability**

The repository's engineered barriers, together with the geologic features and natural processes of the site, must retard the release of radionuclides to the accessible environment for thousands of years. The likeliest medium by which radionuclides could be transported is water, and Yucca Mountain was selected as a candidate repository site in part because it is in an arid environment.

But over geologic time, will it be arid enough? Over thousands of years will enough moisture be present to corrode waste packages and transport radionuclides? How much water percolates through the mountain? By what pathways does it travel? How much might reach waste packages, and for how long could it be in contact with them? At what rate would it corrode them? How might water transport radionuclides to the accessible environment? In what quantities and concentrations? How fast?

The fact that so little moisture is present at the site makes the task of investigating it difficult, but we carefully pursue a number of inquiries, that together help us better understand this key issue:

- Infiltration and percolation of moisture from the surface of the site. We are determining quantities, rates, and variations through space and time.
- Chlorine-36, a product of atmospheric nuclear testing in the 1950's. We are determining what its presence in elevated concentrations in rock samples can tell us about preferential pathways by which water might travel.
- Ghost Dance Fault. We are investigating whether it offers pathways by which radionuclides can travel to the accessible environment.
- Thermal loading. Heater tests help us determine the optimal temperature for the repository at any given time and what the effects of heat are on the host rock, on moisture, and on waste package materials.
- Climate. We are examining how changes in future climate could impact the site.
- Hydraulic gradient. We are investigating the nature and implications of the steep gradient in the water table north of the proposed repository site.
- Radionuclide transport. We are investigating possible mechanisms and pathways.

What we learn about the potential for moisture at the site has consequences for waste package design, helping us determine what materials the waste package should be made of and how robust it should be. It also helps us evaluate other options for design of the waste package and of the area in which waste packages will be emplaced.

Using performance assessment, we can couple what we learn about the site with design assumptions to simulate repository performance over long periods of time.



Lawrence Livermore, Lawrence Berkeley, Argonne, Sandia, and Los Alamos. Tests examined the effects that heat may have on the basic behavior of moisture in the potential repository rock, on the chemical properties of water within the host rock, and on candidate waste package materials—and how those effects, in turn, might affect the performance of the engineered barrier system. Tests also examined how radionuclides might be transported through the natural barriers of the site.

### *Special focus: thermal studies*

Heat emitted by radioactive waste will affect rock mineralogy, rock mechanical properties, both rock and water chemistry, site hydrogeology, and, consequently, the repository's total performance. To determine the effects of cycles of heating and cooling, we designed three studies that use electric heaters to simulate heat emitted by high-level radioactive waste. Data are collected and analyzed as the rock heats up and are collected for analysis as the rock cools down.

The first study, a large-scale underground experiment, used a single heater approximately 5 meters (16.4 feet) long to heat a 25-cubic-meter (883-cubic-foot) volume of rock to a temperature of 100 degrees Celsius; more than 300 thermometers distributed throughout the test alcove are measuring the effects. We turned the heater on in August 1996 and off in May 1997. The test results provide unique preliminary data for

performance assessment calculations and technical guidance for conducting the third thermal study.

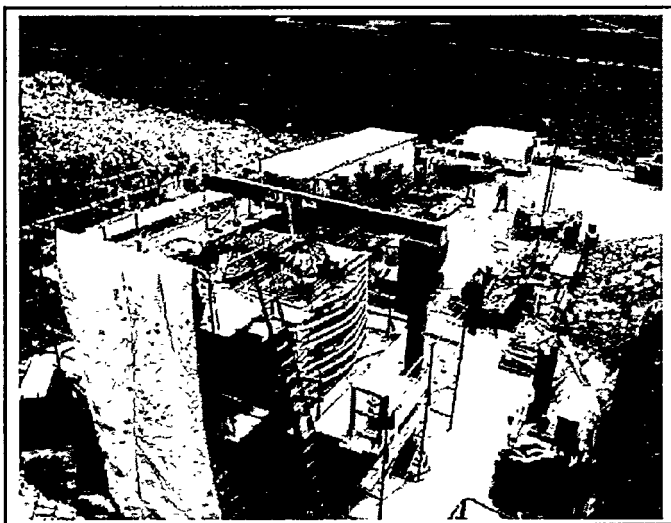
A second study involves heating a large block cut from a rock outcrop at Fran Ridge, the same geologic formation as the potential repository. This discrete above-ground block permits us to closely control and monitor the heater test parameters. The heater for this test was turned on in February 1997; the heating phase is scheduled to continue through the first quarter of 1998. Preliminary data have provided valuable information on water movement, evaporation, and condensation.

The third study, one thousand times larger in volume than the single-heater test, is the largest underground thermal test ever conducted. To provide information on a scale more representative of the repository, it will simulate a portion of an actual waste emplacement tunnel: the Thermal Test Facility, an alcove nearly 305 meters (1,000 feet) below ground and approximately 48 meters (157 feet) long, will be heated continuously over several years. The heat-up period is approximately 4 years; the cool-down period is approximately 4 years from the date the power is turned off.

In Fiscal Year 1997, we finished excavating the test alcove. Electric heaters were placed directly in boreholes drilled into the walls of the alcove and on the floor in canisters similar in dimensions and materials to actual waste canisters, and other test instrumentation was installed. A milestone in our revised *Program Plan* called for the heaters to be turned on in Fiscal Year 1997, but as planning evolved, it became apparent that the start-date should be rescheduled to December 1997 to accommodate a larger scope of work.

### *Collaboration and peer review*

We continued to collaborate with scientists at the Nevada Test Site to combine our three-dimensional, regional groundwater flow computer model with theirs. This collaboration will eventually result in a model that contains more data and can more accurately predict groundwater flow on and near the Nevada Test Site and Yucca Mountain.



Large Block Heater Test



Thermal Test Facility

We initiated a peer review of the results of laboratory analyses of chlorine-36 and other isotopes to ensure that our sampling, analyses, and data interpretation of groundwater pathways and associated percolation fluxes were consistent with the understanding of the scientific community outside the program. We continued to routinely seek reviews of project reports by experts who are not directly involved with the project, such as scientists from Atomic Energy of Canada Limited.

#### *What we learned in Fiscal Year 1997*

The scientific data we gathered significantly reduced uncertainties associated with the models and model predictions that will be incorporated into the total system performance assessment that will support the viability assessment. The data (1) increased our understanding of how water moves through the mountain and how heat affects its chemical composition, (2) increased our understanding of how surface infiltration influences percolation fluxes at the potential repository horizon, and (3) reduced uncertainty in modeling the natural processes that affect the engineered barriers and radionuclide transport.

We produced a report describing our current understanding of the coupled thermal, hydrologic, chemical, and mechanical processes likely to operate in

the repository and the surrounding rock environment. Using additional field data, we revised our integrated site model, which allows us to examine how geologic controls at the site could influence repository performance under varying conditions.

We identified future climate scenarios and completed water flow and radionuclide transport models for the saturated and unsaturated zones, thus meeting two milestones in our revised *Program Plan*. Model simulations predicted that if the climate at Yucca Mountain becomes significantly wetter in the future, the water table under the mountain could rise 60 to 150 meters, a level still well below the level of the proposed repository. Using the flow and transport models in conjunction with the future climate scenarios, we concluded

that the amount of precipitation that percolates beneath the layer of vegetation at the site may be higher in some places than previously estimated. The amount varies widely all over the mountain; the high end of the range for percolation rates is believed to be less than 20 millimeters per year; the average is believed to be less than 5 millimeters per year.

As we continue to gather more hydrologic and geochemical data from our site investigations, we will be able to further refine our radionuclide transport models.

Beyond the viability assessment, future site investigations will aim to further reduce uncertainties surrounding parameters with the greatest impacts on repository design and on the total system performance assessments that are needed to support a site recommendation, license application, and subsequent confirmatory testing.

### **Design Work Advances**

#### *Our approach to design*

In an optimal system, the natural barrier provided by the site itself and the engineered features of the repository together will achieve performance goals. The features and natural processes of the site are a given

that cannot be significantly modified, but engineered barriers, which include the waste package and underground and surface repository facilities, can be designed in many ways. Consequently, they offer many opportunities for increasing confidence in total system performance, and we employ a rigorous approach to design to ensure that we optimize them.

Considerations of safety, performance, operations, and cost and schedule control govern design. To achieve safety and performance goals, we rely on multiple physical barriers that possess diverse physical properties that would exhibit diverse failure modes over a wide range of repository conditions. To develop designs, we (1) identify and characterize potential design features, (2) systematically evaluate repository performance using combinations of those features, (3) select sets of features that together will exceed performance requirements, (4) assess uncertainties associated with each set by conducting analyses and sensitivity studies, (5) select an appropriate set, and (6) confirm that its expected performance has an adequate safety margin.

#### *The importance of examining alternatives*

Sound engineering proceeds by examining design alternatives, and NRC regulations require us to demonstrate consideration of design alternatives in our license application. Moreover, the Nuclear Waste Technical Review Board has recommended that we develop and examine reasonable design alternatives to achieve better repository performance. Accordingly, much of our design work involves trade-off studies that evaluate competing design alternatives.

To ensure that the waste management system will perform as intended and operate smoothly, its components must be closely integrated—a point that the Nuclear Waste Technical Review Board has long stressed. Systems studies are an essential tool for examining how a design change in one component of the system may affect others. By conducting design and systems studies, we methodically narrow and eliminate technical uncertainties associated with assumptions in the system's requirements baseline. The results support recommendations for design features that can improve repository performance, reduce cost, and accelerate schedule.

#### *Design as a dynamic process*

Throughout repository development, new information—from confirmatory testing, scientific and technological advances, operational and cost considerations, the demands of the licensing process, or other sources—will continue to arise. Accordingly, we are designing the engineered system to be flexible enough to accommodate changes warranted by new information and to permit consideration of alternative engineered components and design options that could enhance confidence in overall repository system performance.

We will continue to identify and evaluate different combinations of components and design options to determine their potential contribution to overall system performance, and design may evolve even after the repository has been licensed.

#### *Design work in Fiscal Year 1997*

Design work in Fiscal Year 1997 directly supported the viability assessment: we developed reference designs for the repository and waste package that will serve as the basis for cost estimates and total system performance assessment. The reference design will consist of the features and concepts that will provide us with a reasonable estimate of repository performance based upon the best available scientific, engineering, and cost and schedule analyses.

During the year, we investigated numerous design issues. Preparation of Phase I designs for the waste package and the repository surface and subsurface facilities included development of drawings, analyses, and documentation. Completion of these designs met a milestone in our revised *Program Plan* and kept us on track toward completion of the viability assessment.

#### *Coordination with producers and custodians of Government-managed nuclear materials*

Emplacing Government-managed nuclear materials in the repository requires analysis of how they might affect repository design and performance. At our Yucca Mountain Site Characterization Office, we worked closely with producers and custodians of those materials to obtain and analyze information needed for

waste package and repository design, performance assessment, and environmental impact analyses.

Those parties are (1) the Office of Environmental Management, which manages DOE spent nuclear fuel and high-level radioactive waste; (2) the Office of Fissile Materials Disposition, which manages surplus weapons-grade plutonium; and (3) the Office of Naval Reactors, which manages Naval reactor spent nuclear fuel. To facilitate close coordination, liaison personnel from the Office of Naval Reactors and Idaho Engineering and Environmental Laboratory National Spent Nuclear Fuel Program were stationed at the Yucca Mountain Site Characterization Project.

With the Office of Environmental Management, we planned a multi-year program that will enable us to smoothly manage our technical interface. Our work plan includes provision of specific data about the quantities and characteristics of their waste forms, which are needed for design and performance assessment; provision of data about the sizes and characteristics of bare and canistered spent nuclear fuel and high-level radioactive waste; and determination of how their waste forms will be received at the repository. Another important task is ensuring that decisions the Office of Environmental Management makes about how to package its spent nuclear fuel for near-term storage will be compatible with our long-term licensing requirements.

Our scoping analyses of the impacts on design and performance assessment of integrating proposed surplus weapons-grade plutonium waste forms into the waste management system supported a decision to prepare a formal change proposal to incorporate them into the baseline. We identified tasks needed to demonstrate that disposal of DOE spent nuclear fuel, high-level radioactive waste, and surplus weapons-grade

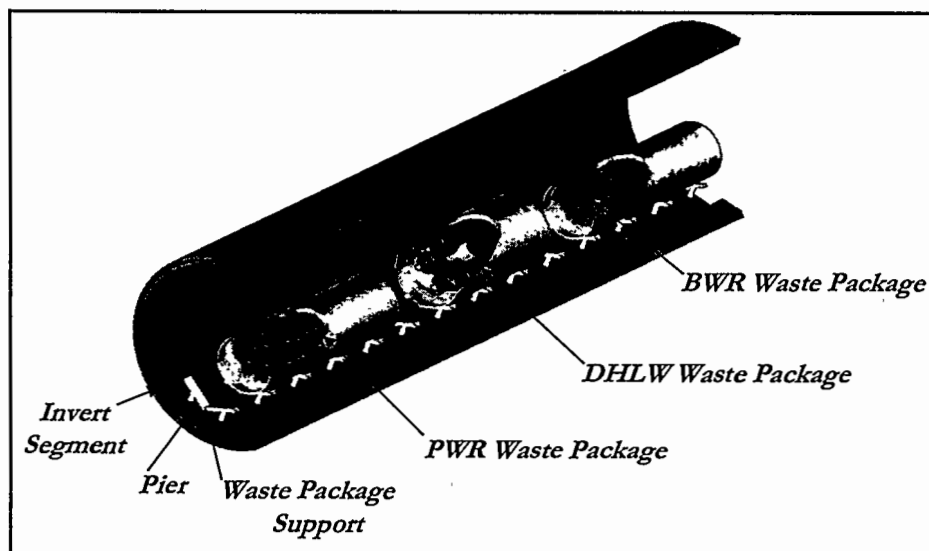
plutonium waste forms will meet NRC licensing requirements, and we began some criticality analyses to evaluate how these wastes might affect the repository system's long-term performance. Because criticality analyses for Naval spent nuclear fuel involve classified information, the Navy will perform its own criticality analyses and present them directly to the NRC.

Collectively, these efforts should ensure that the impacts of integrating these materials into the waste management system are well understood and adequately accommodated.

#### *Waste package design*

Under existing NRC regulations, the waste package must provide substantially complete containment of radionuclides for a period of 300-1,000 years. We are working toward a performance goal that would leave 99.9 percent of the waste packages intact after 3,000 years. In Fiscal Year 1997, waste package design efforts included the following:

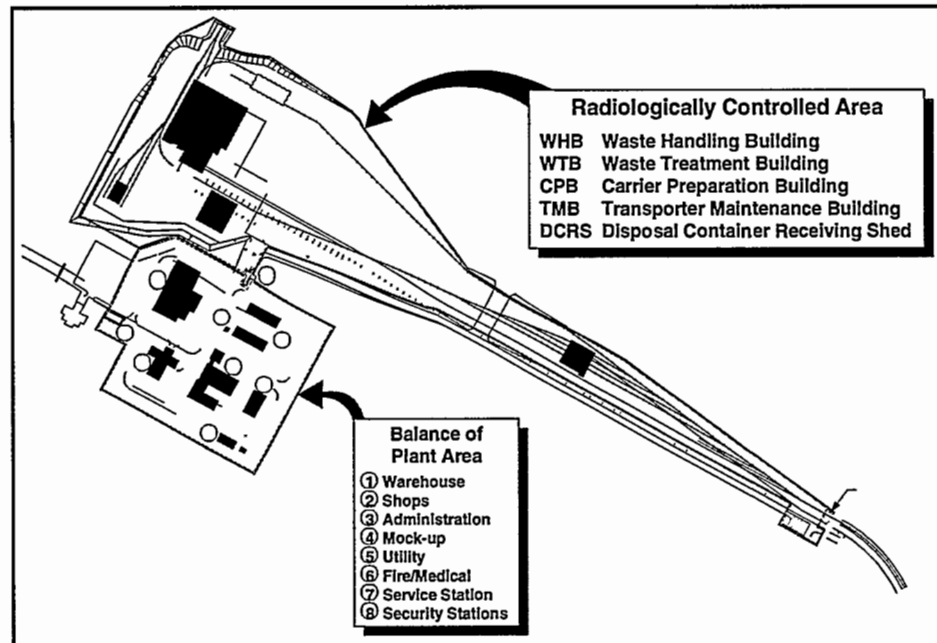
- *Corrosion/materials testing.* Materials for the waste package will be selected on the basis of their resistance to corrosion, cost, and ease of fabrication. To narrow the list of candidate materials and to reduce uncertainties associated with design, we continued to conduct corrosion tests and to model how well various materials might perform. The package is designed with a



Schematic of Waste Package

two-layer containment barrier. Materials tested for it included carbon steel and alloys of nickel, copper, and titanium; materials tested for the inner basket included borated stainless steel and carbon steel.

- *Commercial spent nuclear fuel.* Through a literature search, we compiled the dimensions and weights of the various types of commercial spent fuel assemblies. These data were used to confirm that the waste package cavity lengths and basket cell widths for uncanistered commercial fuel waste packages are satisfactory.
- *Determination of waste package design configuration.* An analysis was performed to determine the most cost-effective method for disposing of commercial spent nuclear fuel based on thermal and criticality goals. We found that to dispose of 100 percent of commercial spent nuclear fuel, more than one distinct type of waste package design is required.
- *Criticality studies* analyzed the criticality potential arising from the disposal of spent nuclear fuel. These studies narrowed the uncertainty in determining the probability of criticality for commercial spent nuclear fuel and determined what kinds of configurations will preclude criticality.
- *Additional barriers.* Analysis of the effects and benefits of including additional barriers as part of the waste package engineered barrier system considered options that included an integral drip shield, separate drip shield, and backfill.



Drawing of Surface Facilities

### Surface design

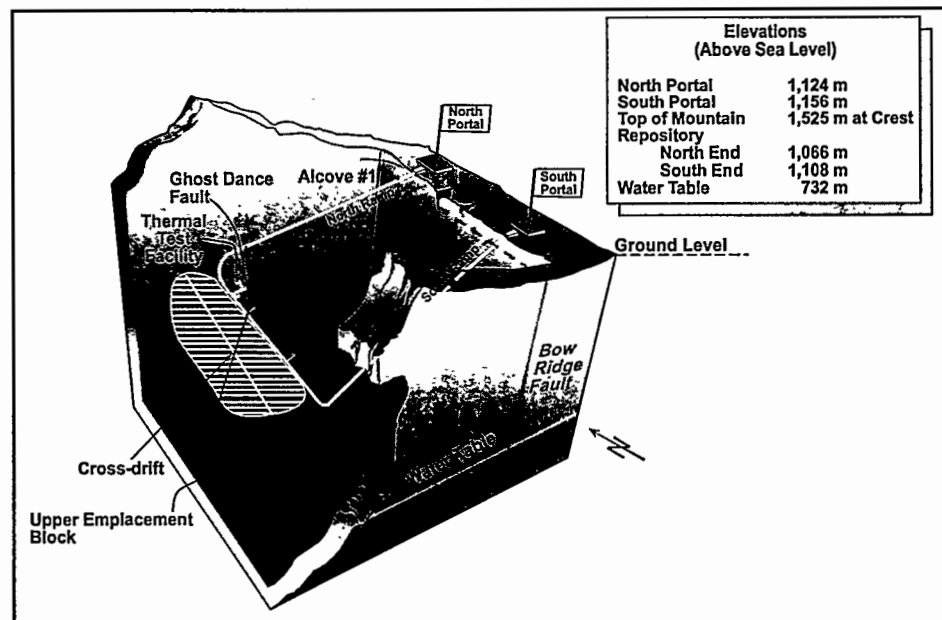
- *Site layout.* We developed a site layout that establishes the arrangement of the surface facilities, the yard, drainage and utilities. Evaluations of the Waste Handling Building, the Waste Treatment Building, and the Carrier Preparation Building included determining layouts, space and structural requirements, ventilation, and radiation protection requirements.
- *Waste handling systems.* Of major importance to repository operations are the waste handling systems, which will receive, transport, and prepare for emplacement very large casks and waste packages. The canister transfer system analysis identified the systems needed in the Waste Handling Building to remove disposable canisters from transportation casks, transfer them into disposal containers, and prepare them for transport to the underground repository. Analysis of the waste handling facilities also identified and evaluated potential operational failures in the waste handling surface facilities, and it recommended procedures and equipment needed for recovery operations.

- **Waste treatment system.** Within the Waste Treatment Building, the waste treatment system will include the primary systems required to process site-generated radioactive waste. An analysis defined the major equipment and sequence of movement required to process low-level radioactive waste.

operate on the surface of the site between the Waste Handling Building and the North Portal, and in the underground ramp, main, access, and emplacement drifts.

### Subsurface design

- **Repository capacity.** We defined the volume of rock mass that would be available for siting subsurface facilities, and we designed the subsurface layout and configuration of repository openings to accommodate the up-to-70,000 metric tons heavy metal (MTHM, a measure that includes uranium, plutonium, and thorium) that can be disposed of in the repository under current law. This layout offers the flexibility to modify design in order to take advantage of new information.
- **Ventilation and dust control requirements** were established, based on regulatory guidelines.
- **A Design Guide** was developed for designing ground support for emplacement drifts and openings, including requirements for the concrete mix for the emplacement drift permanent lining.
- **Waste package handling equipment and a viable handling concept** were developed for transport and emplacement of various waste package sizes. The waste emplacement system will transport loaded and sealed disposal containers from the surface Waste Handling Building to the waste emplacement area. This system will



Drawing of Subsurface Layout

- **Remote operation and control** of key subsurface waste handling and repository monitoring activities are required because of the high radiation fields and elevated temperatures near waste packages. Based on a series of preliminary design analyses and a review of available remote control technologies, several key concepts were identified for waste package emplacement and retrieval equipment and for performance confirmation. Methods for monitoring and controlling the operation of mobile equipment were identified.
- **Thermal loading.** Waste packages will emit heat, and the more densely they are emplaced in the repository the higher the temperature will be. The term *areal mass loading* refers to how densely they are emplaced, and is defined in terms of MTU per acre. High areal mass loading could reduce the repository's size and cost. The higher temperatures could keep moisture away from the waste packages for a longer period of time. However, as is usually the case in design,

there are trade-offs. To avoid design problems that could result from too high an areal mass loading, we established design limits in our thermal analyses that (1) prevent damage to the cladding on spent nuclear fuel rods, thus maintaining a barrier to the release of radionuclides; (2) protect the ability of zeolites below the repository block to absorb and retard the passage of some radionuclides released from the waste packages; and (3) prevent damage to the concrete-lined walls of the repository tunnels. We are still evaluating many aspects of thermal loading. In Fiscal Year 1997, our analyses determined the maximum areal mass loading that could meet all of the thermal goals outlined above. This determination produced the areal mass loading of 85 MTU per acre that is being used for the reference design for the viability assessment, and it confirmed that all related design goals could be met with a certain set of assumed parameters for drift diameters, drift spacing, and waste package spacings. Our analyses also showed that it is possible to place high-level radioactive waste between the waste packages containing spent nuclear fuel with a minimal impact on the design layout.

#### *Cost estimates*

The viability assessment will include an estimate of what it would cost to construct, operate, and close a repository based on preliminary design concepts. We developed a cost analysis report that presents the assumptions and format for this cost estimate; explains the estimating process, models, and techniques; and presents a life cycle cost estimate for a repository compatible with the design configuration documented for the reference design. The cost estimate covers the period beginning with submittal of a license application and reflects the cost to complete the repository and engineered barrier designs, to construct and operate the repository, and to close and decommission the repository.

#### *Systems studies: integration and closure*

Analyses of issues that involve waste acceptance, storage, and transportation functions, or that cut across the program, are conducted by our Program Management Center, as reported in Chapter Three.

Analyses limited to crosscutting components of the repository system are conducted by the Yucca Mountain Site Characterization Project. Analyses completed in Fiscal Year 1997 helped us further narrow options for the reference designs that will support the viability assessment.

- *Repository seals requirements.* We examined the need for sealing the shafts, ramps, and exploratory boreholes; determined what level of performance the sealing subsystem would have to achieve to meet certain regulatory requirements; and produced recommendations for sealing the shafts, ramps, and boreholes.
- *Waste isolation.* We estimated the performance of various natural and engineered barriers in order to recommend which barriers should be considered in the license application and what is needed to substantiate that the performance of a particular barrier is licensable. We concluded that substantial performance is provided by such natural barriers as the unsaturated zone, including Calico Hills, and the saturated zone. Engineering options such as cladding, a drip shield, or low areal mass loading (thermal loading) can provide significant (an order of magnitude or greater) reduction in the total radiation dose that reaches the accessible environment. Investigations, some already planned, were recommended to validate the performance of those barriers.
- *Site-generated waste disposal options.* We conducted a detailed evaluation of options for treating and disposing of secondary wastes generated at a repository, providing a preliminary estimate of site-generated waste quantities for various waste receipt options to support the evaluation of the disposal options. Options included primarily uncanistered and canistered options for commercial spent nuclear fuel for both baseline and expanded environmental impact statement inventories. On-site and off-site disposal options for low-level radioactive, hazardous, and mixed wastes were identified and evaluated against technical, regulatory and licensing, and cost considerations. Recommendations included disposal of low-level radioactive waste at the

Nevada Test Site; minimization of the number of dual-purpose canisters requiring recycling, or development of dual-purpose canister recycling as the baseline for repository design; transportation to and disposal of hazardous waste at an approved site by a commercial, comprehensive hazardous waste disposal service; disposal of mixed waste off-site; and development and periodic updating of a site-generated waste disposal plan.

- *Waste quantity, mix, and throughput.* We identified how the parameters of waste streams influence repository surface, subsurface, and waste package design, and we defined design-

basis waste streams. Three inventories of wastes were considered for acceptance at the repository: (1) baseline, or base case, to be used for the viability assessment; (2) extrapolation from the baseline to all wastes currently documented in Government databases; and (3) further extension to include other estimated waste quantities beyond the baseline. In defining design-basis waste streams, our analysis considered variations of waste inventories, use of interim storage, and a waste acceptance strategy. The impact of these variations on repository design was identified. Design levels were established considering both co-disposal and separate disposal of DOE spent nuclear fuel and high-level radioactive waste.

#### Evaluating Design Alternatives: *Manned or Robotic Systems?*

We currently plan to use manned locomotives to transport waste packages from surface facilities at the repository to the entrance of the emplacement drift. A remotely controlled system would emplace the waste packages in the emplacement drifts. Ventilation would be maintained until the emplacement drift was full; then the drift would be closed and ventilation turned off.

The Nuclear Waste Technical Review Board recommended that we examine whether the repository should be designed in such a way that workers could enter the drifts to perform maintenance and surveillance and to respond to off-normal situations. Because waste packages emit heat, a "manned" repository would require increasing ventilation to the level that would permit workers to enter the emplacement drifts. Because waste packages emit radiation, it would require adding shielding to waste packages to reduce workers' exposure. To examine the feasibility of these design alternatives, we conducted a trade-off analysis.

- *Ventilation of emplacement drifts.* Active ventilation of all drifts would keep temperatures at or below equipment operability thresholds. To keep the emplacement drift temperature below 50° Celsius, air flow would have to be increased—to a level 4 to 5 times greater than current design capacity. Four additional shafts would be required to move this flow. Two additional main intake drifts and two additional main exhaust drifts would be needed to move the air through the subsurface, distribute it to the emplacement drifts, and return it to the exhaust shafts. The cost of maintaining this level of ventilation for all drifts during the entire pre-closure life of the repository could be significant.
- *Shielding waste packages.* Evaluation of this option raised serious concerns. Shielding would reduce the thermal conductivity of the waste package, thereby increasing the fuel temperature and degrading the fuel cladding. It would increase the weight of the waste package, affecting handling. It would increase the cost of the waste package by \$100,000- \$900,000 per package, depending on the type of shielding used. Increasing the size of the package could require larger emplacement drifts, which by increasing the areal extent of the repository would increase its cost. Further, allowing personnel routine access to emplacement drifts would increase overall personnel exposures to radiation.

We believe the current design dimensions and weights of the waste packages and the emplacement mode selected for disposal are well-suited for remote handling during emplacement and that remote handling offers substantial advantages.



- *Performance confirmation.* Our assessment of this subject resulted in the development of a plan that specifies monitoring, testing, and analyses needed to (1) evaluate the accuracy and adequacy of the information used in a license application, and (2) determine that performance objectives for the period of permanent repository closure will be met.
- *Retrievability strategy.* To define a flexible strategy that can ensure that waste packages can be retrieved, we identified retrieval options and discussed the recommended retrieval process in the context of repository and waste package designs. The strategy consists of a step-by-step process for executing retrieval and a technical basis for recommended design requirements.

## Performance Assessment: Key to Site Suitability and Licensing

The determination of site suitability and repository licensing will turn on the application of performance assessment: the modeling that permits scientists to use data gathered from site characterization to simulate the behavior of the repository system under a range of conditions and a variety of design options over thousands of years. In turn, feedback from performance assessment guides development of design. It also focuses scientific investigations on uncertainties associated with the most important aspects of the natural system by indicating where more data are needed to reduce uncertainties.

A total system performance assessment will be one of the four components of the viability assessment, and it will provide input for the draft environmental impact statement. If the site is recommended, another total system performance assessment will be conducted to support the license application to the NRC, using information current at that time.

In 1996, signaling the importance of total system performance assessment, the Nuclear Waste Technical Review Board recommended that we make our application of it transparent and valid, that uncertainty be treated properly, and that peer review or expert elicitation be independent. We fully agreed with this

recommendation and, to attain these goals for the total system performance assessment that will support the viability assessment, we undertook three major initiatives in Fiscal Year 1997:

- A series of workshops to strengthen the technical validity of our models.
- A series of independent and objective expert elicitations to complement ongoing activities and to provide estimates of uncertainty in our modeling.
- Creation of a total system performance assessment peer review panel staffed by a multidisciplinary team of distinguished, independent scientists.

These Fiscal Year 1997 initiatives are described below.

### *Workshops on modeling*

Nine abstraction/testing workshops provided a forum for collaboration on model development among modelers who conduct total system performance assessment, process-level modelers, and staff who perform laboratory and field measurements. Collaboration facilitates model development by ensuring that abstractions are as consistent as possible with the most comprehensive and current understanding of relevant site characteristics and processes.

Participants identified issues related to long-term performance, ranked their importance, and developed proposals for work to address key issues more explicitly in the viability assessment. Topics included unsaturated zone flow, unsaturated zone thermohydrology, near-field geochemical environment, waste package degradation, waste form and cladding degradation, engineered barrier system transport, unsaturated zone radionuclide transport, saturated zone flow and transport, biosphere, and disruptive events. The work proposals were used to guide abstraction/testing analyses that will continue into Fiscal Year 1998. These analyses provide the form of the abstracted sub-system models for input to the total system performance assessment that we will conduct for the viability assessment; they justify the use of those models; they validate them technically.

### *Expert elicitations*

Expert elicitations on the unsaturated zone, waste package degradation, and the saturated zone complemented ongoing modeling, testing, and data collection programs while contributing to the development of total system performance assessment models. Each elicitation proceeded by (1) defining the process model inputs to total system performance assessment; (2) selecting experts to provide interpretations; (3) meeting to identify issues, data needs, methods, and interpretations; (4) compiling and disseminating data to the experts; (5) eliciting expert interpretations; (6) reviewing and finalizing the interpretations; (7) calculating and aggregating the expert interpretations; and (8) documenting the results.

The elicitations will help us develop process model descriptions that will provide technically defensible products for abstraction into total system performance assessment by properly and completely capturing uncertainties in the process models and the data that support them, in a form that is useful for total system performance assessment. Elicitations on near-field coupled effects and waste form dissolution/radionuclide mobilization are planned for Fiscal Year 1998.

### *The peer review panel*

In January 1997, we convened a performance assessment peer review panel intended to serve two goals: (1) making our total system performance assessment transparent to technical peers, regulatory and oversight bodies, and Administration and congressional decision-makers; and (2) ensuring the traceability of decisions and assumptions that support the assessment. The panel's objective is to provide a formal, independent evaluation and critique of our development of a total system performance assessment.

The panel includes experts in the fields of risk assessment, physics and nuclear safety, chemistry and geochemistry, biosphere and health physics, material science and metallurgy, hydrology and fluid flow. It is conducting a 2-year review, in four phases: (1) orientation; (2) modeling, scenarios, and abstractions; (3) review of our draft assessment; and (4) final review. Each phase begins and concludes with an open meeting, and at the end of each phase the panel

submits an interim report to OCRWM's management and operating contractor, to which it is subcontracted.

The panel is evaluating our analytical approach, including physical events and processes considered in analyses, use of appropriate and relevant data, assumptions made, abstraction of process models into total system models, application of accepted analytical methods, and treatment of uncertainty. These aspects will be evaluated within the context of the long-term performance of the repository. The panel's comments, concerns, conclusions, and recommendations will support development of the total system performance assessment for both the viability assessment and, if the site is recommended for development as a repository, for our license application.

Phase One of the panel's work began in February 1997 and concluded in June 1997. The panel's first interim report, issued in July 1997, presents the panel's understanding of our approach and of the processes and events that would affect the future performance of the repository, and initial findings based on what the panel learned during the orientation phase.

### *Documentation*

Proper documentation addresses the validity of the models, confidence in the models, alternative interpretations, and uncertainties affecting long-term performance. The work of assembling appropriate documentation for the total system performance assessment that we will conduct for the viability assessment began in 1997 with the release of a report, *Total System Assessment - Viability Assessment Methods and Assumptions*. As an explanation of how we will implement that total system performance assessment, it served as a preliminary draft of the introductory chapters of the total system performance assessment document that we will prepare for the viability assessment. It described key components of the total system performance assessment, the general approach to producing analyses, and key model abstractions. The report was reviewed internally and externally, and several parties provided comments on the technical validity of the abstracted models, the traceability of model assumptions, and the transparency of our approach.

## Background on Performance Assessment

### Complex models

Total system performance assessment is an analysis in which all significant site features, events, and processes are represented in models that can be used to forecast the long-term behavior of the repository system. The assessment must capture all important components of both the engineered and natural system. It must also evaluate the uncertainty in the prediction of waste containment and isolation, as well as risks associated with uncertainty in (1) site characterization information, (2) conceptual models of sub-system performance, and (3) process models and parameters.

Data obtained from site characterization are used to create conceptual models of the features, events, and processes associated with the site, and, in some instances, alternative conceptual models. Conceptual models are then synthesized into numerical models of how natural geologic, hydrologic, geochemical, and geomechanical processes behave over time. These process models are used to enhance understanding of the controlling natural processes, such as water movement in the unsaturated zone, and to provide estimates of parameter values, such as percolation flux at the repository horizon.

Process models tend to be quite complex and involve intensive computation; typically, they do not lend themselves to inclusion in a total system performance assessment model. To provide input to that model, the process models and/or their results are abstracted: their essential components are simplified while their intrinsic form is retained. The results must reproduce or bound those of the underlying process model, which is based on data about the site.

Abstracted models for each subsystem are combined into the total system performance assessment model that is used to simulate the performance of the repository system, and to determine the effects of uncertainty, in order to identify where more information is needed. As additional site characterization data are obtained, they are used to refine the total system performance assessment models.

### Simple questions

While performance assessment can be complex, the questions it addresses are simple: How adequate are our models? What do we need to do to reduce uncertainties? Where we cannot reduce uncertainties, how much do they matter and how sensitive are they to change?

### Simple goals

A total system performance assessment that is *transparent* will be supported by clear and logical documentation, and it will be clear not only to technical analysts but to other informed reviewers. To be *traceable*, it will have a complete and unambiguous record of decisions and assumptions, and of models and data, and of how they were used to arrive at results. Traceability is achieved through documentation and explanation of all decisions made during the analyses. A model is considered to be *technically valid* if it provides a reasonably accurate representation of reality. The best way to demonstrate validity is through independent confirmation of models and conclusions—the approach we are taking.

*Factoring Government-managed nuclear materials into our assessments*

To obtain NRC authorizations to construct, operate, and close a repository that will contain waste forms from Government-managed nuclear materials, we must demonstrate how those waste forms will affect repository performance. This means that we need specific data on physical, chemical, and radiological properties. Those waste forms are more heterogeneous than commercial spent nuclear fuel; there are approximately 250 forms of DOE spent nuclear fuel.

The total system performance assessment we conduct for the viability assessment will consider all waste forms in some manner. The base case repository capacity will be assumed to be 70,000 MTHM, the statutory limit established by the Nuclear Waste Policy Act. Of that total, 90 percent by weight, or 63,000 MTHM, will be assumed to be commercial spent nuclear fuel. The remaining 10 percent will be assumed to be 7,000 MTHM equivalent of Government-managed nuclear wastes. Approximately two-thirds of the 7,000 MTHM will be high-level radioactive waste in the form of borosilicate glass logs; approximately one-third will be DOE and Naval spent nuclear fuel. While Plutonium waste forms are not explicitly treated in the base case, they--along with individual categories of DOE spent nuclear fuel--are explicitly treated in the total system performance assessment through sensitivity analyses. These analyses indicate that the contribution of plutonium waste forms to the total radiation dose to the public is bounded by the dose from an equivalent amount of commercial spent nuclear fuel and high level waste glass. The plutonium waste forms may therefore be considered to be implicitly treated in the base case.

The environmental impact statement that would accompany a site recommendation will also evaluate these waste forms for disposal in the repository. The base case for the environmental impact statement will assume the 70,000 MTHM statutory limit on repository capacity; alternatives will include assumptions of more than 70,000 MTHM.

## Regulatory Issues Remain Open

*Requirements of the Energy Policy Act of 1992*

Repository siting and development are governed by regulations issued by the U.S. Environmental Protection Agency (EPA), the NRC, and the Department of Energy. In the 1992 Energy Policy Act, Congress directed EPA to develop radiation protection standards to apply specifically to a repository at Yucca Mountain. Congress also directed the NRC to revise its repository licensing regulations, 10 CFR 60, to reflect the new EPA standards. The Department's siting guidelines, 10 CFR 960, *General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories*, which govern selection of a repository site, must also incorporate these standards.

As Fiscal Year 1997 closed, EPA was still working to develop proposed standards, and as the NRC awaited the EPA standards, it was considering revisions to its own regulations.

*Amending the Department's siting guidelines*

When the Department published its siting guidelines in 1984, multiple sites were to be screened as potential candidates for repository development. In 1987, Congress directed us to characterize only the Yucca Mountain site. This change immediately rendered inapplicable several of the general siting guidelines, which were designed to facilitate comparisons of multiple sites. Another change was more gradual: since we published the guidelines in 1984, we have gained a more sophisticated understanding of what is required to assess repository performance. In our May 1996 revised *Program Plan*, we stated our intention to amend the regulatory framework for the repository to reflect (1) policy changes since enactment of the Nuclear Waste Policy Act in 1982, and (2) what had been learned from nearly 10 years of site investigations.

On December 16, 1996, we published a Notice of Proposed Rulemaking in the *Federal Register* in which we proposed amendments to the siting guidelines. The

amendments would reflect the fact that only one site is under consideration, and they would streamline the determination of site suitability for repository development to focus on overall repository system performance, rather than on independent technical considerations of individual features of the site. This reflects our belief that judgments about the Yucca Mountain site should be based on the site's ability to protect public health and safety and the environment as measured by overall system performance.

On January 23, 1997, we held a public hearing to receive comments on the proposal in Las Vegas, Nevada. We twice extended the public comment period, to a total of 151 days, ending on May 16, 1997. These extensions pushed publication of a final rule past the Fiscal Year 1997 milestone date that had been targeted in the revised *Program Plan*.

## **Coordination with the Nuclear Regulatory Commission**

### *The purpose of our interactions*

Under the Nuclear Waste Policy Act, if the Secretary makes a site recommendation to the President, the recommendation must include preliminary comments from the NRC to the Secretary on whether our site characterization analysis and proposed waste form appear to be sufficient to serve as the foundation for a license application. If the site recommendation is accepted by the President and Congress, the Commission must then review and issue a final decision approving or disapproving our application for a "construction authorization" within 3 years.

For our work to satisfy the Commission, and for the Commission's comments and review to be effective, we must share a common understanding of the emerging repository concept, of what the associated licensing requirements should be, and of what information will be available for the initial license application. Accordingly, OCRWM's Director presents semiannual briefings to the Commissioners, and our staffs engage in extensive and continuous informal interactions on procedural and technical issues.

In the near term, the viability assessment will provide a valuable frame of reference for our prelicensing

interactions because issues essential to licensing are being addressed in it. And the Commission's views on the acceptability of our approach to licensing, as set forth in the license application plan that is a component of the viability assessment, will be important to policy-makers' decisions regarding the future direction of our program.

### *An expanded framework for interactions*

In keeping with our conviction that the soundest measure of repository performance is the measure of total system performance, we expanded the focus of our interactions with NRC staff in Fiscal Year 1997. Beyond narrowly addressing isolated technical issues, we worked toward achieving a common understanding of issues important to overall repository performance and of the adequacy of proposed methodologies and approaches to important technical issues.

To focus its work and document progress in resolving issues with us, the Commission initiated Annual Progress Reports on its work and Issue Resolution Status Reports, which present the staff's current thinking and concerns on individual key technical issues. We reviewed the first Progress Report, issued in January 1997. We believe these reports provide insights into the NRC's approach that will help us improve the viability assessment and prepare better documents for licensing.

Within this expanded framework, our staffs discussed selected technical issues. We made progress toward resolving the issue of the potential for igneous activity, identifying points of agreement and a proposed path to resolution of remaining issues. Resolution will entail our description of how the results of our expert elicitation will be used in performance assessment and how sensitivity studies will be conducted. We understand that the Commission's staff has committed to completing, in early Fiscal Year 1998, an Issue Resolution Status Report on the probability of future igneous activity.

In June 1997, the Commission released its Issue Resolution Status Report on Future Climate Scenarios, with which we generally concur, and we resolved issues related to the use of expert elicitation. We continued to develop a risk-based criticality analysis methodology. A

topical report describing our proposed methodology for analyzing postclosure criticality will be submitted to the Commission by the end of Fiscal Year 1998. We intend to continue our dialogue on this important issue.

Following issuance of the viability assessment in 1998, we will engage in more frequent interactions with the NRC to address key technical issues and our own work products. Our ability to communicate effectively with each other and to drive issues to resolution is essential to our ability to meet our milestones.

#### *Planned revision of NRC regulations*

We continued to follow discussions regarding potential changes to the NRC's licensing requirements that will follow from new EPA radiation protection standards. NRC staff share our view about difficulties associated with evaluating subsystem performance against quantitative criteria. They have announced their intention to provide the Commission with options for possible revisions to NRC repository licensing requirements in Fiscal Year 1998.

We support the NRC's staff position, presented at the March 1997 meeting of the Advisory Committee on Nuclear Waste, that the Commission's consideration of revisions to its licensing requirements should not be on the critical path for DOE's amendment of its siting guidelines or for any assessment of the viability of the Yucca Mountain site.

#### *The Licensing Support System evolves: exploiting new technologies*

In 1991, the NRC and the Department began to plan for an electronic licensing support system that would meet the Commission's requirement for electronic access to the unprecedented volume of documents that will support a repository licensing proceeding. Requirements for this system are governed by NRC rulemaking 10 CFR 2 Subpart J.

Since plans for this system were originally formulated, information technology has advanced dramatically. In November 1997, the Commission published a draft rule proposing to move toward electronic filing of documents and the use of Web technology. We support this approach, and we are reviewing the Commission's suggested changes to its regulation and working with NRC staff to resolve comments.

We have begun reprocessing our records into image and text formats that can be accessed through the Internet, and we expect to complete this by the end of Fiscal Year 1999. We have also developed a prototype format for licensing documents that provides a link from the document to supporting information in our records system or other sources.

## **Protecting People and the Environment**

#### *Preparing an environmental impact statement*

The Nuclear Waste Policy Act requires the Department to include an environmental impact statement as part of a recommendation to develop the Yucca Mountain site as a repository. The environmental impact statement will evaluate the effects of transporting both commercial and Government-managed nuclear wastes to the repository and of disposing of them. We began the process of developing the statement in Fiscal Year 1995 by publishing a Notice of Intent in the *Federal Register*; scoping hearings followed. The public comment period, which closed on December 5, 1995, produced approximately 1,000 comment documents. The majority addressed transportation, repository performance, legal issues, and policy issues, with transportation drawing the most concern.

Funding cuts in Fiscal Year 1996 caused us to defer work on the environmental impact statement, but in Fiscal Year 1997, work resumed with the award of a contract to support preparation of the statement and publication of a document summarizing public comments from scoping. Award of this contract, resumption of work to develop the statement, and publication of the summary of comments met several milestones in our revised *Program Plan*.

Two groups are helping us guide development of the statement and ensure coordination within the Department: an Executive Committee, which consists of Departmental Secretarial Officers, and a Management Council, which includes representatives of the Office of Environmental Management with responsibility for Government-managed nuclear materials, and representatives of the Office of the General Counsel and the Office of Environment, Safety and Health.

In developing preliminary approaches to impact assessments for the environmental impact statement, we defined assumptions that include emplacement in the repository of DOE spent nuclear fuel and high-level radioactive waste, surplus weapons-grade plutonium waste forms, and Naval spent nuclear fuel. We reviewed the scope and content of other recent environmental impact statements prepared by the Department, and surveyed existing data and identified additional data needed to prepare the statement. We also started consultations with Federal, State, and county agencies and with Native American Tribes.

In Fiscal Year 1998, we will continue these consultations, complete the development of approaches to impact assessment and perform preliminary impact analyses, write draft chapters of the environmental impact statement, and prepare information for use in appendices or reference documents. A draft environmental impact statement will be issued in Fiscal Year 1999; a final statement, in Fiscal Year 2000.

#### *Worker safety*

Our project's safety and health program requires that written safety plans and procedures be prepared before

work begins. Worker training and line management accountability are critical to the program's success in ensuring worker and public safety. Active oversight is exercised through assessments, surveillances, and inspections performed by the Department and its contractors, with technical support from other Federal agencies and independent technical experts.

Excavation of the Exploratory Studies Facility main 5-mile loop and associated test alcoves, spanning 31 months of underground tunnel construction through varying ground conditions, was completed in Fiscal Year 1997 without serious injuries directly related to excavation operations.

Historically, the Yucca Mountain Site Characterization Project's annual rates of safety- and health-related incidents and illnesses have been well below those of commercial enterprises in similar industries on a national scale. They have also been below the Department's national rates. These trends continued through Fiscal Year 1997. The 5-year total recordable injury and illness rate was approximately 60 percent below the comparable industry rate; the 5-year lost-workday incidence rate was about 50 percent below. The safety and health cost index was approximately 70

percent better than the Department's complex-wide average.

#### *Protecting the environment*

OCRWM is committed to performing its work at the Yucca Mountain site in a manner that minimizes significant adverse environmental impacts. An environmental protection program, implemented at the start of site characterization, covers a wide range of activities and ensures that the Exploratory Studies Facility and associated structures are built, operated, and managed in a



Scientist Engaged in Environmental Monitoring



manner that will protect, maintain, and restore environmental quality, minimize potential threats to the environment and the public, and comply with environmental regulations and Departmental policies. This program continued to function smoothly and efficiently in Fiscal Year 1997.

*Data collection and monitoring.* To establish and maintain a baseline against which we can assess the effects of site characterization activities and could identify the effects of repository construction and operation, we continued to monitor air quality, water quality, ecosystems, and archaeological resources. We also monitored to determine existing background levels of radiation. This baseline information will equip us to mitigate any impacts before they become significant. To date, no significant adverse environmental impacts have been detected. Data collection also supported repository design, biosphere modeling, total system performance assessment, the viability assessment, and preparation for a license application.

*Surveys and reclamation.* Before the start of field activities, we conducted surveys to identify threatened species, objects of cultural interest and, in certain instances, radionuclides in the soil. Reclamation plans were developed for each disturbed site to allow restoration following completion of an activity. Our habitat reclamation program developed the best techniques for reclaiming disturbed areas in the harsh desert environment.

*Environmental compliance.* We continued to review, analyze, and interpret Federal and State environmental laws, regulations and codes, and orders while developing and implementing strategies, plans, and procedures to satisfy environmental compliance requirements. Since the beginning of site characterization, we have obtained over 40 permits for air quality, underground injection control, drinking water, wastewater discharge, and water appropriation. In Fiscal Year 1997, we submitted to the Nevada Division of Environmental Protection and the Nevada State Engineer the quarterly and annual compliance reports required to maintain these permits.

We maintained communication with numerous Federal and State agencies on compliance matters. We maintained land access and land withdrawal agreements and several rights-of-way with the Bureau of Land

Management, U.S. Air Force, National Park Service, and U.S. Forest Service to allow scientific studies at Yucca Mountain and at remote sites in Southern Nevada and California. Frequent environment, safety, and health appraisals, assessments, and surveillances ensured that project activities complied with applicable regulations, procedures, and permit conditions.

*Historic preservation.* Consultations and interactions with 17 Native American Tribes and organizations continued under the Programmatic Agreement between the Department and the Advisory Council on Historic Preservation. Our staff conducted visits to the Yucca Mountain site for Native American Tribes, held a project update attended by all 17 Native American Tribes and organizations, and attended a variety of national meetings.

*Waste minimization and management.* The environmental program continued to be an important part of day-to-day operations at the Yucca Mountain site. It included management of hazardous and solid waste disposal; waste minimization, recycling, and pollution prevention efforts; and operation of hazardous waste accumulation areas in compliance with the Resource Conservation and Recovery Act. Hazardous waste was transported off site to facilities that hold disposal permits from EPA. No hazardous, extremely hazardous, or toxic materials were released to the environment.

*Other environmental efforts.* Workers received environmental protection and pollution prevention training prior to working at the site. Environmental staff participated in engineering design reviews to ensure that safety and health requirements were satisfied, necessary permits were identified, and pollution prevention technology was employed. Rigorous assessments and surveillances contributed to our success in avoiding, minimizing, and mitigating any adverse environmental impacts and ensuring full regulatory compliance.

## **Relations with Other Parties**

### *Interactions with Nevada State and local governments*

Under the Nuclear Waste Policy Act of 1982, the State of Nevada; Nye County, in which the Yucca Mountain site is located; and nine counties contiguous to Nye



County (including Inyo County in California) were designated *affected units of government*, and they are eligible to receive Federal financial assistance to review and monitor site characterization activities. The State and Nye County also have the right to designate on-site representatives to oversee our work and to receive funding for associated “reasonable expenses.” The State has never designated such a representative, but the County has, and its representative did oversee our work in Fiscal Year 1997.

For Fiscal Year 1997, Congress appropriated no funds for either the State of Nevada or the ten affected counties under this section of the Act. The State of Nevada, which remains steadfastly opposed to the Yucca Mountain Site Characterization Project, used funds it carried over from Fiscal Year 1996 to continue to operate its Nuclear Waste Project Office. Lack of funding forced many of the ten affected counties to close their nuclear waste offices, lay off staff, and curtail their review and monitoring of our work.

Nonetheless, we engaged in numerous formal and informal interactions with the affected units of government and the public. Through personal visits to the counties and a series of teleconferences, we provided many updates on project activities and issues to each of the ten county commissions. Our staff participated in a formal meeting with Lincoln County in April 1997; provided six site tours to various counties and their nuclear waste management offices; coordinated with the affected governments in monitoring teleconferences on pertinent congressional hearings on radioactive waste disposal, appropriations and transportation; and responded to more than 600 requests for information from the counties and other stakeholders. Our staff also participated in a town hall meeting held at the University of Nevada, Las Vegas, on the Yucca Mountain Site Characterization Project. And OCRWM provided 497 computers to school districts in six of the affected counties.

In September 1996, the State of Nevada sued the Department seeking funding that it claims it is owed from Fiscal Year 1996 appropriations. In its December 1996 opening brief, the State sought \$3.5 million and petitioned for judicial review of the Department’s decision not to provide the funding. In a January 13, 1998, decision, the U.S. Ninth Circuit Court of Appeals denied the State’s petition for review,

stating that the Department had fulfilled its statutory obligation under the Act: the State had sufficient funds available at the start of Fiscal Year 1996.

Under Section 116(c)(3) of the Act, the Department continued to make Payments-Equal-to-Taxes (PETT) to Nye County. These payments are intended to compensate for taxes that Nye County could have collected on site characterization and the development and operation of a repository if it were authorized to tax Federal Government activities. For Fiscal Year 1997, the payments totaled \$6.4 million.

PETT funding was the subject of mediation between the Department and Benton County, Washington, that was successfully concluded in a May 1, 1997 agreement. The Department owed PETT funds to the county as a result of site characterization activities at the DOE Hanford site, which is in Benton County, during the 1980’s. An initial PETT payment of \$770,000 was made in 1992; under the terms of the May 1, 1997, agreement, an additional \$5.25 million was paid to the County.

#### *Outreach to the public*

We continued to provide information to the general public and to support public education and participation in project-related activities. These efforts centered on informing stakeholders and the public about the status of activities at Yucca Mountain. To reach stakeholders, interested groups, and individuals in a cost-effective manner, we provided information by means of our Home Page, newsletters, fact sheets, correspondence, a toll-free telephone number, science centers, and meetings. Two videos, the Fiscal Year 1996 *Year in Review* and a video documenting the “daylighting” of the tunnel boring machine, depict various aspects of our program for general audiences.

We participated in 201 speaking engagements, reaching over 13,500 stakeholders through the Yucca Mountain Speakers’ Bureau, and we conducted 182 tours of Yucca Mountain, briefing nearly 3,000 visitors on our progress in characterizing the site. A major opportunity for formal public involvement was the public hearing held in January 1997 on the Department’s proposal to amend its repository siting guidelines.

We reached more than 20,000 Nevada students in grades kindergarten through 12, as well as more than 300 Nevada teachers, through such activities as workshops on energy, geology, and environmental studies; science “discovery days”; classroom presentations; field trips; and participation in the JASON project, a nationwide, interactive science exploration program.

***Meeting with professional and academic organizations***

As in years past, our staff met with many professional associations, including the Association of Engineering Geologists, the U.S. Army Corps of Engineers Geotechnical Conference, the American Chemical Society, the Geological Society of America, the American Society for Metals, the American Geophysical Union, and the Institute of Nuclear Materials Management. We also met with students and professors from university science and public policy departments, such as the Mackay School of Mines at the University of Nevada at Reno, and many of them visited the Yucca Mountain site. All of these meetings helped build wider understanding of OCRWM’s program within the public policy, scientific, and technical communities.

**International Collaboration**

OCRWM’s international waste management activities involve formal collaborations with other countries and

international organizations to exchange information and develop consensus on common issues. During Fiscal Year 1997, we participated in bilateral agreements with Canada, Sweden, Switzerland, France, Japan, and Spain to support information exchanges. Interactions continued with the International Atomic Energy Agency, and we continued to play an active role in the Nuclear Energy Agency, which represents approximately 30 countries.

The focus of our ongoing international cooperative work is interpretation of site characterization data and performance assessment. This work involves continuing participation in two programs of the Nuclear Energy Agency: the Site Evaluation and Design of Experiments Group and the Performance Assessment Advisory Group. These groups work cooperatively to improve the state of the art in geosphere transport and two-phase flow characterization and modeling, and in performance assessment and modeling. OCRWM’s participation in these activities strengthens the capabilities and defensibility of our models of natural processes that operate at the Yucca Mountain site.

Interest in the Yucca Mountain Site Characterization Project remained high among other nations that are developing their own nuclear waste management programs. In Fiscal Year 1997, visitors from Sweden, South Korea, Taiwan, Canada, China, and Hungary visited the Yucca Mountain site and met with project scientists to learn about our work.

# Chapter Two

---

## Waste Acceptance, Storage and Transportation Project

### Overview

In Fiscal Year 1996, because of deep funding cuts by Congress, congressional interest in interim storage issues, and the Administration's emphasis on privatization, OCRWM reassessed its programmatic objectives and formulated new strategies for storage and transportation. Those strategies, described in our revised *Program Plan*, continued to govern our Fiscal Year 1997 efforts, which focused on two major tasks:

- Development and refinement of a procurement strategy for acquiring waste acceptance and transportation equipment and services. The strategy will rely, to the maximum extent possible, on obtaining needed equipment and services directly from private vendors through competitive proposals, rather than on provision of design, equipment, and services by the Department.
- Development of a non-site-specific interim storage facility design and Topical Safety Analysis Report for NRC review. This could expedite development of an interim storage facility if one were authorized.

Other activities, such as providing support for the NRC's review of the *Actinide-Only Burn-up Credit Topical Report* and the *Dry Spent Fuel Transfer System Topical SAR* (Safety Analysis Report), also continued during the year.

However, the need to shift more resources to site characterization at Yucca Mountain resulted in a reduction in the budget for waste acceptance, storage, and transportation from \$13.5 million in Fiscal Year 1996 to \$10 million in Fiscal Year 1997. This decreased the level of support for development of the

transportation procurement initiative, reduced funding for cooperative agreement groups, and resulted in a decision not to pursue further design work on a non-site-specific interim storage facility. Nonetheless, even with under 3 percent of OCRWM's total budget, the work performed in this area remained essential to preparing for waste acceptance and transportation of spent nuclear fuel to a Federal facility.

Throughout Fiscal Year 1997, congressional debate on the issue of interim storage for spent nuclear fuel continued. The Administration's position remained constant: any potential decision about interim storage should rest on objective, science-based criteria and be informed by the results of the Yucca Mountain viability assessment. In the absence of authorization for a facility and with limited funding, our work scope for interim storage planning remained limited. Our future activities will be impacted by whether or not such legislation is enacted.

### Developing a Market-Driven Strategy

We continued to refine the strategy for acquiring waste acceptance and transportation services that we had initiated in Fiscal Year 1996. That strategy involves a competitive procurement designed to stimulate the market in transportation of commercial spent nuclear fuel, and it relies on private industry to provide a cost-effective approach with minimal Federal involvement. We are pursuing this procurement independent of interim storage contingency planning: it would support spent nuclear fuel transportation to either an interim storage facility or to a repository.

Essentially, contractors would pick up spent nuclear fuel at utility sites and deliver it to a Federal facility, providing all equipment and services needed to perform those functions. Elements of the acquisition would

**Tasks to Be Performed under Regional Service Contracts for Waste Acceptance and Transportation Services**

**Phase A: Planning**

- Complete site-specific planning
- Develop management and operation plans
- Complete regional planning
- Develop pricing

**Phase B: Mobilization and Acquisition of Equipment**

- Purchase/lease equipment
- Perform site preparation for spent nuclear fuel shipments
- Initiate training
- Provide initial storage systems
- Finalize routing

**Phase C: Operations**

- Transport spent nuclear fuel
- Perform waste acceptance
- Perform cask maintenance
- Provide remaining storage systems

include competition for a combination of fixed-price, fixed-rate, multi-year, performance-based contracts. The acquisition will entail a series of 10- to 15-year contracts, with each contract cycle leading to awards to multiple regional service contractors.

In May 1996, we published an Expression of Interest and Request for Comments in the *Federal Register* and *Commerce Business Daily*. In July 1996, we held the first presolicitation conference with potential vendors to discuss a draft Statement of Work and draft Concept of Operations. On December 27, 1996, we published a complete draft Request for Proposals for public review and comment. Publication of the draft met both a commitment made in the Secretary's Performance Agreement with the President for Fiscal Year 1997 and a milestone in our revised *Program Plan*.

On February 25, 1997, we held our second presolicitation conference, announced in the *Federal Register* and *Commerce Business Daily*, in Washington, D. C., to solicit additional input on technical and contractual issues. Approximately 140 attendees received updated program information and offered comments on operations, logistics, and institutional

issues. The majority of the written comments were supportive of, or neutral about, our overall approach to acquisition.

Two public workshops that we sponsored (described at the end of this chapter) also addressed transportation issues. Input from these workshops and the formal comments submitted in response to the draft Request for Proposals helped shape the next version, which was issued on November 24, 1997.

**The Debate over Interim Storage Continues**

Congressional efforts in Fiscal Year 1997 to redirect the Nation's policies for managing nuclear waste were very similar to efforts in Fiscal Year 1996, with almost the same results. Although the Senate passed S.1936, the Nuclear Waste Policy Act of 1996, the 104th Congress adjourned in December 1996 without passing legislation. However, because of the prospect that legislation could have been enacted in Fiscal Year 1997, and due to continued funding constraints, we concentrated our efforts on development and refinement of our approach for providing waste acceptance and transportation services. While we worked to maintain momentum in waste acceptance, storage, and transportation efforts, we knew that those efforts could be substantially affected if legislation were enacted. Thus, we continued to monitor pending legislation, analyze its potential impacts on our current course of action, and maintain capability to respond to change.

Key congressional actions in Fiscal Year 1997 included the following:

- Senate bill S.104, the Nuclear Waste Policy Act of 1997, was introduced in January 1997 and passed the Senate on April 15, 1997. As approved, this bill ties the designation of the interim storage site to the viability assessment of Yucca Mountain, which the bill would direct the Department to complete by December 1, 1998.
- In the House of Representatives, H.R.1270, which was similar to S.104, was not brought to a floor vote during Fiscal Year 1997, although it had cleared several committees with jurisdiction

over it. The bill passed the full House in Fiscal Year 1998. H.R.1270 would require the Secretary to start operation of an interim storage facility at the Nevada Test Site by January 31, 2002, based on a positive viability assessment of Yucca Mountain.

As stated above, the Administration's position on siting an interim storage facility continued to be that the decision should rest on objective, science-based criteria and should be informed by the results of the viability assessment of the Yucca Mountain site. The Administration has notified Congress that the President would veto any legislation that is inconsistent with this principle and would weaken environmental standards.

### Non-Site-Specific Storage Planning

In April 1996, we had begun work on design, engineering, and the supporting safety analyses for a non-site-specific storage facility to be constructed in two phases. The first phase is for receipt of canistered spent nuclear fuel only; the second phase, which would be developed in modules, adds the capability to receive and store uncanistered spent nuclear fuel.

During Fiscal Year 1997, we completed this design effort and submitted a non-site-specific Topical Safety Analysis Report for a Centralized Interim Storage Facility to the NRC for review. This submittal met a commitment made in the Secretary's Performance Agreement with the President for Fiscal Year 1997. It also met a milestone in our revised *Program Plan*. The report describes the facility design, operations, and supporting systems; demonstrates conformance with the NRC's siting evaluation factors and general design criteria; and presents the results of radiological and safety analyses.

In January 1997, we issued a *Design Requirements Document* (Revision 1) to support development of this Topical Safety Analysis Report. The *Design Requirements Document* identifies the basis for the non-site-specific design, engineering, and safety requirements, and it describes physical characteristics and capacity assumed in the Phase I facility design. We discussed the design criteria with the NRC's Advisory Committee on Nuclear Waste on May 22, 1997; the Committee found them acceptable.

The *Total System Description* we issued in June 1997, described below, addresses possible acceptance of DOE spent nuclear fuel and high-level radioactive waste at a centralized interim storage facility, and it states that "to the extent practicable, the facility will have the capability to accommodate certain types of DOE spent nuclear fuel starting from its first year of operation."

### Relations with Utilities

#### *Managing the Standard Contract with utilities*

The *Standard Contract* requires the Federal Government to take legal title to, as well as physical possession of, the spent nuclear fuel. Therefore, waste acceptance will require well-defined procedures and accurate documentation. In preparation for this, we continued to monitor spent nuclear fuel inventories and discharges.

The Nuclear Waste Policy Act of 1982 authorized the Secretary to enter into contracts with the owners and generators of commercial spent nuclear fuel, and our interactions with them on matters concerning receipt, shipment, and disposal of their spent nuclear fuel are governed by a 1983 rulemaking, *Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste*, 10 CFR Part 961, which defined the terms of a *Standard Contract*.

On May 19, 1997, we provided to all holders of the *Standard Contract* a Spent Fuel Verification Plan (Revision 0). The document explains how we plan to fulfill our contractual responsibilities to verify spent nuclear fuel prior to acceptance and how we plan to collect information needed to implement the Material Control & Accounting Plan, in order to meet NRC and International Atomic Energy Agency requirements.

Our revised *Program Plan* identified as a Fiscal Year 1997 milestone the completion of the first phase of a unified database that would integrate existing information about all spent nuclear fuel and high-level radioactive waste loaded into sealed canisters. The information would be used for planning and operations, including tracking of spent nuclear fuel generation, material control and accounting, and spent nuclear fuel verification. Budget cuts and the need to shift resources

to the Yucca Mountain Site Characterization Project forced us to terminate this effort.

### *Legal developments*

Throughout Fiscal Year 1997, congressional debate over interim storage legislation continued. The Administration's position remained constant: any decision about interim storage should be based on objective, scientific criteria and should be informed by the results of the Yucca Mountain viability assessment. The Nuclear Waste Technical Review Board stated its belief that a primary centralized interim storage facility should not be sited at Yucca Mountain until the site's suitability for a repository has been determined.

In July 1996, the U.S. Court of Appeals for the District of Columbia Circuit held that the Department has an obligation to commence spent nuclear fuel disposal by January 31, 1998, but stated that it was premature to address the remedy available because the Department had not yet failed to meet its obligation. On December 17, 1996, the Department notified holders of the *Standard Contract* that it did not expect to be able to start accepting spent nuclear fuel by January 31, 1998, and it solicited their views on how best to accommodate this delay. Soon after his confirmation, in April 1997, the Secretary met with utility executives to discuss options for addressing the Department's delay in spent nuclear fuel acceptance. However, no agreements were reached. In January 1997, a coalition of utilities and a coalition of State agencies filed a petition for the court to issue a writ of mandamus enforcing its earlier decision and compelling the Department to begin accepting spent nuclear fuel by January 31, 1998.

While litigation proceeded, the Department explored with some contract holders how it might alleviate the impacts of a delay on a case-by-case basis, by modifying individual contracts under clauses of the *Standard Contract*. Under existing delivery schedules, 14 of 59 contract holders have 1998 delivery dates.

On November 14, 1997, the U. S. Court of Appeals for the District of Columbia Circuit concluded that "the remedial scheme of the standard contract offers a potentially adequate remedy." The court did not direct the Department to start accepting waste on January 31,

1998, nor did it allow contract holders to escrow Nuclear Waste Fund payments until waste acceptance begins. It did issue a writ precluding the Department from excusing its failure to accept waste on the grounds that it had not yet established a permanent repository or an interim storage program.

In December 1997, the Department filed a petition for rehearing, arguing that the D.C. Circuit Court lacks jurisdiction to decide the adequacy and appropriateness of contractual remedies, since such issues are committed to the Court of Federal Claims. In February 1998, State regulators and utilities petitioned the court on several issues. They asked the court to bar the Department from using the Nuclear Waste Fund to compensate utilities, authorize utilities to escrow their fee payments, order the Department to file a plan for immediately beginning spent nuclear fuel disposal, and appoint a Special Master to oversee the Department's activities. On May 5, 1998, the court denied the Department's December 1997 request for a rehearing and the February 1998 petitions filed by the States and utilities.

As of May 31, 1998, no utility has sought the contractual remedy the court discussed in its November 1997 opinion, which would require the Department to process claims pursuant to the *Standard Contract*. Two utilities, however, have filed claims in the Court of Federal Claims for partial breach of contract.

In an attempt to end the litigation, on May 18, 1998, the Department proposed a settlement for utilities that have standard contracts with the Department. The Department proposes that utilities limit Nuclear Waste Fund payments to the proportionate share of fees appropriated to administer the civilian radioactive waste program. The remaining portion of the fee, normally paid quarterly, would be postponed until the Department is ready to accept spent nuclear fuel. A utility would remain obligated to pay the withheld fees, with interest at the Treasury rate, when receipt of spent nuclear fuel begins. Until then, a utility would be able to invest the withheld funds at higher interest rates and use the extra earnings to pay for its costs resulting from the contract delay. The Department estimates a benefit of approximately \$2.8 to \$5 billion to all utilities. The utilities, through the Nuclear Energy Institute, contend that the proposal is inadequate because it does not

provide a mechanism for the Department to meet its obligation to accept spent nuclear fuel and does not directly provide funds for continued on-site storage.

## Technical Developments

### *Dry spent fuel transfer system*

To enable utilities with crane capacity limitations or physical size constraints to use the larger storage and transportation systems being developed commercially, OCRWM and the Electric Power Research Institute (EPRI) jointly developed the concept of a dry transfer system. The system is designed as a free-standing, portable, self-contained building that would provide the shielding, structural integrity, containment, and criticality controls necessary to allow the transfer of spent nuclear fuel from the small transfer casks that those utilities can safely handle to a larger storage or transportation cask. The ability to use the larger storage or transportation casks would allow the utility to more economically store or ship spent nuclear fuel.

The possibility of accelerated reactor shut-downs resulting from the economic impacts of utility deregulation and restructuring increases the importance of having the dry transfer system available in the near term. The dry transfer system must be licensed by the

technical review. We expect the NRC to issue a Safety Evaluation Report by September 1998.

### *Actinide-only burnup credit topical report*

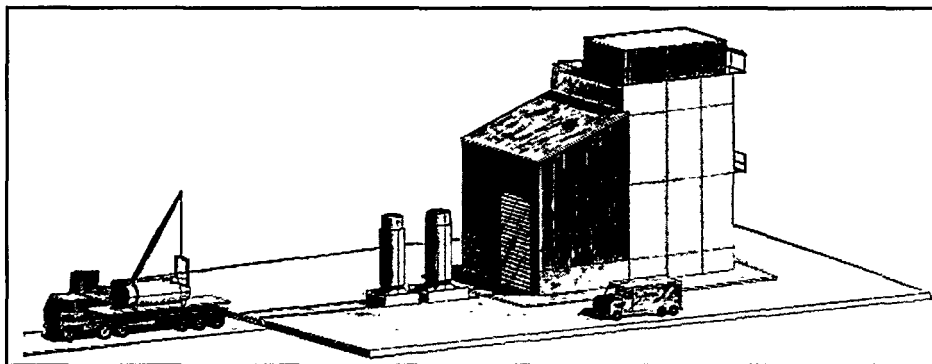
In May 1995, we submitted a Topical Report to the NRC concerning the methodologies for factoring burnup credit into the design of criticality control systems for casks used to transport spent nuclear fuel. Burnup credit accounts for the fact that, as nuclear fuel is used to generate power in a reactor, its reactivity declines. The use of burnup credit in cask criticality analysis permits design of a cask that can accommodate more spent nuclear fuel. With larger cask capacities, fewer shipments will be needed to transport spent nuclear fuel, thereby reducing transportation risk to the public.

During Fiscal Year 1997, we provided responses to the NRC's first round of questions on the Topical Report. As the year ended, we were evaluating the costs and benefits of proceeding with a follow-up Topical Report. The report would seek further burn-up credit that can be attributed to reduced reactivity when additional key fission products are considered.

## Institutional Developments

### *Safe transportation and emergency response training, technical assistance, and funding*

Section 180(c) of the Nuclear Waste Policy Act provides for technical and financial assistance to States and Native American Tribes through whose jurisdictions DOE plans to transport spent nuclear fuel and high-



Dry Transfer System

NRC, and we have worked with Transnuclear Corporation to develop a detailed generic design for the system.

We submitted a Topical Safety Analysis Report for the dry transfer system to the NRC in September 1996, and in October 1996 the NRC accepted it for further

level radioactive waste. This assistance includes training public safety officials of appropriate units of local government. Training will cover procedures required for safe routine transportation of these materials, as well as procedures for responding to emergency situations. The Department's Office of the General Counsel determined that Section 180(c) applies

only to shipments to a facility developed under the authority of the Nuclear Waste Policy Act—that is, a repository for spent nuclear fuel and high-level radioactive waste, or a monitored retrievable storage facility constructed under the Nuclear Waste Policy Act.

To implement Section 180(c), we published a Notice of Revised Proposed Policy and Procedures for comment in the *Federal Register* on July 17, 1997. Publication met a commitment made in the Secretary's Performance Agreement with the President for Fiscal Year 1997. Publication of a final Notice of Policy and Procedures in Fiscal Year 1997 was a milestone in our May 1996 revised *Program Plan*, but because our current planning assumptions tie the start of waste shipments to the opening of a repository in 2010 and because the Yucca Mountain site's suitability for a repository has not yet been determined, we decided that it would be premature to publish a final Notice so far in advance of the selection of actual transportation routes. We published another revised proposed policy on April 30, 1998, which summarized the comments we received on the previous Notice and responded to specific issues raised.

Several of the organizations with which we maintain cooperative agreements have provided valuable input to the development of policies and procedures to implement Section 180(c). We have also received comments responding to previous *Federal Register* Notices on Section 180(c) and have participated in public forums, such as the Transportation External Coordination Working Group, described below, to obtain their views on particular implementation issues, such as eligibility for and the timing of grants as well as the percentage of funds that may be used to purchase equipment.

We intend to implement Section 180(c) through a grants program. The Department would administer the grants, which would be made for activities specified under the policy and procedures for implementing Section 180(c). OCRWM will adopt, to the extent practicable, any future Department-wide standardization of assistance to States and Tribes for the Department's shipments of radioactive materials.

We expect to know approximately 4 years prior to shipment through which State or Tribal lands the

shipments will travel, even if specific routes have not been selected. Using this information, the Department will notify these jurisdictions about their potential eligibility for the Section 180(c) grants.

### *Transportation External Coordination Working Group*

Co-chaired by OCRWM and DOE's Office of Environmental Management, this group is the primary mechanism for coordination among OCRWM and other DOE elements, other government organizations, and outside entities with responsibility for, or interest in, DOE transportation activities. Members include personnel from various DOE programs, national and regional organizations representing State, Tribal, and local governments; professional associations; and industry organizations.

Meetings are open to the public and are held twice a year to exchange information and identify issues. Participants report back to their member organizations to share information and materials from the meetings and to seek further input.

At the January and July 1997 meetings, OCRWM staff participated in topic groups that addressed route identification, funding and technical assistance for emergency preparedness, railroad operational issues, and training. Our staff provided program updates at the plenary sessions. The topic groups reported their views to the full membership at each of the meetings. The views they expressed are contributing to our implementation of Section 180(c) and to our development of the procurement initiative for waste acceptance and transportation services.

### *Transportation workshops*

We sponsored two public workshops to discuss transportation of commercial spent nuclear fuel and Government-managed nuclear waste. One was held in Dallas, Texas, August 7-8, 1997; the other in Reston, Virginia, August 12-13, 1997. The workshops drew over 100 people with varying views of transportation activities. Participants included representatives of industry, State and Tribal governments, environmental organizations, and members of the public.



The workshops provided a forum for open discussions in which participants could express their own views and listen to those of others. On the first day of each workshop, participants had the opportunity to provide public comments and submit statements for the record. During the second day, summary reports from the breakout sessions, public comments, and statements submitted for the record were recorded. Information from these workshops is posted on the OCRWM Home Page; it includes the lists of attendees, the transcripts of their reports, and public comments submitted.

*Transportation cooperative agreement groups*

OCRWM maintains cooperative agreements with nine stakeholder organizations, identified in Chapter Four. During Fiscal Year 1997, our staff participated in meetings sponsored by these organizations to provide them with updates on our transportation planning and to respond to questions about our transportation program. Frequent communication with these groups enables us to provide them with current information and to learn their views and understand their concerns.



# Chapter Three

## Program Management

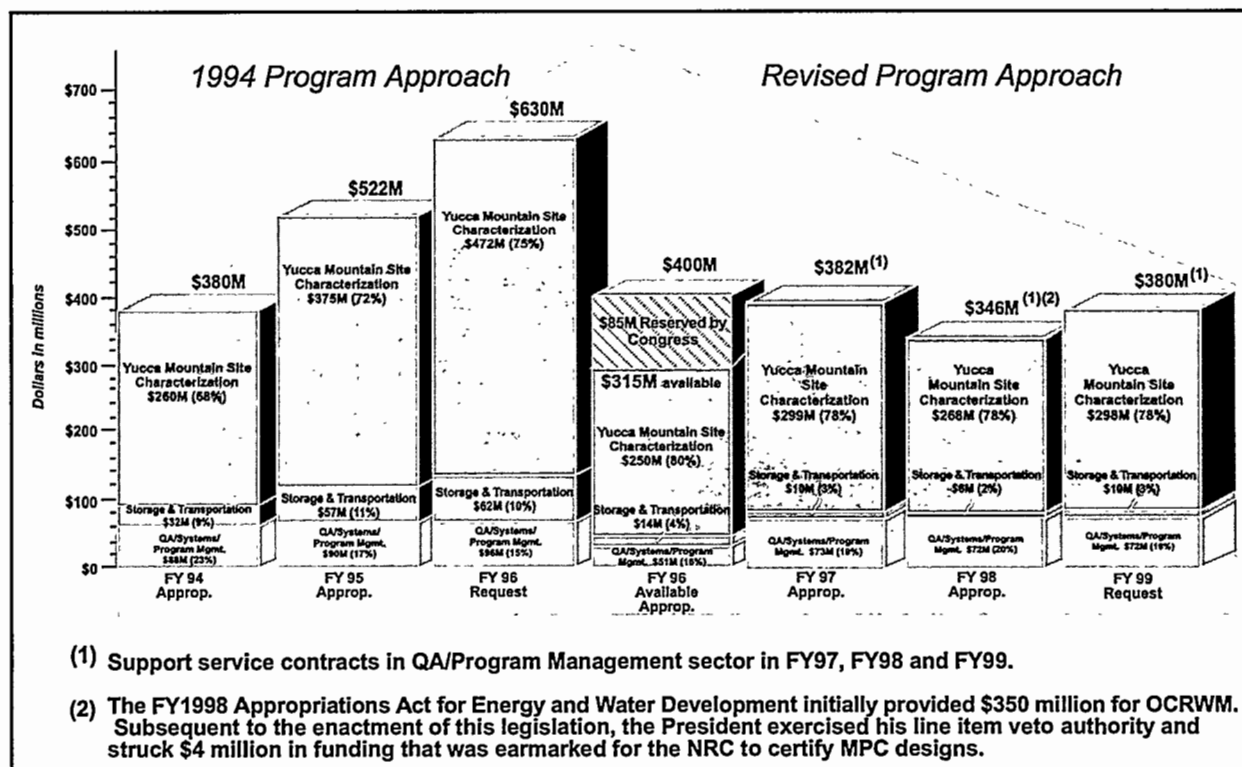
OCRWM's Director, Daniel A. Dreyfus, the third permanent Director of our program, resigned effective January 18, 1997. Lake H. Barrett, Deputy Director, was appointed Acting Director, the ninth person to hold the position since the program's inception in 1983.

### Adapting to Budget Cuts

While the Fiscal Year 1997 appropriation of \$382 million was slightly higher than that for Fiscal Year 1996, it was \$18 million less than the Administration's request. In the conference report accompanying the Fiscal Year 1997 Energy and Water Development Appropriations Act, Congress directed OCRWM to

"refocus the repository program on completing the core scientific activities at Yucca Mountain" and to prepare the viability assessment by September 30, 1998. In accordance with this direction, we allocated 85 percent of our Fiscal Year 1997 appropriation to the Yucca Mountain Site Characterization Project to ensure successful completion of the viability assessment.

The remainder of the appropriation was used to support the Waste Acceptance, Storage and Transportation Project, which received 3 percent, and the Program Management Center, which received 12 percent. Funding for the latter shrank by almost half from Fiscal Year 1995 to Fiscal Year 1997. (See Figure below.)

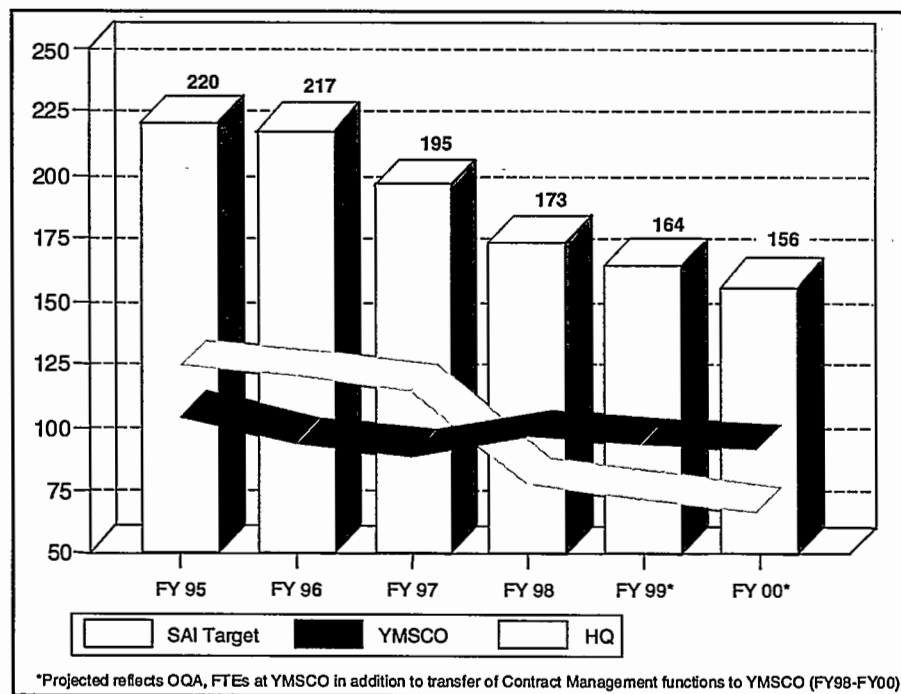


Budget Distribution Comparison

Consequently, a major challenge has been adapting to funding reductions and meeting program objectives with greatly reduced contractor support—a challenge that has required continuing management attention. In Fiscal Year 1997, we completed the restructuring of our organization and narrowed our work scope to reflect congressional guidance.

## Managing Our Human Resources

In accordance with the Department's Strategic Alignment Initiative, OCRWM's staffing levels have continued to shrink, as depicted below, and reductions are projected through Fiscal Year 2000. For Fiscal Year 1997, our Strategic Alignment Initiative staffing goal was 195. By the end of the fiscal year, through attrition, buy-outs, resignations, and reassignments, the number of full-time-equivalent staff positions was reduced from 213 to 202.



OCRWM Strategic Alignment Initiative Staffing Levels

Retaining the appropriate skills mix in our staff while achieving target staffing levels remained a program priority that received careful analysis and consideration. Our Fiscal Year 1998 Strategic

Alignment Initiative staffing goal of 173 could not be attained without involuntary separations; accordingly, we conducted a reduction-in-force early in Calendar Year 1998.

We continued to promote and support career development opportunities through formal training, rotational assignments, mentoring, and personnel details. In a collaborative effort by employees, supervisors, and managers, Individual Development Plans were prepared for our employees to guide training and staff development. To foster continuous improvement and excellence, OCRWM continued to participate in numerous departmental awards programs.

## Managing Contractor Support

During Fiscal Year 1997, OCRWM's support service contractor costs remained below the ceilings mandated by the Secretary's Strategic Alignment Initiative.

We continued implementation of contract reform initiatives for our management and operating contract in such areas as performance-based fee arrangements, use of the Department's streamlined approach to business management oversight, and strengthened environmental, safety, and health requirements. These innovations eliminate unnecessary and costly processes and reviews, and provide incentives for improved contract performance. TRW Environmental Safety Systems, Inc., the OCRWM management and operating contractor, also simplified its

purchasing system and introduced industry "best practices" that resulted in lower acquisition costs.

We transitioned all programwide management and technical support services to the Booz-Allen &

## Results-Oriented Government

Traditionally, federal agencies have used the amount of money directed toward their programs, or the level of staff deployed, or even the number of tasks completed as some of the measures of their performance. But at a time when the value of many federal programs is undergoing intense public scrutiny, an agency that reports only these measures has not answered the defining question of whether these programs have produced real results. Today's environment is results-oriented. Congress, the executive branch, and the public are beginning to hold agencies accountable less for inputs and outputs than for *outcomes*, by which is meant the results of government programs as measured by the differences they make, for example, in the economy or program participants' lives.

Congress' determination to make agencies accountable for their performance lay at the heart of two landmark reforms of the 1990s: the Chief Financial Officers (CFO) Act of 1990 and the Government Performance and Results Act of 1993 (GPRA). With these two laws, Congress imposed on federal agencies a new and more businesslike framework for management and accountability. In addition, GPRA created requirements for agencies to generate the information congressional and executive branch decision makers need in considering measures to improve government performance and reduce costs.

*from The Executive Guide: Effectively Implementing  
the Government Performance and Results Act (GAO/IGD-96-118, June 1996)*

Hamilton, Inc., contract, fully integrating those activities at headquarters and the Yucca Mountain Site Characterization Office in Las Vegas, Nevada.

### Integrating our Planning, Budgeting, and Reporting Functions

#### *Planning activities under GPRA*

Enacted in 1993 to promote performance and accountability in government, the Government Performance and Results Act (GPRA) took effect with the Fiscal Year 1999 budget cycle. It requires that each agency (1) prepare, for submission with its annual budget request, an annual performance plan that identifies milestones and performance indicators; (2) report to Congress each year on progress made under its plan; and (3) prepare a strategic plan every 3 years covering the fiscal year in which it is submitted and at least 5 fiscal years forward.

During 1997, OCRWM participated in the development of the Department's September 1997 Strategic Plan, and prepared a Five-Year Planning Summary and a Fiscal Year 1999 Performance Plan as part of the Department's Fiscal Year 1999 internal review budget process. The Fiscal Year 1999 performance measures

developed by OCRWM were included in the Department's Fiscal Year 1999 Performance Plan, which was submitted with the Fiscal Year 1999 budget request.

Although GPRA's requirements for a strategic plan and an annual performance plan and performance report are directed at executive branch agencies, OCRWM applied key GPRA provisions to its own planning activities. In Fiscal Year 1997, OCRWM began to update and integrate its strategic and multi-year program plans into a single, preliminary draft document—the *OCRWM Program Plan, Revision 2*. This plan will be directly linked and traceable to objectives, strategies, and success measures in the Department of Energy's September 1997 Strategic Plan, as well as its Five-Year Planning Summary, Fiscal Year 1999 Annual Performance Plan, and Fiscal Year 1999 budget request.

Prior to participating in the Department's implementation of GPRA for the Fiscal Year 1999 budget cycle, OCRWM developed GPRA-compliant commitments and performance measures in Fiscal Year 1997 that were included in the Secretary of Energy's Performance Agreement with the President for that year. All of OCRWM's commitments (reproduced on the inside front cover of this report) were fully met.

We expect that the use of GPRA-compliant, performance-based planning and reporting methods will produce benefits by focusing management attention on mission-directed outcomes.

## Strengthening Program Management and Integration

### *Management systems*

In Fiscal Year 1997, we developed a draft management policy document that consolidates management system requirements, processes, and practices necessary to manage OCRWM's program. To be finalized in Fiscal Year 1998, the policy document is designed to yield the following benefits:

- A program/project management system that functions efficiently and effectively, producing products and services that are timely and of high quality, at the lowest possible cost.
- Clear definitions of accountability, responsibility, and authority. The policy is anchored in a performance-based approach that promotes accountability of both Federal employees and contractors, which includes any organization/agency expending funds in the performance of the program's authorized work scope.
- Clear demonstrations of accountability to program customers and the public. By codifying management policies and requirements, this document will further the understanding of how OCRWM carries out its mission; implementation will produce performance that demonstrates accountability.
- A sharp reduction in paperwork. Previous requirements were difficult to implement, entailed cumbersome improvement processes, and produced voluminous, duplicative paperwork. The management policy document replaces numerous documents with one integrated document.

The policy is designed to be consistent with the requirements of GPRA, described above, and to comply with DOE Order 430.1, "Life Cycle Asset

Management." This Order establishes a performance-based approach to cost estimating, systems engineering, and project management processes, and states minimum requirements in those areas. It is supplemented by the Joint Program Direction on Project Management issued by DOE's Offices of Energy Research, Environmental Management, Defense Programs, and OCRWM. Departmental Good Practice Guides are also available to assist with performance-based management.

DOE Order 430.1 reduces the number of DOE documents governing program and project management, and it delegates responsibility for defining management requirements to programs/projects. Under this DOE Order, in a September 28, 1995, memorandum, the Secretary designated the Civilian Radioactive Waste Management Program a Strategic System based on its size and importance. This designation means that the program's components are now managed as a single integrated entity rather than as separate, independent projects. The Secretary also delegated to OCRWM's Director responsibility for two of the four decisions deemed critical under the Strategic System designation: approval of mission need and approval of the start of construction. The Secretary retains approval of baselines and approval to start operations after construction is complete.

### *Baselines: controlling technical scope, cost, and schedule*

OCRWM uses common business practices and standard project management tools to manage what is a large, complex undertaking. We baseline our scope of work, prepare schedules for specific activities, cost those activities out to establish a cost baseline, and establish key milestones by which performance can be measured. These milestones are approved and issued as the schedule baseline. A hierarchy of baselines governs the program, ranging from a very summary Secretarial level, through the Director's level and project level, to the highly-detailed contractor level.

Because baselines are the management tool used to measure project performance, they must be closely controlled if they are to be accurate and realistic. As the program evolves, as funding levels fluctuate, and as work scope changes, baselines are modified by means of controlled changes that are reviewed and approved

by baseline change control boards at the program, project, and contractor levels.

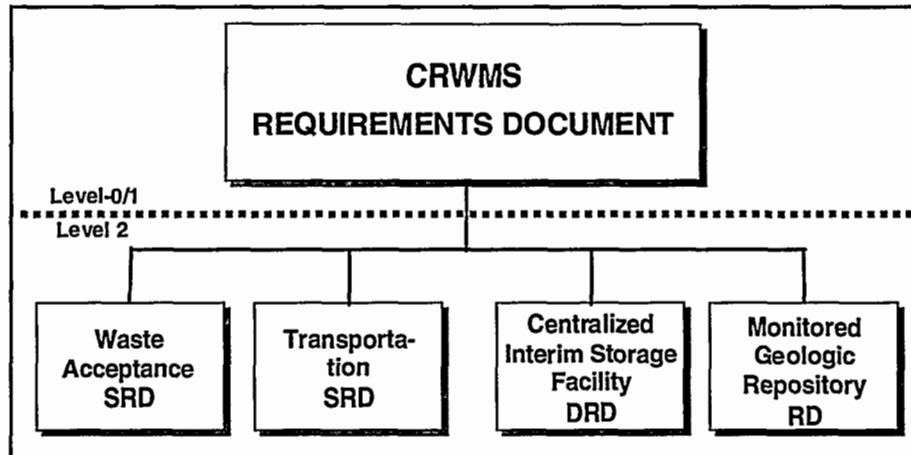
The baseline management process outlined in the draft management policy document described above ensures that these baselines are clearly defined and controlled at the appropriate level of authority. It also ensures that deliverables satisfy the technical and operational requirements derived from mission and programmatic needs.

During Fiscal Year 1997, the cost and schedule components of the baseline were updated to reflect the current fiscal year appropriation and the next year's congressional budget request. We also evaluated the impacts on the technical baseline of incorporating the two waste forms proposed for surplus weapons-grade plutonium: immobilized surplus weapons-grade plutonium and mixed oxide spent fuel. Because the impacts were determined to be manageable and acceptable, we initiated a formal change proposal to modify the program baseline to incorporate them. Work continued on fully integrating into our planning for the waste management system both DOE and Naval spent nuclear fuel, which had been incorporated into the program baseline in Fiscal Year 1996. Commercial spent nuclear fuel and high-level radioactive waste were part of the original program baseline.

Reports on OCRWM performance against the technical, cost, and schedule baselines were submitted to the Secretary on a quarterly basis and presented at bimonthly Director's Program Review meetings and monthly project management review meetings.

***Controlled documents: defining an evolving waste management system***

The technical baseline is the reference set of technical requirements, design information, and data that establishes the basis for design, construction and/or procurement of the components of the Civilian Radioactive Waste Management System (CRWMS).



CRWMS Technical Baseline – Level 0, 1, & 2

The CRWMS technical baseline consists of a *CRWMS Requirements Document* and the appropriate project-level documents necessary to define the CRWMS systems, structures, and components and to provide a well-documented basis for their design. The figure below shows the hierarchy of CRWMS technical baseline documents.

In November 1996, we issued Revision 3 of the *CRWMS Requirements Document*; it streamlined the program technical baseline and delegated control of the four *System Requirements Documents* to the Yucca Mountain Site Characterization Project and the Waste Acceptance, Storage and Transportation Project.

In June 1997, we issued the *Total System Description*, Revision 0, which presents a top-level description of the Federal waste management system and its operations as currently conceived. This document is consistent with other key program documents and provides guidance for total system life cycle cost analyses, systems studies, and planning. Intended as a common frame of reference for program participants, regulators, oversight bodies, and stakeholders, it is posted on the OCRWM Home Page.

***Systems integration: controlling interfaces and understanding effects***

Systems integration and systems engineering are fundamental to safe, efficient, cost-effective design and operation of the CRWMS. The Nuclear Waste Technical Review Board has long urged special attention to these functions, and a principal reason we

engaged a management and operating contractor was to ensure that they are performed effectively.

Systems studies conducted only for the geologic disposal system are discussed in Chapter One. To integrate all components of the CRWMS, we also conduct systems studies for issues that crosscut the program. In Fiscal Year 1997, we conducted the following studies:

- *The Preliminary Analysis of the Early Receipt Contingency Study* developed and discussed a list of issues associated with early receipt of commercial spent nuclear fuel at the repository.
- *The Repository Early Receipt Contingency Study* addressed the technical, cost, schedule, regulatory, and programmatic impacts of providing early receipt of spent nuclear fuel and high-level radioactive waste at repository surface facilities.
- *The Analysis of Potential Program Funding Constraints* analyzed potential impacts on the CRWMS of constrained funding in Fiscal Years 2003 through 2010, and it identified possible mitigation strategies.
- *The Early Reactor Shutdown Study* analyzed the impacts on fee income and interest plus the impact on program costs of early reactor shutdown (shutdowns before the projected end-of-reactor life).
- *Advantages and Disadvantages of Disposal of Site-Generated Wastes at the Repository* was a high-level study that characterized the advantages and disadvantages of disposing of low-level radioactive, hazardous, and mixed wastes at the repository.
- *The Preliminary Evaluation of the Disposability of Commercial Dual Purpose Canisters* provided an initial technical assessment of CRWMS capability to dispose of commercial dual purpose canisters.
- *The Analysis of Using All Legal Weight Trucks for Transportation* provided scoping information

on all transportation that would be conducted within Nevada for the CRWMS. The report provided input for the draft repository environmental impact statement.

We also developed the CRWMS process for interface management, which establishes the responsibilities and process for the development of interface control documents.

#### ***Regulatory coordination***

Regulatory coordination helps to ensure that the OCRWM program is in compliance with all applicable Federal, State, local, and Native American Tribal requirements and with departmental orders and directives; it also helps to ensure that OCRWM program activities are consistent with the activities of other programs within the Department. In Fiscal Year 1997, we reviewed and participated in the preparation of three departmental programmatic and project-specific environmental impact statements, reviewing them against OCRWM's revised *Program Plan*. We also participated in a departmental working group to support the requirements of Executive Order 12898 on environmental justice.

Regulatory coordination also involves interacting with the NRC on matters related to repository licensing, licensing of an interim storage facility, and transport of spent nuclear fuel; coordinating the Department's position on the development of new EPA radiation protection standards and resulting revisions to NRC licensing regulations; and amending the siting guidelines for the repository. These efforts are reported in Chapters One and Two.

#### ***Safeguards and security***

To obtain authorizations from the NRC to construct, operate, and close a repository, OCRWM must demonstrate that it complies with NRC requirements for a nuclear safeguards and security program. Utilities already have such programs in place, as a condition of the NRC licenses they hold. OCRWM must develop a program that will ensure that once utilities' spent nuclear fuel is accepted by the CRWMS, it is safely and securely managed. This same requirement will apply to Government-managed nuclear materials.



In Fiscal Year 1997, we established a task team that began planning for a safeguards and security program that will provide an internally consistent approach to meeting these requirements. Our preliminary efforts include consultations with the Office of Environmental Management and the Office of Naval Reactors, whose wastes will be encompassed by this program. After we develop a program policy, those two offices and our two projects will develop implementing procedures to ensure that CRWMS facilities and activities are in compliance with all applicable safeguards and security requirements specified by the NRC.

## Preparing to Accept Government-Managed Nuclear Materials

### *Incorporating Government-managed nuclear materials into the CRWMS*

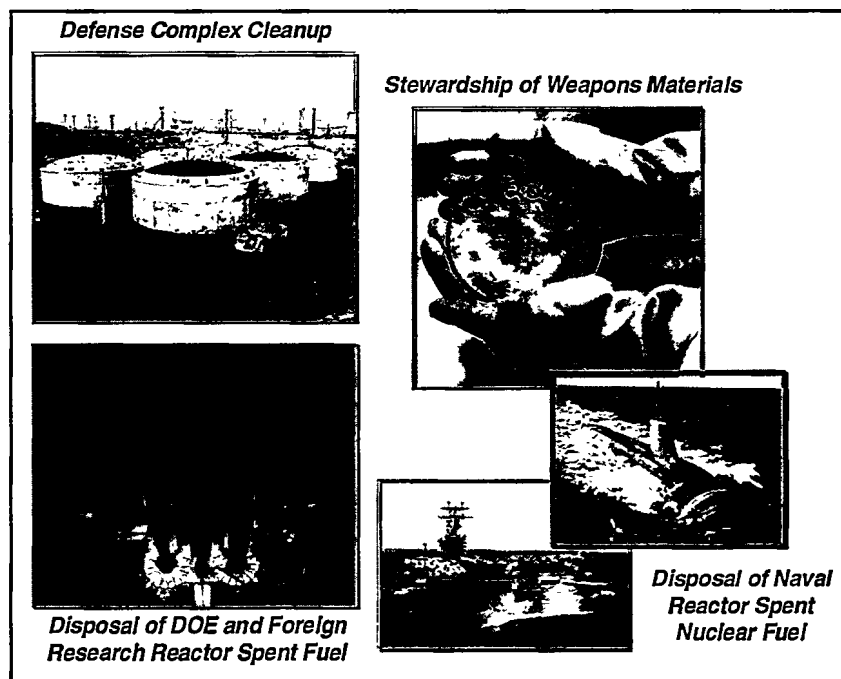
Integrating Government-managed nuclear materials into the CRWMS has impacts that cut across our program, affecting the following:

- Baselines
- Waste acceptance criteria and protocols, safeguards verification, and the application of quality assurance
- Waste package design
- Interim storage facility design and operations
- Repository design and operations
- Performance assessments conducted to determine site suitability and obtain an NRC license
- The licensing strategy
- Cost allocation
- Potential storage
- Transportation—not only hardware for shipping and handling, but the full array of logistical and administrative functions that transportation entails
- Record-keeping at every step of the process by which waste is transferred to OCRWM's custody, transported to the repository, and disposed of

The subject is also addressed in Chapter One of this report, within the context of waste package and repository design, total system performance assessment, and the environmental impact statement; in Chapter Two, within the context of contingency planning for interim storage and transportation; and in this chapter, within the context of baseline control and below.

### *The decision path to disposal of Government-managed nuclear materials*

Stored at multiple sites, Government-managed nuclear materials take forms that vary widely, and some have not yet been converted to final disposal forms. The sidebar that follows summarizes information about Government-managed nuclear materials. While current planning assumes that they will be emplaced in the



Government-Managed Nuclear Materials Destined for Geologic Disposal

### Sources of Government-Managed Nuclear Materials and Current Planning Assumptions

*Note:* Quantities below are estimated through the year 2035.

#### *High-level radioactive waste*

In 1985, when the President determined that high-level radioactive waste resulting from atomic energy defense activities could be disposed of in the civilian repository, DOE and Naval spent nuclear fuel were being reprocessed. Those reprocessing wastes are stored at DOE's Idaho National Engineering and Environmental Laboratory, the Hanford Site, and the Savannah River Site, in the form of sludges, slurries, and calcines. They would be accepted at the repository only in solid form, and the Department plans to vitrify these wastes as borosilicate glass logs. The logs will be safely stored near the vitrification site, in the canisters the glass is poured into, until they are picked up by OCRWM. Approximately 19,000 canisters will require disposal. At the Savannah River site, vitrification has begun.

The West Valley Demonstration Project in New York State, a facility now managed by DOE, is vitrifying high-level radioactive waste that resulted from commercial reprocessing of spent nuclear fuel. Approximately 300 canisters of vitrified waste will be produced.

#### *DOE spent nuclear fuel*

DOE originally intended to reprocess most of its spent nuclear fuel, and spent nuclear fuel was reprocessed at a number of Federal sites, dating back to the 1940's. In 1992, the Secretary discontinued the practice, and the remaining intact spent nuclear fuel was placed in storage pending ultimate disposition. In 1995, concluding the development of a programmatic environmental impact statement that evaluated options for disposal, DOE issued a Record of Decision stating its intention to dispose of its spent nuclear fuel in a geologic repository and to store it regionally, largely on the basis of fuel composition. A 1996 Record of Decision for foreign research reactor spent nuclear fuel determined that most of it would be stored at the Savannah River site.

The total inventory of DOE spent nuclear fuel is projected to be approximately 2,655 MTHM.

- *Hanford Site.* The Hanford site in Washington State has most of the DOE inventory: 2,132 MTHM, most of it generated in the N-reactor for use in the weapons program. The Department plans to place this spent nuclear fuel, which is metallic-based, in dry storage at that site.
- *Savannah River Site.* The Department has designated this site, in South Carolina, for storage of aluminum-based spent nuclear fuel from domestic and foreign research reactors. The uranium in foreign reactor fuel was originally exported by the U. S. Government under the Atoms for Peace program. In keeping with nuclear non-proliferation policies, it is being returned to this country and placed under DOE management. Of the 19.2 MTHM projected to be returned, 18.2 will be stored at the Savannah River Site.

- *Idaho National Engineering and Environmental Laboratory.* The 230 MTHM of DOE spent nuclear fuel stored at this site originated in activities to promote the peaceful uses of atomic energy, beginning with the passage of the Atomic Energy Act of 1954. (The Naval spent nuclear fuel at this site is addressed below.) The inventory includes spent nuclear fuel from demonstration reactors, from research and development activities, and from activities to demonstrate storage technologies and characterization for disposal. The research reactor fuel stored at this site is not aluminum-based; it will include MTHM foreign research reactor spent nuclear fuel.
- Debris from the Three Mile Island reactor is also stored at this site. Under a consent agreement between the Federal Government and the State of Idaho, all spent nuclear fuel stored in that State must be removed by January 1, 2035.

The total projected inventory of DOE spent nuclear fuel includes some commercially irradiated spent nuclear fuel that DOE now manages. Some of the total DOE inventory is being evaluated to determine whether it requires treatment to make it suitable for disposal.

#### *Naval spent nuclear fuel*

The Department of the Navy fabricates its own nuclear fuel for its nuclear-powered vessels using uranium-235 leased from DOE. For many years, Naval spent nuclear fuel was shipped to the Idaho Chemical Processing Plant, where DOE reprocessed it to recover the uranium. Following DOE's termination of reprocessing in 1992, an agreement was reached in October 1995 between the Federal Government and the State of Idaho to allow the temporary storage of Naval spent nuclear fuel at the Idaho National Engineering and Environmental Laboratory. Under the consent agreement, Naval spent nuclear fuel will be among the first shipments to a repository. In 1996, the Navy issued a Record of Decision stating that it would store its spent nuclear fuel in dual purpose canisters in Idaho prior to shipping it to a geologic repository for disposal. The inventory will total approximately 65 MTHM.

#### *Surplus weapons-grade plutonium*

Recovered primarily from dismantled nuclear warheads, this material is stored primarily at the DOE Pantex site in Texas. Approximately 50 MTHM will be dispositioned to support national non-proliferation objectives. On January 21, 1997, the Department published a Record of Decision stating that it was considering a dual-track strategy for immobilizing its surplus weapons-grade plutonium and that it intended to dispose of the final waste forms in the geologic repository under the Nuclear Waste Policy Act of 1982, as amended. Thirty-three MTHM may be converted to a mixed oxide fuel that would be burned in commercial light water reactors; the resulting spent nuclear fuel would be stored at the reactor sites until OCRWM picked it up.

The remaining 17 MTHM could be immobilized in a glass or ceramic waste form and placed in small stainless steel cans that would be arrayed in a canister that would be filled with molten glass mixed with high-level radioactive waste. The high-level radioactive waste would increase the radioactivity of the waste form to meet the spent fuel standard under safeguards and security requirements. The waste forms would be stored at a high-level radioactive waste storage site to be designated.

civilian repository, the Department's plans for disposing of these materials are still evolving. The specific impacts of disposal will be carefully evaluated in the total system performance assessment that supports the viability assessment in Fiscal Year 1998. That assessment will also support the environmental impact statement, which will evaluate the impacts of transporting and disposing of the waste forms in the repository. Any recommendation of a site by the Secretary to the President must be accompanied by the final environmental impact statement as well as a discussion of data obtained through site characterization relating to the safety of the site, preliminary comments of the NRC, views of the Governor and legislature of Nevada, and other pertinent information. A subsequent total system performance assessment supporting a license application to the NRC would also evaluate the impacts of disposal of Government-managed nuclear materials.

As described in Chapter One, work to evaluate these impacts was under way in Fiscal Year 1997.

#### *Fiscal Year 1997 activities*

Because integrating these wastes into the CRWMS requires close coordination with the producers and custodians of these materials, in Fiscal Year 1997, a primary focus of efforts at OCRWM headquarters was enhancing integration and coordination with the four offices within the Department that manage these materials, and between OCRWM headquarters and the Yucca Mountain Site Characterization Office.

Two of those offices are within the Environmental Management Program: the Office of Waste Management, which is responsible for high-level radioactive waste, and the Office of Nuclear Materials and Facility Stabilization, which is responsible for DOE spent nuclear fuel. The other offices are the Office of Fissile Materials Disposition, responsible for surplus weapons-grade plutonium, and the Office of Naval Reactors, responsible for Naval spent nuclear fuel.

For some years, OCRWM has been working to prepare to accept Government-managed nuclear materials. During Fiscal Year 1997, we continued to work with the Office of Environmental Management and the Office of Naval Reactors to develop the terms of memoranda of agreement that define each party's

responsibilities for safe and timely disposal of their wastes.

Both memoranda will address waste acceptance, transportation, storage (if needed), and disposal. We currently plan to accept wastes at Environmental Management Program sites and transport them to the repository, and we are working to develop the capability to begin picking up DOE spent nuclear fuel for disposal as early as 2010, the year in which the repository would begin operations. The Office of Naval Reactors expects to transport its spent nuclear fuel to the repository.

Identification of data needs and definition of interface descriptions are also addressed. The memoranda will establish a process for determining waste acceptance schedules similar to those OCRWM has developed for utilities under the *Standard Contract*: the schedules will define what wastes will be picked up, where, and when. Development of waste acceptance criteria and compliance procedures needed to support the repository license application to the NRC are provided for, as is development of transportation systems that will meet applicable NRC and Department of Transportation requirements for shipping.

The memoranda will require cooperation to ensure that all waste acceptance activities are performed safely, securely, and cost-effectively, in a manner that contributes to public understanding of DOE goals and activities and complies with applicable regulations. They will establish a schedule for payment of fees to OCRWM equivalent to those paid by utilities. Equitable sharing of direct costs, common variable costs and unassignable costs is to be achieved through the methodology described in the *Federal Register* Notice identified in Chapter Five of this report. The parties are to coordinate in developing annual budget justifications to the Office of Management and Budget and presentations for congressional hearings. The desired results are sound integration of planning and consistency in communication.

No memorandum of agreement was initiated with the Office of Fissile Materials Disposition, as it was still developing its plans, but we continued to coordinate informally with that office's staff to ensure that all necessary technical interfaces are identified.

### Coordination on quality assurance

Close coordination with producers and custodians of Government-managed nuclear materials is essential to ensure that they appropriately apply our quality assurance (QA) requirements to activities that could impact our acceptance and disposal of their wastes. In Fiscal Year 1997, we continued our interactions on QA with the Office of Environmental Management and initiated formal interactions with the Office of Naval Reactors. Our activities included QA audits and surveillances, information exchange, and guidance on applying OCRWM's quality assurance requirements.

### Planning for allocation of repository capacity

The Nuclear Waste Policy Act of 1982 places a statutory cap of 70,000 MTHM on the quantity of waste that can be emplaced in the first repository until a second repository is in operation. The CRWMS planning basis for Fiscal Year 1997 allocated 10 percent of the 70,000 MTHM cap to Government-managed nuclear wastes. Of that 7,000 MTHM, two-thirds would be high-level radioactive waste; one-third DOE and Naval spent nuclear fuel and surplus weapons-grade plutonium waste forms.

For the viability assessment, the base case assumed for the total system performance assessment, which does not include surplus plutonium waste forms, converts these proportions into numbers of waste packages: 7,667 waste packages for commercial spent nuclear fuel; 2,546 waste packages for high-level radioactive waste, Naval spent nuclear fuel, and DOE spent nuclear fuel.

All waste packages would be very similar in design, but because those containing commercial spent nuclear fuel will be very hot, under current planning assumptions they would be spaced far apart in the emplacement drifts, and cooler waste packages, containing non-commercial wastes, would be placed between them—a design strategy that optimizes the use of the area that must be excavated, and thus minimizes cost.

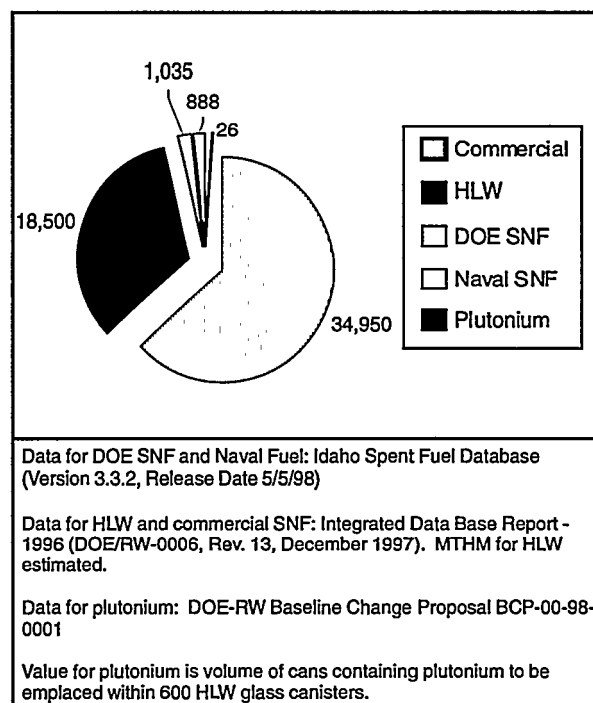
OCRWM's planning horizon extends to the year 2035, which marks the expiration of all currently held

operating licenses for commercial reactors and the last year for which the Office of Environmental Management believes it can reliably project its operations for planning purposes. The total inventories of commercial and Government-managed nuclear materials projected through that date exceed 70,000 MTHM.

The map on page 12 shows the location of all nuclear materials destined for geologic disposal. The tables and figures below report quantities projected through 2035 and allocation of first repository capacity.

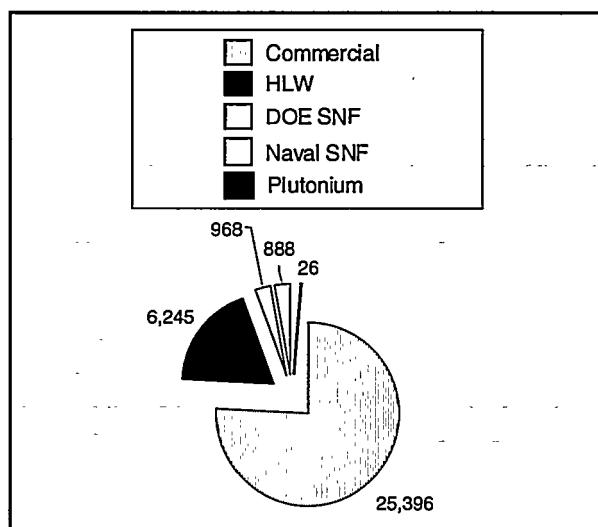
Quantities of Nuclear Materials Destined for Geologic Disposal			
Type	MTHM***	Volume (cubic meters)	Canisters
Commercial SNF*	86,700	34,950	Not applicable
HLW**	9,650	18,500	19,300
DOE SNF	2,660	1,035	Not applicable
Naval SNF	65	888	300
Plutonium	17	26	600

\*Spent Nuclear Fuel \*\*High-Level Radioactive Waste \*\*\*Metric Tons Heavy Metal



Total Volume of Nuclear Materials Destined for Geologic Disposal (cubic meters)

Allocation of First Repository Capacity				
Type	MTHM	Volume (cubic meters)	Canisters	Waste Packages
Commercial SNF	63,000	25,396	Not applicable	7,667
HLW	4,667	6,245	8,314	1,483
DOE SNF	2,268	968	Not applicable	658
Naval SNF	65	888	300	300
Plutonium	17	26	600	300



Figures are extrapolated from base case planning assumptions adopted for the total system performance assessment to be conducted for the viability assessment.

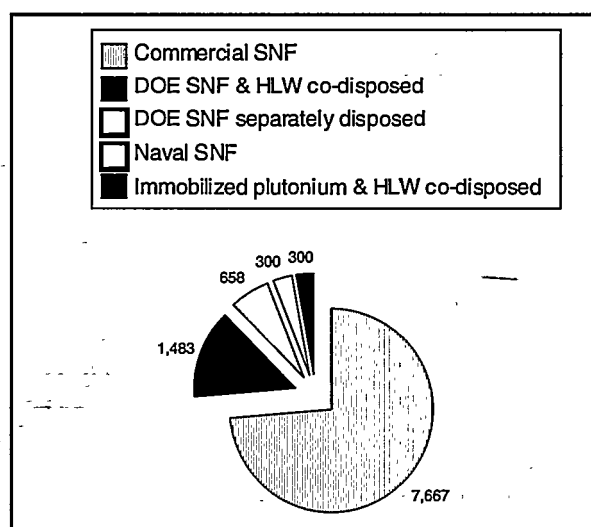
Of 19,000 total HLW canisters, 8,314 are to be dispositioned in the first repository, including all 302 West Valley canisters, all 5,915 Savannah River Site canisters, and 2,097 Hanford canisters. The dispositioned glass volume is calculated from these values.

Value for plutonium is the volume of cans containing plutonium to be emplaced within 600 HLW glass canisters.

Co-disposal of HLW assumes that 5 canisters of HLW and 1 canister of DOE SNF will be packaged in a single waste package.

Co-disposal of plutonium assumes that a single waste package will hold 2 canisters of HLW glass with plutonium and 3 canisters of HLW-only glass.

Allocation of First Repository Capacity in Volume (cubic meters)



Figures are extrapolated from base case planning assumptions adopted for the total system performance assessment to be conducted for the viability assessment.

Of 19,000 total HLW canisters, 8,314 are to be dispositioned in the first repository, including all 302 West Valley canisters, all 5,915 Savannah River Site canisters, and 2,097 Hanford canisters. The dispositioned glass volume is calculated from these values.

Value for plutonium is the volume of cans containing plutonium to be emplaced within 600 HLW glass canisters.

Co-disposal of HLW assumes that 5 canisters of HLW and 1 canister of DOE SNF will be packaged in a single waste package.

Co-disposal of plutonium assumes that a single waste package will hold 2 canisters of HLW glass with plutonium and 3 canisters of HLW-only glass.

Allocation of First Repository Capacity in Waste Packages

## Consolidating Quality Assurance Functions

OCRWM is committed to protecting public and worker health and safety, and the environment. To that end, we apply stringent QA standards to all work that affects the

near- and long-term radiological safety of the waste management system. Our QA program complies with NRC requirements, and it applies to quality-affecting work performed within OCRWM, as well as to quality-affecting work performed by external organizations, such as vendors who supply us with goods and services. By adhering to QA procedures in collecting and

maintaining the data we need for licensing and other purposes, we ensure that the NRC and other oversight bodies will accept the data as valid and traceable.

In Fiscal Year 1997, we consolidated the various QA organizations maintained by our management and operating contractor, the U. S. Geological Survey, and participating national laboratories into a single organizational unit reporting to the Director of OCRWM's Office of Quality Assurance. The consolidation was phased in over the course of the fiscal year and was carefully managed to ensure that our high quality standards were not compromised during the transition.

By consolidating these QA organizations, we significantly reduced overhead and infrastructure costs. We also increased the organizational independence of QA personnel and provided for greater consistency in interpretation and application of requirements across the program.

During Fiscal Year 1997, OCRWM's Office of Quality Assurance continued to implement its comprehensive audit and surveillance program. Audits and surveillances were performed to verify that our QA standards were being effectively implemented by all organizations that perform quality-affecting work. These audits and surveillances covered the full scope of operations of the Yucca Mountain Site Characterization Project and the Waste Acceptance, Storage and Transportation Project. In addition, we performed audits and surveillances of vendors supplying goods and services to us. Not only have these audits and surveillances resulted in early identification and correction of quality problems, they have proved to be effective tools for providing information that OCRWM managers can use to improve management processes.

## Getting the Most from Information Technologies

The strategic application of information technologies is vital to OCRWM's ability to carry out its mission. These technologies provide integrated information systems, solutions, and services that enhance the productivity of our employees, drive business process improvement efforts, and reduce program costs.

OCRWM's information management (IM) organization performs the following functions:

- It designs and develops information systems to support the management and disposal of the Nation's commercial spent nuclear fuel and Government-managed nuclear wastes.
- It provides a reliable infrastructure for effective and timely access to, and communication of, information.
- It ensures the integration and integrity of technical, regulatory, management, and financial data.
- It streamlines program work processes through automation, thus reducing the paperwork burden and increasing the productivity and job satisfaction of OCRWM's human resources.

In Fiscal Year 1997, we validated OCRWM's IM Strategic Plan, and we issued our IM Multi-Year Program Plan for Fiscal Years 1998-2002, as well as the IM Planning Guidance for Fiscal Year 1998. These efforts are directed at better integration of IM planning with overall program planning, greater efficiencies and economies in IM developmental and implementation efforts, enhanced productivity of IM staff, and consistent compliance with Federal and departmental IM regulations.

In Fiscal Year 1997, OCRWM:

- Maintained over 654,000 records
- Processed over 7,800 records per month
- Responded to over 3,100 help desk inquiries per month
- Maintained an e-mail system that processed over 298,000 messages per month
- Trained approximately 60 users per month in various systems and applications
- Managed over 130 hours of videoconferencing per month

- Tracked over 70 pieces of correspondence per month
- Maintained over 2,000 work stations

Overall customer satisfaction with our services was rated at 94 percent; computer network availability was consistently 99 percent; and the OCRWM Home Page—[www.rw.doe.gov](http://www.rw.doe.gov)—continued to be heavily visited.

We continued to streamline and integrate internal information systems that support assignment tracking, controlled correspondence, and management of critical data and information products such as speeches, testimony, issue papers, presentations, and briefings. These systems support the entire information product life cycle, from task assignment and tracking through the completion of product development, delivery, and dissemination. We also worked to incorporate Intranet and Internet technologies to more rapidly disseminate internal and external information. These information systems deliver substantial benefits:

- Instantaneous, simultaneous access across the program to accurate, complete, and consistent program data.

- More rapid response times and improvement in the caliber of information provided to meet the information needs of Congress and other parties.
- Electronic sharing of draft documents and immediate availability of new versions of controlled documents.
- Ready access to the Internet to disseminate information about the program and obtain information on policy, legislative, technical, scientific, and institutional matters.

In addition, we continued to apply state-of-the-art records management policies and practices to ensure support for repository licensing. Chapter One discusses planning for the Licensing Support System.

In Fiscal Year 1998, we will continue to manage the program's information infrastructure, develop useful products and services, and apply information technologies to improve business processes that support OCRWM's mission and objectives.



# Chapter Four

---

## *Working with External Parties*

Because of the unprecedented nature of OCRWM's mission, Congress designed this program to be one of the most closely scrutinized in the public arena: it is subject to exceptionally broad and intensive review, regulation, and oversight. Moreover, a host of stakeholders want and need information about our work and, in turn, we want and need the benefit of their views as we formulate our plans and assess our performance.

Although our external interactions have been curtailed in recent years because of funding cuts, we continue to be fully responsive to our regulators and oversight bodies. We also routinely provide information to other parties and actively solicit their views.

Because interactions with external parties are integral to our Yucca Mountain Site Characterization and Waste Acceptance, Storage, and Transportation Projects, they are discussed in Chapters One and Two. This chapter presents an overview of the range of interactions in which we are engaged.

### **Review, Regulation, and Oversight**

Parties that exercise review, regulation, and oversight functions over our program are listed below. Appendix C lists the hearings, briefings, and meetings held on OCRWM's program in Fiscal Year 1997 and the topics discussed at each. Appendix E lists selected publications issued by some of these parties in Fiscal Year 1997.

#### ***Congress***

Congress defines our statutory basis, appropriates funds, and monitors our progress. The congressional committees that exercise primary oversight of OCRWM's program are the Senate Committee on

Energy and Natural Resources, the House Commerce Committee, and the Energy and Water Development Subcommittees of the House and Senate Appropriations Committees.

#### ***General Accounting Office***

The General Accounting Office is an arm of Congress. It audits our program every year. It also reviews and reports on program activities in response to specific congressional inquiries and requests. In January 1997, it issued a report, *Impediments to Completing the Yucca Mountain Repository Project*.

#### ***Nuclear Regulatory Commission***

The Nuclear Regulatory Commission exercises a statutory role under the Nuclear Waste Policy Act. It defines regulatory standards for the protection of the public and the environment from radioactive releases associated with storage and disposal of high-level radioactive waste and spent nuclear fuel. It is responsible for certifying and licensing the components of the waste management system, including the repository, facilities for storing spent nuclear fuel, and transportation casks. It mandates quality assurance requirements and content requirements for license applications.

In Fiscal Year 1997, we continued prelicensing consultations with two offices at the NRC: the Office of High-Level Waste and the Spent Fuel Projects Office. The former interfaces with our Yucca Mountain Site Characterization Project on matters related to site characterization and the repository; the latter interfaces with our Waste Acceptance, Storage, and Transportation Project on non-site-specific issues associated with interim storage. Both NRC offices interface with the regulatory coordination group within

our Office of Program Management and Administration.

We continued our semiannual briefings to the Commission on our progress at Yucca Mountain, and we provided information to the Commission's Advisory Committee on Nuclear Waste, which reviews the work of Commission staff and makes recommendations to the Commission regarding the adequacy of that work.

#### ***Nuclear Waste Technical Review Board***

The Nuclear Waste Technical Review Board exercises a statutory and independent role established in the Nuclear Waste Policy Amendments Act of 1987. It must evaluate the technical and scientific validity of activities related to site characterization and to the packaging and transportation of high-level radioactive waste and spent nuclear fuel. The Board is required to report its findings, conclusions, and recommendations to Congress and the Secretary of Energy at least twice a year.

In March 1997, the Board released its 1996 Report to the U.S. Congress and the Secretary of Energy presenting its findings and nine recommendations for our program. The Board recommended that a decision on an interim storage facility be deferred until after the suitability of the Yucca Mountain site has been determined and that the program retain the advantages of standardization under the new transportation initiative previously offered by the multipurpose canister. Its recommendations also addressed technical issues related to the repository, such as design alternatives, additional site characterization, and total system performance assessment.

As in years past, we prepared a formal response to the Board's recommendations; it was issued in October 1997. With respect to design alternatives, we assured the Board that many design alternatives are under active consideration. A reference design has been developed for use in the viability assessment and, as scientific work progresses, we expect the design to evolve to reflect our increased understanding of the repository environment. In keeping with the Board's recommendation, we committed to accelerating the construction of a cross-drift over the proposed repository block. With regard to total system

performance assessment, we acknowledged that presenting highly technical information in a form readily comprehensible to the general public will be a challenge. We view good communication as essential to the success of our mission, and we are developing enhanced public outreach strategies. For some years, we have successfully used peer review and expert elicitation. In Fiscal Year 1997, we applied them to total system performance assessment and other tasks, and we will continue to use them.

During Fiscal Year 1997, the Board held three full Board meetings. Such meetings give the public an opportunity to observe the Board, OCRWM staff, and other scientists exchange information on technical issues. In April 1997, the Board restructured its seven technical panels into five, to more closely align them with OCRWM's current activities.

#### ***National Academy of Sciences***

The National Academy of Sciences Board on Radioactive Waste Management reviews our program on an as-requested basis, offering technical expert review and advice on program issues. On March 24-25, 1997, representatives of the Board met in Nevada to learn the status of site characterization and performance assessment, but the Board performed no reviews during Fiscal Year 1997.

#### ***Environmental Protection Agency***

The Environmental Protection Agency promulgates environmental radiation protection standards for the management and disposal of spent nuclear fuel. The Energy Policy Act of 1992 directed the agency to issue new radiation protection standards to apply specifically to the Yucca Mountain site. At the end of Fiscal Year 1997, new standards had not yet been issued.

#### ***Department of Transportation***

The Department of Transportation regulates transportation of highly radioactive materials, including spent nuclear fuel. Its regulations govern handling of shipping containers, labeling of containers and placarding of transport vehicles for identification purposes, driver training and certification, and highway routing.

### ***State of Nevada and affected units of local government***

The State of Nevada and ten affected units of local government have statutory roles under the Nuclear Waste Policy Act. In Fiscal Year 1997, by congressional direction, no monies were provided to support their oversight functions, but statutory Payments-Equal-to-Taxes were made to Nye County.

### ***OCRWM statutory reports***

The Nuclear Waste Policy Act requires us to submit to the Governor and legislature of the State of Nevada and to the NRC semiannual site characterization progress reports. Our 15th report, covering the period April 1996 through September 1996, was submitted in April 1997. The 16th was released in October 1997.

We submitted the *Annual Report* on OCRWM's activities and expenditures for Fiscal Year 1996 to Congress, as required by the Nuclear Waste Policy Act.

### **Soliciting the Public's Views and Sharing Information**

We solicit the thinking of other parties through formal and informal meetings and through use of the *Federal Register* and *Commerce Business Daily*. Some information presented below is discussed in greater detail in Chapters One and Two.

#### ***Comment solicitations***

In Fiscal Year 1997, OCRWM was actively addressing four open issues that involved solicitation of public comment. Extensive information about these issues was posted on the OCRWM Home Page.

- *Siting Guidelines*, 10 CFR Part 960. On December 16, 1996, we published in the *Federal Register* a Notice of Proposed Rulemaking to amend the Department's repository siting guidelines. On January 23, 1997, we held a public hearing to receive comments on the proposal in Las Vegas, Nevada. We extended the comment period three times, to a total of 151 days.

- *Environmental impact statement for the repository*. In Fiscal Year 1997, we resumed work to develop the environmental impact statement that must accompany a Secretarial recommendation of the Yucca Mountain site to the President and a license application to the NRC. In May 1997, we issued a summary of the approximately 1,000 comments we had received on scoping for the document. We also started consultations with Federal, State, and county agencies, Native American Tribes and organizations that have an historic or cultural interest in Yucca Mountain.
- *Waste acceptance and transportation services*: On December 27, 1996, we published a draft Request for Proposals to solicit comments from vendors and other parties on our approach to procuring waste acceptance and transportation services. On February 25, 1997, we held our second presolicitation conference, announced in the *Federal Register* and *Commerce Business Daily*, in Washington, D.C., to solicit vendors' views on technical and contractual issues. Two transportation workshops also generated information that helped us draft a revised Request for Proposals that was issued on November 24, 1997.
- *Transportation: Section 180(c) of the Nuclear Waste Policy Act*. On July 17, 1997, we issued a Notice of Revised Proposed Policy and Procedures to implement this statutory requirement for provision of technical and financial assistance to States and Native American Tribes through whose jurisdictions we will transport waste. The assistance is for the purpose of training public safety officials in routine transportation and emergency response procedures. We issued another Notice of Revised Proposed Policy and Procedures on April 30, 1998.

#### ***Cooperative agreements***

Cooperative agreements provide a means of facilitating the involvement of national, regional, and State organizations in our program. The agreements typically run for 5 years, with funding provided annually, subject

to availability. In recent years, funding has declined sharply.

In Fiscal Year 1997, we terminated funding for our agreement with the League of Women Voters Education Fund. We continued our interactions with the nine groups with which cooperative agreements remained in force: the Commercial Vehicle Safety Alliance; the Conference of Radiation Control Program Directors, Inc.; the Council of State Governments' Eastern Regional Conference and Midwestern Office; the National Association of Regulatory Utility Commissioners; the National Conference of State Legislatures; the National Congress of American Indians; the Southern States Energy Board; and the Western Interstate Energy Board.

#### ***Transportation meetings***

Transportation of radioactive waste to Federal facilities will affect and involve more parties than any other component of the program. Consequently, for many years we have interacted closely with many parties concerned with transportation planning, and in Fiscal Year 1997 we participated in numerous meetings on that subject.

The Transportation External Coordination Working Group, co-chaired by OCRWM and the Office of Environmental Management, is the principal forum for transportation planning. Members include personnel from various DOE programs, national and regional organizations representing State, Tribal, and local governments; professional associations; and industry organizations.

To provide a forum in which interested parties could discuss our transportation plans, we sponsored two 2-day, facilitated public workshops in Reston, Virginia, and Dallas, Texas. The workshops were announced in the *Federal Register*.

Our staff also participated in meetings on transportation-related issues sponsored by local environmental groups in Atlanta, Georgia, and South Bend, Indiana. Those

meetings were attended by representatives of the NRC and local agencies concerned with safety.

#### ***Interactions with other organizations***

OCRWM staff and contractors participated in numerous meetings and conferences sponsored by other organizations, including the American Nuclear Society, the Nuclear Energy Institute Fuel Cycle Conference, the Institute for Nuclear Materials Management, the Western Governors Association, the National Society of Environmental Journalists, and environmental groups, including the Natural Resources Defense Council, the Critical Mass Energy Project, and the Nuclear Information Resources Services.

The Yucca Mountain Site Characterization Project's interactions with the State of Nevada and affected units of local government, its visits from officials from other nations, and its meetings with professional and academic organizations are described in Chapter One.

#### **Public Information and Outreach**

The goal of OCRWM's public information program is to inform and educate the public by making current program information easily accessible. That program is described below. Information about the Yucca Mountain Site Characterization Project's outreach to



Public Outreach

the general public in Nevada is presented in Chapter One.

### ***OCRWM National Information Center***

OCRWM's National Information Center provided the public with general programwide information and responded to specific questions and requests received through a toll-free telephone number, through the mail, and over the Internet. The Center relied heavily on the OCRWM Home Page as the most efficient and cost-effective means of making program documents, announcements, and other program materials available quickly to interested external parties. It provides the public with electronic access to a comprehensive range of program information and services, including current program and budget plans, a comprehensive program briefing that includes informative graphics, major program documents, congressional testimony, *Federal Register* notices, speeches, fact sheets, photographs of the Yucca Mountain site, a calendar of scheduled events and meetings (including Yucca Mountain tours, lectures and Science Center Open Houses), notification of opportunities for public participation, and a publications ordering system.

The Home Page also offers a Technical Publications Database that enables users to review abstracts of recent OCRWM technical reports that have been issued

and submitted to the Department's Office of Scientific and Technical Information Energy Database. An interactive mailbox facilitates responses to individual questions and elicits comments on the Home Page. As a convenience to its users, the Home Page is linked to the home pages of other agencies and organizations with which OCRWM regularly interacts, including the NRC, EPA, and the State of Nevada.

During Fiscal Year 1997, use of the OCRWM Home Page continued to increase. Users come from more than 30 countries on 6 continents and represent a variety of government, commercial, academic and private domains.

*The OCRWM Enterprise* (formerly the OCRWM Bulletin), a semiannual newsletter that reports program progress and announcements, is posted on the OCRWM Home Page. It is also printed and distributed through the mail to meet the needs of interested parties and stakeholders without access to the Internet.

The OCRWM Calendar announces opportunities for public involvement, programwide meetings, and Yucca Mountain tours that are open to the public. The Calendar also identifies meetings that are videoconferenced for the convenience of stakeholders who cannot or prefer not to travel to the meeting site. The Calendar is posted on the OCRWM Home Page and published in *The OCRWM Enterprise*.

### ***Scholarship and Fellowship Programs***

OCRWM's scholarship and fellowship programs implement both Executive Order 12677, which directs support to Historically Black Colleges and Universities, and the Secretary of Energy's Science and Math Education Initiative. They also provide a diverse pool of highly skilled, specialized scientists and engineers to help meet OCRWM's future staffing needs.

OCRWM supported scholarships for ten juniors and seniors attending the Nation's Historically Black Colleges



Yucca Mountain Tour Group

and Universities in Fiscal Year 1997. The scholars were competitively selected, primarily on the basis of academic achievement and their interest in pursuing careers in fields related to high-level radioactive waste management. Scholars serve summer internships at the Yucca Mountain Site Characterization Project or with other program participants. The internships offer them an opportunity to learn how the skills and knowledge gained through their undergraduate scientific and technical studies can contribute to our work.

Through its Radioactive Waste Management Graduate Fellowship Program, OCRWM provided fellowships to

eight graduate students pursuing advanced degrees in disciplines directly related to high-level radioactive waste management at the Nation's top colleges and universities. Fellows are selected from among numerous applicants, primarily on the basis of academic standing and career goals, and they must attend an approved college or university. Fellows complete a practicum assignment that involves research relevant to ongoing site characterization studies, at the Yucca Mountain Site Characterization Project or with other program participants.

# Chapter Five

---

## *Financial Management*

We continued to carry out our primary financial management functions: accounting for the program's assets, liabilities, and cash flows; quantifying the program's long-range financial needs; and managing the investment of civilian revenues so that they are available to meet program requirements.

### **Program Funding**

The Nuclear Waste Policy Act of 1982 provides for the costs of disposing of spent nuclear fuel and high-level radioactive waste to be borne by the parties responsible for its generation. The Act left it up to the President to determine whether civilian and defense-related wastes should be emplaced in the same repository. On April 30, 1985, the President issued a decision that they should be, with each party paying its proportional share of the full cost. To implement that decision, public rulemaking was used to develop a methodology for allocating defense and civilian costs. The result was published in the *Federal Register* in August 1987. The program's accounting system is consistent with this methodology.

#### ***Program revenues: ratepayer dollars for civilian waste***

The Nuclear Waste Policy Act provides for two types of fee to be levied on the owners and generators of civilian spent nuclear fuel: an ongoing fee of 1.0 mil (one tenth of one cent) per kilowatt-hour on nuclear electricity generated and sold after April 7, 1983, and a one-time fee for all nuclear electricity generated and sold prior to that date. The fees are defined in the *Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste*, which was promulgated in 1983 in 10 CFR Part 961. Individual contracts based on the *Standard Contract* have been executed between the Department and the owners and

generators of the spent nuclear fuel. Nuclear power producers make quarterly payments of the ongoing fee. For the one-time fee, the contract allowed owners to choose to pay immediately or defer payment and incur interest. Contract holders chose to pay approximately \$1,400 million and to defer approximately \$900 million.

Fees for spent nuclear fuel disposal are deposited in the Nuclear Waste Fund, a separate account in the U.S. Treasury that is managed and administered by the Department of Energy. Amounts not appropriated for current expenses, consistent with budgetary strictures, are invested in U.S. Treasury securities. OCRWM manages these investments strategically to ensure that the long-term costs of waste disposal can be met.

The program earns civilian revenue when nuclear power plants generate and sell power, when the program earns interest or realizes capital gains on U.S. Treasury investments, and when interest is charged on the utilities' unpaid fee balances. The cumulative civilian revenue, as of September 30, 1997 (shown in Table 5-1) is \$14,120 million, of which \$11,702 million has been paid and \$2,418 million remained unpaid. Civilian revenue includes \$3,278 million in investment earnings on U.S. Treasury investments, of which \$3,186 million has been paid and \$92 million was due with the next semiannual interest payment.

During Fiscal Year 1997, the program earned \$1,132 million in civilian revenue. Fiscal Year 1997 revenue consisted of \$594 million in ongoing 1 mil/kWh fees, \$111 million in interest on and adjustments to one-time fees, and \$427 million in investment earnings. On September 30, 1997, the market value of Nuclear Waste Fund investments was approximately \$6,947 million, compared with \$5,898 million at the end of Fiscal Year 1996.

**Table 5-1**  
**Cumulative Program Revenue as of September 30, 1997**  
(In Millions of Dollars)

	Civilian					Defense			Grand Total
	1 mil/ kWh Fee	One- Time Fee	Interest on Fees	Return on Invest- ment	Civilian Total	Fee	Interest On Fees	Defense Total	
FY 1997	595	0	111	426	1,132	75 <sup>1</sup>	48	123	1,255
Cumulative through FY 1997	7,176 <sup>2</sup>	2,337	1,329	3,278	14,120	1,242	496	1,738	15,858
Paid	7,030	1,457	29	3,186	11,702	699 <sup>3</sup>		699	12,401
Receivable <sup>4</sup>	146	880	1,300	92	2,418	1,039		1,039	3,457

<sup>1</sup> Although \$200 million was appropriated for FY 1997, only \$75 million was FY 1997 fee revenues. The remainder was used to reduce deferred defense fees.

<sup>2</sup> From the Statements of Operations in the Financial Statements (Appendix A). The "intragovernmental" fees in the financial statements come from non-defense government agencies such as the Tennessee Valley Authority.

<sup>3</sup> Defense payments include the \$12.5 million paid into the Nuclear Waste Fund, Defense Nuclear Waste Disposal Appropriations, and credits to the government for use of the Nevada Test Site facilities.

<sup>4</sup> From the Statements of Financial Position in the Financial Statements. The receivable balance represents the difference between cumulative revenues and amounts paid from inception to date.

### *Program revenues: taxpayer dollars for defense waste*

The Department of Energy's Office of Environmental Management is the custodian of the Department's inventory of spent nuclear fuel and high-level radioactive waste. OCRWM and the Office of Environmental Management are working to establish a Memorandum of Agreement (MOA) for the acceptance of DOE-owned spent nuclear fuel and high-level radioactive waste. The MOA will establish detailed arrangements for the acceptance, transportation, and disposal of DOE spent nuclear fuel and high-level radioactive waste. It assigns responsibilities for the transportation of spent nuclear fuel and high-level radioactive waste from Office of Environmental Management facilities to OCRWM facilities, defines the process for documenting a payment schedule for the disposal fees owed by DOE (which are equivalent to those paid by civilian utilities), formalizes the development of a waste acceptance schedule identifying specific quantities and locations for DOE spent nuclear fuel and high-level radioactive waste to be disposed of by OCRWM, and provides for appropriate control of interfaces between the two offices. In addition, OCRWM is working with the Office of Naval Reactors to establish a similar agreement for acceptance of Naval spent nuclear fuel.

Table 5-1 also shows program revenue from defense sources. Defense revenue is earned when the program incurs costs related to defense waste disposal and when interest is charged on unpaid defense balances. The program's defense revenue as of September 30, 1997, consisted of \$1,242 million in fees and \$496 million in interest, for a total of \$1,738 million. Of the total, \$699 million had been paid and \$1,039 million (including interest) remained unpaid. During Fiscal Year 1997, the program earned \$123 million in defense revenue, which includes \$75 million in fee revenue and \$48 million in interest on deferred fee.

### *Program expenditures*

Congress makes two separate appropriations for the program, one from the Nuclear Waste Fund, the other through a Defense Nuclear Waste Disposal Appropriation. These appropriations are recorded in separate internal accounts; however, they are consolidated in the OCRWM financial statements.

Expenditures from the Nuclear Waste Fund and the Defense Nuclear Waste Disposal Appropriation are subject to the Federal budget process. They are considered part of the discretionary portion of the budget and thus compete for resources with other



**Table 5-2**  
**Cumulative Program Expenditures as of September 30, 1997**  
(In Millions of Dollars)

	Civilian	Defense <sup>1</sup>	Total <sup>2</sup>
<b>FY 1997</b>	284	75	359
Cumulative through FY 1997	4,341	1,242	5,583
Paid	4,304	1,232	5,536
Payable <sup>3</sup>	37	10	47
<b>Appropriations<sup>4</sup></b>	<b>4,839<sup>5</sup></b>	<b>713<sup>6</sup></b>	<b>5,552</b>

<sup>1</sup> From the Statements of Operations in the Financial Statements (Appendix A). Defense expenditures and defense fees are equal, by definition of defense fees. Civilian expenditures are the difference between total expenditures and defense expenditures.

<sup>2</sup> Total expenditures are greater than total appropriations because civilian costs include \$135 million in interest on utility overpayments, most of which was funded through fee credits, i.e., not through appropriations.

<sup>3</sup> From the Statements of Financial Position in the Financial Statements. (Payables are amounts owed by the program that have not yet been paid.)

<sup>4</sup> Based on historic appropriations legislation — not discussed in the Financial Statements in Appendix A.

<sup>5</sup> Includes \$217 million appropriated from the Nuclear Waste Fund to the Nuclear Regulatory Commission, the Nuclear Waste Technical Review Board, and the now defunct Office of the Nuclear Waste Negotiator.

<sup>6</sup> Does not include \$85 million appropriated in Fiscal Year 1996, which is reserved pending statutory authority to develop an interim storage facility. Also does not include \$12.5 million paid into the Nuclear Waste Fund in FY 1991 and FY 1992.

discretionary spending programs. As a consequence, although the Nuclear Waste Fund is composed of dedicated ratepayer money, it is included in the total spending limits imposed on general Federal programs. Historically this has resulted in constraints on program funding.

As shown in Table 5-2, cumulative program expenditures were \$5,583 million, of which \$4,341 million was allocated to civilian and \$1,242 million to defense waste disposal activities. Through Fiscal Year 1997, Congress had appropriated a total of \$5,552 million for the program and related activities under the Nuclear Waste Policy Act, as amended.

The OCRWM Financial Statements for Fiscal Year 1997 and the report of OCRWM's independent auditor are in *Appendix A*.

Figure 5-1 shows the program's annual revenues and appropriations since its inception.

## Long-Range Financial Planning

### *Estimating Total System Life Cycle Costs (TSLCC)*

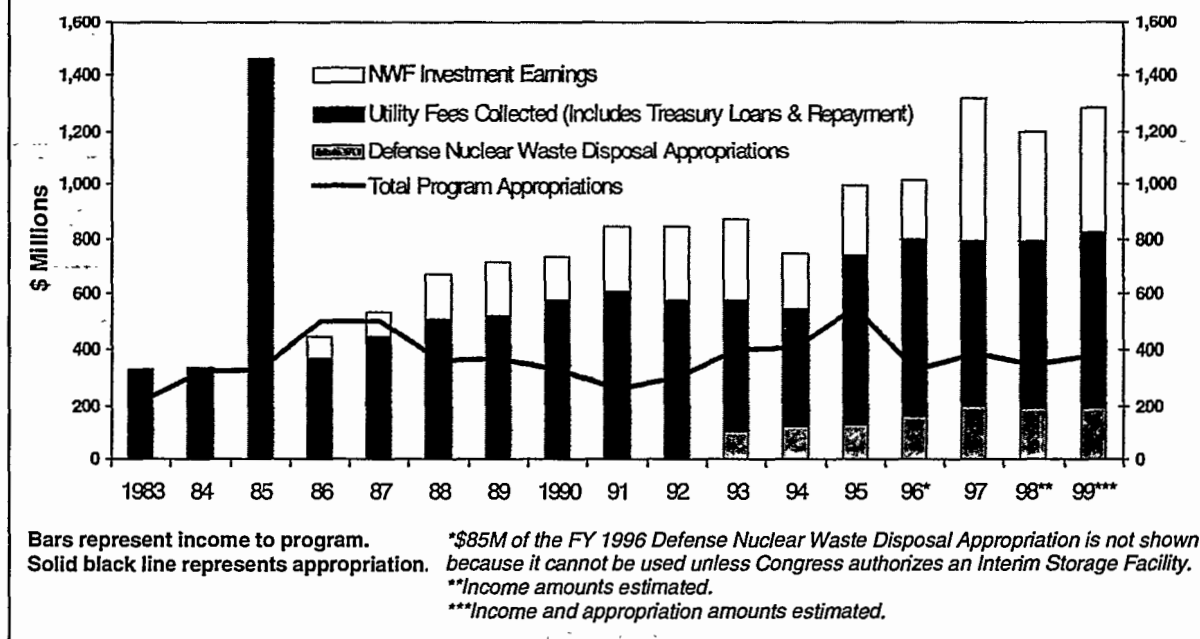
In Fiscal Year 1995, we published an *Analysis of the Total System Life Cycle Cost of the Civilian Radioactive Waste Management Program*.

Following the unanticipated reduction in program funding for Fiscal Year 1996, and the issuance of our revised *Program Plan*, updating of the 1995 TSLCC was deferred. We will conduct a new total system life cycle cost analysis to support the site viability assessment that will be completed in Fiscal Year 1998.

### *Assessing fee adequacy*

Because the owners and generators of spent nuclear fuel are required to pay the full costs of its disposal, the Nuclear Waste Policy Act requires an annual assessment of the adequacy of the 1 mil/kWh fee. The

Figure 5-1  
Program Revenue and Appropriation History



latest assessment, published in Fiscal Year 1997, is based on the 1995 *Analysis of the Total System Life Cycle Cost of the Civilian Radioactive Waste Management Program*. It indicates that the fee is adequate to ensure full cost recovery.

#### Managing investments

The Nuclear Waste Policy Act requires that the fees charged for spent nuclear fuel disposal cover all disposal costs through repository decommissioning. Our investment management goal is to ensure that funds will be available to pay both near-term system development and construction costs and long-term operation, monitoring and closure costs. We, therefore, carefully select investments from among the available U.S. Treasury securities to meet program needs while balancing investment risk and expected return. Over the last year, Nuclear Waste Fund investments returned 10.05 percent, exceeding the return of the average

intermediate-term U.S. Treasury bond fund by 2.30 percentage points or 30 percent. Over the last 10 years, the Nuclear Waste Fund's average return has been 9.03 percent, compared with the average intermediate-term U.S. Treasury bond fund's return of 8.24 percent. The Nuclear Waste Fund's average annual return, since inception, is 8.38 percent.

#### Civilian Radioactive Waste Research and Development Account

We also administer the Civilian Radioactive Waste Research and Development account, which, like the Defense Nuclear Waste Disposal Appropriation, is supported by general taxpayer revenues. It pays for generic research, development, and demonstration activities authorized by Title II of the Nuclear Waste Policy Act. There was no appropriation to this account for Fiscal Year 1997; only funds carried over from prior years were spent.

# *Appendix A*

---

## *Financial Statements*

*Appendix A — Financial Statements*

---

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Financial Statements

September 30, 1997 and 1996

	Page
Overview .....	1-3
Independent Auditors' Report on Financial Statements .....	4-5
Statements of Financial Position .....	6
Statements of Operations .....	7
Statements of Cash Flows .....	8
Notes to Financial Statements .....	9-24
Independent Auditors' Report on Internal Controls Over Financial Reporting .....	25-26
Independent Auditors' Report on Compliance with Laws and Regulations .....	27

*Appendix A — Financial Statements*

---

## OVERVIEW

### Reporting Entity

The Nuclear Waste Policy Act of 1982 (Public Law 97-425) established the Office of Civilian Radioactive Waste Management (OCRWM) within the Department of Energy. OCRWM's mission is to manage and dispose of the nation's spent nuclear fuel and high-level radioactive waste. The office provides leadership in developing and implementing strategies to accomplish this mission that assure public and worker health and safety, protect the environment, merit public confidence, and are economically viable.

The Nuclear Waste Policy Amendments Act of 1987 (Title V, Public Law 100-203) directed the Secretary of Energy to characterize only the Yucca Mountain site in Nevada to determine if it is suitable for a repository for spent nuclear fuel and high-level radioactive waste.

As of September 30, 1997, OCRWM employed 2,850 people. This included 202 OCRWM Federal staff, 18 Federal full-time equivalents (FTEs) at other DOE Headquarters offices, 5 Federal FTEs at DOE operations offices, 123 U.S. Geological Survey employees, and 2,502 contractor employees, including employees of national laboratories.

OCRWM is composed of a management center and two business centers organized to carry out two major projects.

The Yucca Mountain Site Characterization Project, located in Las Vegas, Nevada, oversees the scientific and technical investigation of Yucca Mountain, including:

- Addressing the major unresolved technical questions regarding the site;
- Completing a viability assessment of the Yucca Mountain site in 1998;
- Constructing and operating the exploratory studies facility;
- Addressing those repository and waste package design elements that are critical to determining the feasibility and performance of the repository and the engineered barrier system;
- Preparing a final environmental impact statement to accompany the Secretarial site recommendation, should the site be found suitable; and
- Preparing and submitting a license application for repository construction to the Nuclear Regulatory Commission, should the President recommend and the Congress approve the Yucca Mountain site.

The Waste Acceptance Storage and Transportation Project, located in Washington, D.C., is primarily responsible for:

- Conducting activities necessary for the Department to take title to and physical possession of spent nuclear fuel and high-level radioactive waste from owners and generators of these wastes;
- Developing a market-driven waste acceptance and transportation approach that relies on the private sector for implementation; and
- Conducting contingency planning and design activities related to interim storage that are consistent with Administration policy.

OCRWM's Program Management Center provides program integration and management support to the Director, OCRWM, and to the two business centers. The management center, comprised of the Office of Program Management and Administration in Washington, D.C., and the Office of Quality Assurance in Las Vegas, Nevada, is responsible for program planning and administration, program management, technical and regulatory integration, quality assurance, institutional activities, resources and information management, and international waste management activities.

#### **Fiscal Year 1997 Technical Performance**

In keeping with its schedule, OCRWM's tunnel boring machine completed excavation of the 8-kilometer (5-mile) main loop of the underground Exploratory Studies Facility (ESF) and emerged from the south portal at Yucca Mountain on April 25, 1997. This major milestone was accomplished with a safety record that exceeded mining industry performance. The ESF offers scientists direct access to the repository block and critical geologic features and enables them to conduct tests and collect important data on moisture movement and thermal stress effects within the host rock. Such data have confirmed earlier site characteristics determined through surface-based tests and they strengthen the technical ability to model natural processes and design a repository and waste package tailored to specific conditions at the site.

In its FY 1996 financial statements OCRWM established five technical performance measures for FY 1997, the following three of which were completed:

- Complete excavation of the Exploratory Studies Facility main 5-mile loop and scientific instrumentation alcoves to support studies for a viability assessment of the Yucca Mountain site in September 1998 and subsequent site suitability determination and licensing.
- Submit a topical safety analysis report to the Nuclear Regulatory Commission for a non-site-specific interim storage facility to maintain a readiness capability should an interim storage site be designated.
- Carry on collaboration with the nuclear utilities and other Program stakeholders to resolve issues and to develop the management and logistical capability in the private sector to address the Department's 1998 waste acceptance obligation.

The fourth measure "Issue a final rule to amend the Department's siting guidelines (10 CFR Part 960) to support a more efficient process for evaluating the suitability of the Yucca Mountain site, as outlined in the revised draft Program Plan," was deferred. The public comment period on the draft revised siting guidelines was extended three times as a result of intense and widespread interest in the guidelines. Issuance of the final rule is anticipated in FY 1998, following evaluation of the numerous public comments received.

The fifth measure "Issue Notice of Final Policy and Procedures pursuant to Section 180 (c) of the NWSA, as amended, which provides for technical and financial assistance to States and Indian Tribes for training public safety officials through whose jurisdictions spent nuclear fuel and high-level waste would be transported, in preparation for an orderly transportation activity," was partially completed. A Notice of Policy and Procedures was issued in July 1997, but OCRWM intends to issue a revised Notice of Policy and Procedures in FY 1998 to address the numerous comments received in response to the original Notice.

#### **Fiscal Year 1998 Technical Performance Measures**

- Completing the viability assessment analyses for licensing and constructing a geologic repository at the Yucca Mountain site in FY 1998. The assessment will consist of four key components:



- A design and operational concept of the repository;
  - An assessment of the performance of that concept in the geologic setting;
  - A plan and cost estimate to construct and operate the repository; and
  - A plan and an estimate of the costs to complete a license application.
- Completing, in FY 1998, generic, non-site-specific interim storage facility work and addressing long lead-time issues related to storage of waste including design, engineering, and safety analyses.
  - Developing, in FY 1998, a market-driven approach that uses private sector management and operational capabilities to provide waste acceptance and transportation services. Issuing a revised draft request for proposals.
  - Completing, in FY 1998, a revised Policy and Procedure for Implementation of Section 180(c) of the Nuclear Waste Policy Act.

### **FY 1997 Financial Performance**

Program funding comes from the Nuclear Waste Fund (NWF) and the Defense Nuclear Waste Disposal appropriation (DNWDA). The NWF consists of fees paid by the owners and generators of spent nuclear fuel from civilian reactors, in accordance with provisions of their contracts with the Department of Energy (DOE) for disposal services. NWF assets in excess of those appropriated to pay program costs are invested in U.S. Treasury securities. The DNWDA was established by the Congress to fund the cost of disposal of high-level radioactive waste resulting from atomic energy defense activities. As of September 30, 1997, cumulative accrued revenue from fees, including the DNWDA, totaled approximately \$10.755 billion, and cumulative interest earnings and other accrued revenue totaled approximately \$5.1 billion. Cumulative expenditures from appropriations for the program, the Nuclear Regulatory Commission, the Office of the Nuclear Waste Negotiator, and the Nuclear Waste Technical Review Board, totaled approximately \$5.6 billion.

As of September 30, 1997, the U.S. Treasury securities held by the NWF had a market value of \$6.947 billion. The net income from investments for fiscal year 1997 was \$425.5 million, including \$420 million in interest earnings and \$5.5 million in net gains on sale of securities. Over the last year, based on market value, OCRWM's NWF investments returned 10.05 percent compared to 7.75 percent for the average intermediate-term Treasury mutual fund.

OCRWM's primary financial performance goal is to ensure that future spending needs can be met. Therefore, OCRWM has adopted the asset-liability matching approach used by pension funds and insurance companies to ensure that long-term needs will be met. By matching investments to anticipated spending needs, OCRWM reduces the risk that changes in interest rates will adversely affect the value of its investments, ensures that identified needs will be met, and makes investments at the most favorable rates currently available. In Fiscal Year 1997, OCRWM executed a memorandum of understanding with the U.S. Department of Treasury that establishes a process for the purchase of zero-coupon bonds by OCRWM, effectively extending the ability to match spending needs 30 years into the future.

### **FY 1998 Financial Performance Measure**

- Increase from 6 to at least 12 the number of years in the 2004 - 2028 period, for which invested Program assets match anticipated Program liabilities.



2001 M. Street, N.W.  
Washington, DC 20036

## Independent Auditors' Report on Financial Statements

United States Department of Energy  
Office of Civilian Radioactive Waste Management:

We have audited the accompanying statements of financial position of the Office of Civilian Radioactive Waste Management (OCRWM) as of September 30, 1997 and 1996, and the related statements of operations and cash flows for the years then ended and cumulatively from inception (January 7, 1983) to September 30, 1997. These financial statements are the responsibility of OCRWM's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with generally accepted auditing standards; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and Office of Management and Budget Bulletin 93-06, *Audit Requirements for Federal Financial Statements*, except for those portions of the Bulletin that relate to the Federal Financial Management Improvement Act (FFMIA) of 1996. The Department of Energy Office of Inspector General is responsible for determining compliance with FFMIA. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

As described in note 2, these financial statements were prepared in conformity with the hierarchy of accounting principles and standards approved by the principals of the Federal Accounting Standards Advisory Board. This hierarchy is a comprehensive basis of accounting other than generally accepted accounting principles.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Office of Civilian Radioactive Waste Management as of September 30, 1997 and 1996, and the results of its operations and its cash flows for the years then ended and cumulatively from inception (January 7, 1983) to September 30, 1997, in conformity with the basis of accounting described in note 2.

In accordance with *Government Auditing Standards*, we have also issued reports dated January 2, 1998 on our consideration of the OCRWM's internal controls over financial reporting and on its compliance with laws and regulations.



Member Firm of  
KPMG International

Our audits were made for the purpose of forming an opinion on OCRWM's financial statements, taken as a whole. The information presented in management's Overview is not a required part of the basic financial statements but is supplementary information required by Office of Management and Budget Bulletin Nos. 94-01 and 97-01, *Form and Content of Agency Financial Statements*. We considered whether this information is materially inconsistent with the principal financial statements. Such information has not been subjected to the auditing procedures applied in the audit of the financial statements and, accordingly, we do not express an opinion on it. The performance information included in the Overview is addressed in our auditors' report on the internal control structure over financial reporting in accordance with OMB Bulletin 93-06.

As discussed in note 2 to the financial statements, OCRWM implemented Statement of Federal Financial Accounting Standards No. 6, *Accounting for Property, Plant, and Equipment*, effective October 1, 1996.

As discussed in note 10 to the financial statements, OCRWM implemented Statement of Federal Financial Accounting Standards No. 5, *Accounting for Liabilities of the Federal Government*, effective October 1, 1996.

This report is intended for the information of the management of OCRWM and the United States Department of Energy. This restriction is not intended to limit the distribution of this report, which is a matter of public record.

KPMG Peat Marwick LLP

January 2, 1998, except as to note 12,  
which is as of January 14, 1998

*Appendix A — Financial Statements*

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Statements of Financial Position

September 30, 1997 and 1996

(Dollars in thousands)

Assets	1997	1996
Entity assets:		
Intragovernmental assets, current:		
Fund balance with Treasury	\$ 112	148
Investments (note 3)	6,947,353	5,897,756
Current portion of accounts receivable:		
Receivable from Department of Energy (notes 2 and 11)	235,300	216,312
kwh fees (note 4)	9,847	10,314
Accrued investment interest (note 3)	92,412	103,071
Governmental assets, current:		
Current portion of accounts receivable from utilities (note 4):		
kwh fees	135,814	139,676
Advances and prepayments	1,225	675
Other governmental	41	80
Intragovernmental assets, long-term:		
Long-term portion of accounts receivable from Department of Energy (notes 2 and 11)	803,455	871,000
Governmental assets, long-term:		
Long-term portion of accounts receivable (note 4):		
One-time spent fuel fees	880,489	880,462
Interest on one-time spent fuel fees	1,299,740	1,189,144
Capital equipment, net (note 6)	32,755	51,092
Total assets	\$ 10,438,543	9,359,730
Liabilities and Net Position		
Liabilities covered by budgetary resources:		
Intragovernmental liabilities, current:		
Accounts payable	\$ 3,232	3,498
Other funded liabilities	226	208
Governmental liabilities, current:		
Accounts payable	102	8,125
Other governmental:		
Accrued payroll and benefits	3,616	4,812
Other	40,163	26,543
Intragovernmental liabilities, long-term:		
Deferred fees revenue	1,173,799	1,227,128
Governmental liabilities, long-term:		
Deferred fees revenue	5,714,118	5,231,694
Deferred investment revenue	3,151,172	2,725,690
Contract holdback	442	460
Total liabilities covered by budgetary resources	10,086,870	9,228,158
Liabilities not covered by budgetary resources:		
Governmental liabilities:		
Accrued leave	1,460	1,539
Other liabilities	8,908	11,627
Total liabilities not covered by budgetary resources	10,368	13,166
Total liabilities	10,097,238	9,241,324
Net position (note 7):		
Unexpended appropriations (note 7)	198,194	155,977
Invested capital (note 7)	32,755	51,092
Future funding requirements (note 7)	(9,607)	(12,992)
Total net position before unrealized gain (loss)	221,342	194,077
Unrealized gain (loss) on investments available for sale	119,963	(75,671)
Total net position	341,305	118,406
Commitments and contingencies (notes 4, 10, 12, 13, and 15)		
Total liabilities and net position	\$ 10,438,543	9,359,730

The accompanying notes are an integral part of these statements.

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

**Statements of Operations**

September 30, 1997 and 1996  
and cumulatively from January 7, 1983, date of inception, to September 30, 1997

(Dollars in thousands)

	1997	1996	Cumulative
<b>Revenue:</b>			
Revenue from fees (note 4):			
One-time spent fuel fees:			
Public	\$ 27	(24)	2,174,903
Intragovernmental	—	—	162,098
kwh fees:			
Public	555,209	603,816	6,935,910
Intragovernmental	39,446	31,884	240,419
Defense high-level waste fees, Intragovernmental (note 2)	74,852	84,400	1,242,116
Interest on one-time spent fuel fees, public (note 4)	110,596	106,144	1,328,697
Interest, intragovernmental:			
Income on investments	420,274	375,519	3,032,838
Defense high-level waste fees (note 2)	47,603	52,000	495,681
Other revenue (note 5)	6,791	33,519	245,134
<b>Total revenue and other financing sources</b>	<b>1,254,798</b>	<b>1,287,258</b>	<b>15,857,796</b>
<b>Less change in deferred revenue</b>	<b>854,577</b>	<b>869,094</b>	<b>10,039,089</b>
<b>Excess of revenue and financing sources over change in deferred revenue</b>	<b>400,221</b>	<b>418,164</b>	<b>5,818,707</b>
<b>Expenses (note 14):</b>			
Program expenses:			
First repository	270,723	252,750	3,777,067
Second repository	(12)	20	108,89
Monitored retrievable storage	16,825	29,496	348,177
Program support	57,793	65,547	1,039,865
Transfer appropriations (note 9)	13,531	13,461	176,849
Interest (notes 2 and 5)	—	1,023	132,415
<b>Total expenses</b>	<b>358,860</b>	<b>362,297</b>	<b>5,583,269</b>
<b>Excess of revenue and other financing sources over expenses and change in deferred revenue before cumulative effect of change in accounting principle</b>	<b>41,361</b>	<b>55,867</b>	<b>235,438</b>
<b>Cumulative effect of changing capitalization policy</b>	<b>(14,096)</b>	<b>—</b>	<b>(14,096)</b>
<b>Excess of revenue and other financing sources over expenses and change in deferred revenue</b>	<b>27,265</b>	<b>55,867</b>	<b>221,342</b>
<b>Net position, beginning of year</b>	<b>118,406</b>	<b>277,342</b>	<b>—</b>
<b>Change in unrealized gain (loss) on investments available for sale</b>	<b>195,634</b>	<b>(214,803)</b>	<b>119,963</b>
<b>Excess of revenue and other financing sources over expenses and change in deferred revenue</b>	<b>27,265</b>	<b>55,867</b>	<b>221,342</b>
<b>Net position, end of year</b>	<b>\$ 341,305</b>	<b>118,406</b>	<b>341,305</b>

The accompanying notes are an integral part of these statements.

*Appendix A — Financial Statements*

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Statements of Cash Flows

September 30, 1997 and 1996  
and cumulatively from January 7, 1983, date of inception, to September 30, 1997

(Dollars in thousands)

	1997	1996	Cumulative
Cash flows from operating activities:			
Excess of revenue and other financing sources over expenses and change in deferred revenue before cumulative effect of accounting change	\$ 41,361	55,867	235,438
Adjustments affecting cash flows:			
Increase in accounts receivable	(59,003)	(90,381)	(3,365,911)
(Increase) decrease in other assets	11,414	1,971	(92,411)
Increase (decrease) in accounts payable	(8,289)	3,707	3,334
Increase (decrease) in other liabilities	9,626	(7,850)	41,579
Increase in deferred revenue	854,577	869,094	10,039,089
Depreciation expense	17,130	8,754	86,850
Amortization of premiums and accretion of discounts on investments	4,100	46,406	502,781
Net gain on sale of investments	(5,561)	(33,519)	(241,593)
Cumulative effect of accounting change	(14,096)	—	(14,096)
Nonfund adjustments	2,678	(1,096)	45,644
Net cash provided by operating activities	853,937	852,953	7,240,704
Cash flows from investing activities:			
Proceeds from sales and maturities of investments	1,838,240	1,368,949	10,574,774
Purchases of investments	(2,690,742)	(2,210,443)	(17,663,395)
Purchases of capital equipment	(1,471)	(2,365)	(151,971)
Net cash used in investing activities	(853,973)	(843,859)	(7,240,592)
Cash flows from financing activities:			
Borrowings from U.S. Treasury	—	—	264,964
Repayments on loans from U.S. Treasury	—	—	(264,964)
Borrowings from DOE for capital equipment	—	—	9,739
Repayments on loans from DOE for capital equipment	—	—	(9,739)
Net cash provided by financing activities	—	—	—
Net cash provided by (used in) operating, investing, and financing activities	(36)	9,094	112
Fund balances with U.S. Treasury, beginning	148	(8,946)	—
Fund balances with U.S. Treasury, ending	\$ 112	148	112

The accompanying notes are an integral part of these statements.

---

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

September 30, 1997 and 1996

(Dollars in thousands unless otherwise noted)

---

**(1) Legislative Background**

The Nuclear Waste Policy Act (NWPA) was signed into law on January 7, 1983. The NWPA establishes a framework for the financing, siting, licensing, operating and decommissioning of one or more mined geologic repositories for the Nation's spent nuclear fuel and high-level radioactive waste which is to be carried out by the Department of Energy's (DOE) Office of Civilian Radioactive Waste Management (OCRWM). In addition, the NWPA contains other provisions including:

Assigning responsibility for the full payment of disposal cost to the owners and generators of high-level waste and spent nuclear fuel and, accordingly, creating a special Nuclear Waste Fund (NWF) within the Treasury of the United States.

Providing for contracts between the DOE and the owners and generators of spent nuclear fuel and high-level radioactive waste pursuant to which DOE is to take title to the spent nuclear fuel or high-level radioactive waste as expeditiously as possible, following commencement of repository operations and, in return for payment of fees established by the NWPA, to begin disposal of the spent nuclear fuel or high-level radioactive waste not later than January 31, 1998.

Requiring evaluation of the use of civilian disposal capacity for the disposal of high-level radioactive waste resulting from atomic energy defense activities (defense waste). In April 1985, the President notified DOE of his determination that a separate defense waste repository was not necessary and directed DOE to proceed with arrangements for disposal of such waste. Fees, equivalent to those paid by commercial owners, must be paid for this service by the Federal government.

On December 22, 1987, the President signed into law the Budget Reconciliation Act Subtitle A of Title V of which contained amendments to the NWPA of 1982. The legislation directed DOE to characterize only the Yucca Mountain site in Nevada as a candidate site for the first repository.

The legislation also provided for the termination of site-specific activities at all candidate sites other than the Yucca Mountain site, within 90 days of enactment, and for phasing out, not later than 6 months after enactment, all research programs in existence designed to evaluate the suitability of crystalline rock as a potential repository host medium. In the event that the Yucca Mountain site proves unsuitable for use as a repository, the legislation requires DOE to terminate site-specific activities and report to Congress.

Further, the legislation authorized DOE to pay interest on overpayments of kilowatt hour (kWh) fees consistent with the December 5, 1985 ruling of the United States Court of Appeals as discussed in note 4. Interest on these overpayments of kWh fees was fully paid or credited as of September 30, 1990.

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

---

**(1) Continued**

Additionally, the legislation annulled and revoked DOE's Monitored Retrievable Storage (MRS) proposal, submitted to Congress on March 31, 1987, to construct an MRS facility in Oak Ridge, Tennessee. However, the legislation authorized DOE to site, construct and operate one MRS facility subject to certain conditions.

Although the Amendments Act prohibits the selection of an MRS site through a DOE-directed site-survey process until the repository site is recommended to the President, it allowed for expedited siting to proceed via a Nuclear Waste Negotiator, authorized to negotiate a proposed agreement with a State or Indian Tribe that would agree to host a repository or MRS facility. The Negotiator was to submit to Congress proposed agreements.

In fiscal year 1994, the Energy and Water Development Act provided no funds for grants to potential MRS hosts. The Negotiator continued his efforts in fiscal year 1994 but did not identify a volunteer host. The Office of the Nuclear Waste Negotiator expired in January 1995.

**(2) Significant Accounting Policies**

**Basis of Presentation** — These financial statements include all activity related to the NWF and the Defense Nuclear Waste Disposal appropriation used for nuclear waste disposal activities.

**Basis of Accounting** — OCRWM's financial statements are prepared using the accrual method of accounting. OCRWM also uses budgetary accounting to facilitate compliance with legal constraints and to monitor its budget authority.

Until a sufficiently comprehensive set of accounting standards which will constitute "generally accepted accounting principles" for the Federal government, are agreed to and published by the Joint Financial Management Improvement Program (JFMIP) principals, agencies are required to prepare financial statements in accordance with the following hierarchy, which is a comprehensive basis of accounting:

Individual standards agreed to and published by the Joint Financial Management Improvement Program (JFMIP) Principals, based upon recommendations from the Federal Accounting Standards Advisory Board (FASAB).

Form and content requirements included in Office of Management and Budget (OMB) Bulletin 94-01, dated November 6, 1993, and subsequent issuances.

Accounting standards contained in agency accounting policy, procedures manuals, and/or related guidance as of March 29, 1991, so long as they are prevalent practices.



---

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

---

(2) Continued

Accounting principles published by authoritative standard setting bodies and other authoritative sources (1) in the absence of other guidance in the first three parts of this hierarchy, and (2) if the use of such accounting standards improves the meaningfulness of the financial statements.

**Revenue Recognition** — A one-time fee (see note 4) was recorded by the NWF as of April 7, 1983, for spent nuclear fuel generated prior to that date. Fees based upon kWh of electricity generated by civilian nuclear reactors on or after April 7, 1983 are accrued as earned. All fees are recognized as revenue to the extent of expenses incurred. Revenue in excess of current expenses and unexpended appropriations is deferred; deferred revenue is not segregated between Federal and nonfederal activities. The life cycle of the program is expected to extend over a period of nearly 100 years.

OCRWM's most recent Total-System Life Cycle Cost (TSLCC) analysis, issued in September 1995, estimated the cost of a surrogate single-repository system without interim storage to be \$33,100,000. Adjusted for inflation through September 30, 1997, this amount is approximately \$35,745,000. Yucca Mountain, Nevada, was assumed as the location for the repository since it is the only site that the Department is authorized by law to characterize, but this does not constitute a predecision that Yucca Mountain is an acceptable site. Additional scenarios including a two-repository system with interim storage were not costed since the Department did not have current cost information or designs for a second repository and interim storage.

To estimate the share of the TSLCC that should be allocated to the disposal of defense high-level radioactive waste in the civilian repository, the methodology announced by the Department in the *Federal Register* in August 1987 was used. The September 1995 TSLCC analysis estimated the defense waste share of total system costs to be \$6,432,000. That amount adjusted for inflation through September 30, 1997, is approximately \$6,947,000.

The September 1995 TSLCC estimates did not reflect the Civilian Radioactive Waste Management Program as currently envisioned, nor do they address the amount and types of defense waste now expected to be disposed of in a civilian repository. OCRWM intends to develop a new TSLCC analysis in 1998.

To date, OCRWM has not entered into an agreement with the Office of Environmental Management for payment of fees and interest to the NWF to pay DOE's defense high-level waste share of costs. OCRWM has estimated that approximately \$1,738,000 of costs incurred to date by the NWF, including interest of \$496,000, assessed from enactment of the NWPA (January 1983), are attributable to defense high-level radioactive waste based on the methodology previously published. Of this total amount, DOE has paid or funded \$698,000 as of September 30, 1997. (See also note 11.) Total revenue from defense high-level radioactive waste fees and interest was \$123,000 and \$136,000 in 1997 and 1996, respectively.

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

---

(2) **Continued**

For fiscal years 1997 and 1996, Congress appropriated \$200,000 and \$248,400, respectively, from the Defense Nuclear Waste Disposal appropriation to be used for nuclear waste disposal activities. Of this \$248,400, \$85,000 was restricted to obligation and expenditure on an interim storage facility. None of this restricted portion was used in Fiscal Year 1997 or 1996, as statutory authority for an interim storage facility was not enacted. As of September 30, 1997, OCRWM had used the remaining Fiscal Year 1996 appropriation of \$16,312, and \$154,700 of the current year appropriation. Also, at September 30, 1997, OCRWM had obligated \$45,300 of the Fiscal Year 1997 appropriation for payment in 1998.

For Fiscal Year 1998, Congress has appropriated \$190,000 from the Defense Nuclear Waste Disposal appropriation to be used for nuclear waste disposal activities.

**Investments** — Investments, which consist of U.S. Treasury securities, are classified as available-for-sale and are reported at fair value, with unrealized gains and losses excluded from earnings and reported as a separate component of net position. OCRWM uses the effective interest rate method in determining book value of NWF investments.

**Capital Equipment** — Capital equipment is depreciated on a straight-line basis over the estimated useful lives of the assets which range from 5 to 30 years. Maintenance costs are borne by OCRWM for equipment either on loan from or shared with other programs.

In 1997, OCRWM implemented Statement of Federal Financial Accounting Standards No. 6, *Accounting for Property, Plant, and Equipment*, effective October 1, 1996. Under this statement, OCRWM raised the capitalization threshold from \$5 to \$25. The threshold applies to assets with a useful life greater than two years.

**Accounts Receivable** — Payment of accounts receivable will not be complete until OCRWM starts accepting waste. An allowance for doubtful accounts related to one time spent fuel fees has not been recorded as of September 30, 1997 and 1996, as OCRWM is not obligated to accept waste without payment of fees (the utilities have an inherent incentive to pay to these fees).

**Liabilities** — Liabilities represent the amount of monies or other resources that are likely to be paid by OCRWM as the result of a transaction or event that has already occurred. However, no liability can be paid by OCRWM absent an appropriation. Liabilities for which an appropriation has not been enacted are therefore classified as liabilities not covered by budgetary resources and there is no certainty that the appropriation will be enacted. Also, liabilities of OCRWM arising from other than contracts can be abrogated by the government, acting in its sovereign capacity.

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

---

**(2) Continued**

**Accrued Annual Leave** – To the extent that current or prior year appropriations are not available to fund annual leave earned but not taken, funding will be obtained from future financing sources.

**Tax Status** – OCRWM, as a part of the Department of Energy which is a Federal agency, is not subject to Federal, State, or local income taxes.

**Presentation of Prior Year's Financial Statements** – Certain 1996 amounts have been reclassified to conform with the 1997 presentation.

**(3) Investments**

For the years ended September 30, 1997 and 1996, OCRWM received proceeds of \$1,838,240 and \$1,368,949, respectively, from the sale of securities. The realized gain on the sale using the specific identification method for the years ended September 30, 1997 and 1996 was \$5,561 and \$33,519, respectively. From September 30, 1996 to 1997, the change in net unrealized holding gain (loss) on available-for-sale securities included in net position was \$195,634.

Accrued interest receivable on investments as of September 30, 1997 and 1996, totaled \$92,412 and \$103,071, respectively.

The gross unrealized gain and (loss) on sale of securities are \$174,319 and (\$54,356), respectively for the year ending September 30, 1997.

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

**Notes to Financial Statements**

(Dollars in thousands unless otherwise noted)

**(3) Continued**

Investments consisting of U.S. Treasury securities held as of September 30 of each year consisted of the following:

	1997			1996	
	Cost	Amortized (premium) discount, net	Investments, net	Investments at fair value	Investments at fair value
Intragovernmental securities available for sale:					
Marketable	\$ 1,790,210	(6,401)	1,783,809	1,786,926	544,094
Due after 1 year but within 5 years	1,238,593	(57,153)	1,181,440	1,192,474	1,325,376
Due after 5 years but within 10 years	816,146	(48,791)	767,355	754,409	1,227,210
Due after 10 years	3,121,278	(26,492)	3,094,786	3,213,544	2,801,076
	\$ 6,966,227	(138,837)	6,827,390	6,947,353	5,897,756

---

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

---

**(4) Receivables Due from Utilities**

Owners and generators of civilian spent nuclear fuel and high-level radioactive waste have entered into contracts with DOE for disposal services and for payment of fees to the NWF.

The NWPA specifies two types of fees to be paid to the NWF for disposal services: (a) a one-time charge per kilogram of heavy metal in solidified high-level waste or spent nuclear fuel existing prior to April 7, 1983; and (b) a one mil per kWh fee on all net electricity generated and sold by civilian nuclear power reactors on or after April 7, 1983. The Secretary shall annually review the adequacy of the fees established. In the event the Secretary determines either insufficient or excess revenue is being collected, the Secretary shall propose an adjustment to the fee to ensure full cost recovery. The contracts between DOE and the owners and generators of the waste provide three options for payment of the one-time spent fuel fee, one of which must have been selected by June 30, 1985, or within two years of contract execution. The options were:

Payment of the amount due, plus interest earned from April 7, 1983, in 40 quarterly installments, with the final payment due on or before the first scheduled delivery of spent fuel to DOE;

Payment of the amount due, plus interest from April 7, 1983, in a single payment, any time prior to the first delivery of spent fuel to DOE;

Payment of the amount due, any time prior to June 30, 1985, or two years after contract execution, in the form of a single payment, with no interest due.

Under options (1) and (2), interest accrues from April 7, 1983, to date of first payment, at the 13-week Treasury bill rate compounded quarterly. Under option (1), beginning with the first payment, interest is calculated at the 10-year Treasury note rate in effect at the time.

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

(4) Continued

During 1997 and 1996, payments or adjustments of one-time spent fuel fees by owners and generators of civilian high-level waste and spent nuclear fuel consisted of:

	1997		1996	
	Payments	Adjustments	Payments	Adjustments
Option (1)	\$ —		—	—
Option (2)		27	667	—
Option (3)	—		—	(24)
	\$ —	27	667	(24)

Public and intragovernmental receivables from utilities at September 30 of each year were as follows:

	1997	1996
Current portion of accounts receivable:		
Kilowatt hour fees		
Governmental	\$ 135,814	139,676
Intragovernmental	9,847	10,314
Total current portion of accounts receivable	<u>145,661</u>	<u>149,990</u>
Long-term portion of accounts receivable:		
Governmental one-time spent fuel fees:		
Option (1)	143,531	143,531
Option (2)	736,958	736,931
	<u>880,498</u>	<u>880,462</u>
Governmental interest on one-time spent fuel fees:		
Option (1)	212,642	194,590
Option (2)	1,087,098	994,554
	<u>1,299,740</u>	<u>1,189,144</u>
Total long-term accounts receivable from utilities	<u>2,180,229</u>	<u>2,069,606</u>
Total accounts receivable from utilities	\$ <u>2,325,890</u>	<u>2,219,596</u>

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

**(5) Other Revenue**

The NWF's other revenue for fiscal year 1997 and 1996 consisted of the following:

	1997	1996
Gain (loss) on sale of investments (note 3)	\$ 5,561	33,519
Imputed financing source (note 10)	1,230	—
Total expenses	\$ 6,791	33,519

**(6) Capital Equipment, Net**

Capital equipment and related accumulated depreciation consisted of the following at September 30, 1997 and 1996:

	1997	1996
Capital equipment	\$ 80,212	100,323
Work-in-progress	4,628	90
	84,840	100,413
Less accumulated depreciation	(52,085)	(49,321)
Net book value	\$ 32,755	51,092

Effective October 1, 1996, OCRWM, in accordance with DOE guidance, changed its policy for the capitalization of equipment, increasing the threshold for capitalization from \$5 to \$25. The cumulative effect of this change in accounting principle resulted in a charge to operations of \$14,096 as of October 1, 1996.

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

**(7) Net Position**

	1997			1996		
	Trust fund	Appropriated fund	Total	Trust fund	Appropriated fund	Total
Unexpended appropriations:						
Unobligated, available	\$ 22,013	63	22,076	19,106	3,394	22,500
Unobligated, unavailable	-	85,000	85,000	-	85,000	85,000
Undelivered orders	68,956	22,162	91,118	41,017	7,460	48,477
Invested capital	32,755	-	32,755	51,092	-	51,092
Future funding requirements	(9,607)	-	(9,607)	(12,992)	-	(12,992)
Total net position before unrealized gain (loss)	114,117	107,225	221,342	98,223	95,854	194,077
Unrealized gain (loss) on investments available for sale	119,963	-	119,963	(75,671)	-	(75,671)
Total net position	\$ 234,080	107,225	341,305	22,552	95,854	118,406

Trust fund activity represents net position activity in the NWF while appropriated funds activity represents net position activity in the Defense Nuclear Waste Disposal appropriation.



**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

**(8) Financing**

The NWPA provides that the NWF consist of:

- unexpended balances available on the date of enactment for functions or activities incident to the disposal of civilian high-level radioactive waste or civilian spent nuclear fuel;
- appropriations made by Congress;
- receipt of fees; and
- investment income from authorized investments.

Expenditures may be made from the NWF subject to appropriation. Investments may be made in U.S. obligations from funds in excess of current needs. If, at any time, monies available in the NWF are insufficient to discharge responsibilities under the NWPA, borrowings may be made from the U.S. Treasury. The NWPA limits the NWF from incurring expenditures, entering into contracts and obligating amounts to be expended, except as provided in advance by appropriation acts.

**(9) Transfer Appropriations**

During 1997 and 1996, Congress authorized certain funds to be transferred directly from the NWF to various entities to pay for necessary expenses of the NWF. Amounts transferred consisted of:

	1997	1996	Cumulative
Nuclear Regulatory Commission	\$ 11,000	11,000	149,583
Nuclear Waste Technical Review Board	2,531	2,531	20,127
Office of the Nuclear Waste Negotiator	—	(70)	7,139
	\$ 13,531	13,461	176,849

The Nuclear Waste Technical Review Board (Board) and the Office of the Nuclear Waste Negotiator (Negotiator) were established under the Amendments Act. The Board, an independent establishment within the executive branch of the U.S. government, was established to evaluate the technical and scientific validity of activities undertaken by the Secretary, including site characterization activities and activities relating to the packaging or transportation of high-level radioactive waste or spent nuclear fuel. The Negotiator, who was appointed by the President and approved by the Senate, was to seek a State or Indian Tribe willing to host a repository or MRS facility, at a technically qualified site, on reasonable terms. The Office of the Nuclear Waste Negotiator

---

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

---

**(9) Continued**

expired in January 1995 and \$70 of the fiscal year 1995 appropriation was transferred back to the Nuclear Waste Fund in fiscal year 1996.

**(10) Pension Plan**

DOE employees working for OCRWM are covered by the Civil Service Retirement System (CSRS) or the Federal Employees Retirement System (FERS). As required by law, employees make contributions to the plans based on a percentage of their salaries with an amount contributed by OCRWM in accordance with the required retirement system regulations. Data regarding the CSRS and the FERS actuarial present value of accumulated benefits, assets available for benefits, and unfunded pension liability are not available to individual departments and agencies and therefore are not disclosed by OCRWM. As such, reporting is the responsibility of the U.S. Office of Personnel Management.

In 1997, OCRWM implemented Statement of Federal Financial Accounting Standards (SFFAS) No. 5, *Accounting for Liabilities of the Federal Government*, effective October 1, 1996. The provisions of SFFAS No. 5 require an employer entity to recognize an expense for its employees' retirement benefits equal to the service costs for these employees for the year based on the plans' actuarial cost methods and assumptions. The difference between the retirement benefit expense and contributions made by the entity is reported as an imputed financing source as these costs will ultimately be funded by the Office of Personnel Management (OPM). As a result, OCRWM recognized total retirement expense of \$2,587 as of September 30, 1997, and an imputed financing source of \$1,230 to reflect the portion of 1997 retirement expense to be paid by OPM.

**(11) Transactions With Other Government Agencies**

The NWPA established the Office of Civilian Radioactive Waste Management (OCRWM) within DOE to carry out the provisions of the NWPA and created a separate fund in the Treasury of the United States. All of the investment and borrowing powers of OCRWM are limited to transactions with the U.S. Treasury. In discharging its obligations under the NWPA, DOE contracts for services with numerous contractors including other Federal government agencies. Further, significant administrative services are provided by DOE.

As of September 30, 1997 and 1996, OCRWM owed other government agencies \$2,248 and \$2,087, respectively, for services and costs provided to OCRWM. For the years ended September 30, 1997 and 1996, OCRWM had incurred costs of \$16,484 and \$16,527, respectively, for services and costs provided by other government agencies.

As discussed in note 2, OCRWM is owed \$1,038,755 as of September 30, 1997 from DOE for the disposal of defense high-level waste in civilian repositories. This receivable is comprised of a current portion of \$235,300 and long-term portion of \$803,455.

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

**(12) Contingencies**

DOE is currently involved in various litigation arising from its activities. Although certain proceedings are at a preliminary stage, management does not expect that resolution of this litigation will have a material effect on the financial position of the NWF.

The NWPA provides for Payments-Equal-To-Taxes (PETT) each fiscal year to the State of Nevada and any affected unit of local government equal to the amount they would receive if authorized to tax Federal site characterization activities at a candidate repository site (prior to the 1987 amendments, the NWPA provided for payments-equal-taxes to eligible States and affected units of local governments). On August 27, 1991, DOE published a Notice of Interpretation and Procedures in the *Federal Register* outlining the implementation of Sections 116(c)(3)(A) and 118(b) (4) of the NWPA.

During fiscal year 1994, DOE entered into an agreement with Nye County, Nevada, for \$37,900 of PETT, covering the period from May 1986 through June 1999. DOE has made payments totaling \$26,600 through September 30, 1997, and has accrued an additional \$5,469 attributable to the tax period ending as of September 30, 1997.

In FY 1992, DOE made a PETT payment of \$771 to Benton County, Washington. In November 1993, Benton County, Washington, filed an appeal increasing its request to \$45,752. The Office of Hearings and Appeals issued a Supplemental Order adopting a Joint Stipulation filed on April 30, 1997, by Benton County, Washington, and the Department of Energy, through OCRWM. The Stipulation embodied the parties' agreement that the Department's total liability for Benton County PETT is \$5,334 to be paid in two installments. The first installment of \$2,253 was paid in May 1997. The second installment of \$3,000 plus interest amounting to \$82 was paid to Benton County, Washington, in October 1997.

In addition, in February 1993, the State of Washington filed a PETT claim which included interest through 1992 in the amount of \$9,978 based on its state and local use tax and its business and occupation tax. By agreement of the parties, the State of Washington PETT claim was held in abeyance pending resolution of the Benton County PETT claim. The Benton County claim was settled in FY 1997, pursuant to a joint stipulation between the parties. The Department is awaiting additional data before further evaluating the State of Washington's claim. It is not expected that this matter will have a significant impact on OCRWM.

The State of Nevada filed a petition for review on September 23, 1996, in the U.S. Court of Appeals for the Ninth Circuit requesting that the Secretary of Energy be ordered to make grants from the Nuclear Waste Fund at historical levels to the State and affected units of local government for the purpose of participating in activities under sections 116 and 117 of the NWPA for fiscal year 1996. Historically, the State of Nevada has received between \$5 million and \$5.5 million yearly in oversight funds, which represents approximately 1.5 percent of moneys appropriated for site characterization activities at Yucca Mountain. In its amended

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

---

**(12) Continued**

opening brief, dated June 10, 1997, the State asserted that it was entitled to \$3.5 million in grants, as its "historical proportion," and that the affected units of local government were entitled to a commensurate amount.

Oral argument in this case was held on December 11, 1997. On January 14, 1998, the Court denied the State of Nevada's petition for review. There is a low probability of an impact on the NWF.

**(13) DOE's Waste Acceptance Obligation**

DOE acknowledged that it would not have an operational high-level nuclear waste repository by the January 31, 1998 date specified in the NWPA of 1982, as amended. The Indiana Michigan Power Company and intervenors, other power companies and several states, filed petitions on May 26, 1995, challenging the Department's interpretation of the Nuclear Waste Policy Act (NWPA) that it was not obligated to accept spent nuclear fuel and high-level radioactive waste by January 31, 1998, in the absence of a facility constructed and licensed under the Act.

On July 23, 1996, the U.S. Court of Appeals for the District of Columbia Circuit held that the NWPA created an unconditional obligation that the Department commence disposing of utilities' spent nuclear fuel no later than January 31, 1998, in return for payment under the Standard Contract.

On January 31, 1997, thirty-six contract holders and thirty-three States filed petitions in Northern States Power Company, et al. v. U.S. Department of Energy, again in the U.S. Court of Appeals for the District of Columbia Circuit, for "enforcement" of the Indiana Michigan decision. They asserted that the anticipated inability of the Department to meet the January 31, 1998 deadline constituted an anticipatory breach of provisions of the NWPA and their contracts. They also contended that they should be entitled to suspend their payment of fees into the Fund and that these fees should be placed in escrow until the Department commences disposal pursuant to the Standard Contract.

On November 14, 1997, the U.S. Court of Appeals for the District of Columbia Circuit issued its decision in Northern States Power, concluding that the "remedial scheme of the Standard Contract offers a potentially adequate remedy" for the Department's anticipated failure to meet the 1998 deadline and holding that the petitioners must pursue the remedies provided in the Standard Contract. However, in ordering the parties to proceed with contractual remedies, the Court specifically precluded the Department "from concluding that its delay was unavoidable on the ground that it has not yet prepared a permanent repository or that it has no authority to provide storage in the interim." Article IX of the Standard Contract, entitled "Delays," provides for an equitable adjustment of charges and schedules if a party's delay is avoidable "to reflect any estimated additional costs incurred by the party not responsible for or contributing to the delay."

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

**(13) Continued**

On December 29, 1997, the Department filed a petition for rehearing and suggestion for rehearing en banc. The Court of Appeals has not acted on that petition and the ultimate outcome of this litigation is uncertain. If the Court of Appeals' decision stands, the NWF may be affected if contract holders pursue and receive equitable adjustments of their fees under the Standard Contract's Delays Clause, as the Court of Appeals appears to believe is appropriate. However, it is not possible at this time to reliably estimate the amount of such an impact, given the fact that no claims have yet been filed and that resolution of such claims will likely turn on highly fact-specific and individualized decisions about the costs incurred by each contract holder as a result of the delay. Moreover, if equitable adjustments of fees substantially impacted revenues to the Fund, the Department might be obligated, under the NWPA's "full cost recovery" provision, 42 U.S.C. 10222(a)(4), to propose off-setting fee adjustments. It is also possible that, whether or not the Court of Appeals' decision stands, contract holders will sue for breach of contract. However, it is not possible at this time to reliably estimate the nature or size of the claims that might be asserted, whether the contract holders will prevail, or whether any judgments that might be entered would be payable out of the "Judgment Fund", rather than the Nuclear Waste Fund.

**(14) Expenses by Object Classification**

The NWF's expenses by object classification for fiscal years 1997 and 1996 consisted of:

	1997	1996
Personal services and benefits	\$ 20,403	20,265
Contractual services	326,169	312,260
Other	12,853	15,228
Interest	—	1,023
Transfer appropriations (note 9)	13,531	13,461
Total expenses	\$ 372,956	362,297

**(15) Additional Waste**

In November 1993, DOE's Office of Environment, Safety and Health issued a report that identified additional waste owned by the Department, from both commercial and defense projects, that may require disposal in a civilian repository. OCRWM has been in the process of evaluating the additional liability to the Nuclear Waste Fund for disposal of these waste forms. The need to consider additional waste forms has raised new issues that complicate cost projections as the volume of wastes requiring disposal, and the corresponding cost of regulatory

**UNITED STATES DEPARTMENT OF ENERGY  
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT  
NUCLEAR WASTE FUND**

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

---

**(15) Continued**

compliance, facility and equipment designs, and cost of operations are unknown at this time. The range of costs (\$200,000 to \$500,000) presented in the notes to OCRWM's financial statements as of September 30, 1995 are incomplete and have not been revised. Therefore, no amounts have been recorded in the accompanying financial statements as of September 30, 1997, because the amount of fees attributable to this waste is not reasonably able to be estimated at this time.

High-level radioactive waste owned by the State of New York and currently stored at the West Valley Demonstration Project site, is of a type that may be disposed of in a Federal repository if the State of New York has entered into a contractual agreement with DOE, similar to the provisions of 10 CFR Part 961. To date, the State of New York has not entered into such an agreement. If the methodology announced by DOE in the Federal Register in August 1987, for the calculation of the defense high-level waste share of program costs were used, the share of total-system costs allocated to the disposal of West Valley high-level waste would be approximately \$114 million. This amount has not been recorded in the financial statements as of September 30, 1997, because, at this time, DOE is not legally required to take title to or dispose of the West Valley high-level waste, nor is the State of New York required to enter into a disposal contract with DOE if it does not plan to dispose of the high-level waste in a Federal repository.



Peat Marwick LLP

2001 M. Street, N.W.  
Washington, DC 20036

## Independent Auditors' Report on Internal Controls Over Financial Reporting

Office of Civilian Radioactive Waste Management  
United States Department of Energy:

We have audited the financial statements of the Office of Civilian Radioactive Waste Management (OCRWM) as of and for the year ended September 30, 1997, and have issued our report thereon dated January 2, 1998. We conducted our audit in accordance with generally accepted auditing standards; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and Office of Management and Budget (OMB) Bulletin No. 93-06, *Audit Requirements for Federal Financial Statements*.

The management of OCRWM is responsible for establishing and maintaining internal controls. In fulfilling this responsibility, estimates and judgments by management are required to assess the expected benefits and related costs of internal control structure policies and procedures. The objectives of internal controls are to provide management with reasonable, but not absolute, assurance that transactions, including those relating to obligations and costs, are executed in compliance with applicable laws and regulations that could have a direct and material effect on the financial statements and any other laws and regulations that OMB or OCRWM's management have identified as being significant and for which compliance can be objectively measured and evaluated; funds, property, and other assets are safeguarded against loss from unauthorized use or disposition; transactions are executed in accordance with management's authorization and properly recorded and accounted for to permit the preparation of reliable financial reports in conformity with applicable accounting principles described in note 2 to the financial statements and to maintain accountability over assets; and data that support reported performance measures are properly recorded and accounted for to permit preparation of reliable and complete performance information. Because of inherent limitations in internal controls, fraud may nevertheless occur and not be detected. Also, projection of any evaluation of internal controls to future periods is subject to the risk that procedures may become inadequate because of changes in conditions or that the effectiveness of the design and operation of policies and procedures may deteriorate.

In planning and performing our audit, we considered OCRWM's internal control over financial reporting in order to determine our auditing procedures for the purposes of expressing an opinion on the financial statements, and not to provide an opinion on the internal control over financial reporting. Accordingly, we do not express such an opinion. With respect to internal controls, we obtained an understanding of the design of relevant policies and procedures, determined if they had been placed in operation, assessed control risk, and performed tests of internal controls.



Member Firm of  
KPMG International

Our evaluation of the controls for performance information was limited to those controls designed to ensure the existence and completeness of the information. With respect to the performance measure control objectives, we obtained an understanding of relevant internal control policies and procedures designed to permit the preparation of reliable and complete performance information, and we assessed control risk.

A material weakness is a condition in which the design or operation of one or more of the internal control components does not reduce to a relatively low level the risk that misstatements in amounts that would be material in relation to the financial statements being audited, or to a performance measure or aggregation of related performance measures, may occur and not be detected within a timely period by employees in the normal course of performing their assigned functions. Our consideration of internal controls would not necessarily disclose all internal control matters that might be material weaknesses under standards established by the American Institute of Certified Public Accountants and OMB Bulletin No. 93-06. We noted no matters involving internal control over financial reporting and its operation that we consider to be material weaknesses.

However, we noted other matters involving internal controls and their operation that we have reported to management of OCRWM in a separate letter.

This report is intended for the information of the management of OCRWM and the United States Department of Energy. However, this report is a matter of public record and its distribution is not limited.

*KPMG Peat Marwick LLP*

January 2, 1998





2001 M. Street, N.W.  
Washington, DC 20036

## Independent Auditors' Report on Compliance with Laws and Regulations

Office of Civilian Radioactive Waste Management  
United States Department of Energy:

We have audited the financial statements of the Office of Civilian Radioactive Waste Management (OCRWM) as of and for the year ended September 30, 1997, and have issued our report thereon dated January 2, 1998. We conducted our audit in accordance with generally accepted auditing standards; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and Office of Management and Budget (OMB) Bulletin No. 93-06, *Audit Requirements for Federal Financial Statements*, except for those portions of the Bulletin that relate to the Federal Financial Management Improvement Act (FFMIA) of 1996. The Department of Energy Office of Inspector General is responsible for determining compliance with FFMIA.

The management of OCRWM is responsible for complying with laws and regulations applicable to OCRWM. As part of obtaining reasonable assurance about whether OCRWM's financial statements are free of material misstatement, we performed tests of its compliance with certain provisions of laws and regulations, noncompliance with which could have a direct and material effect on the determination of financial statement amounts, and certain other laws and regulations specified in OMB Bulletin No. 93-06. However, providing an opinion on compliance with certain provisions of laws and regulations was not an objective of our audit. Accordingly, we do not express such an opinion.

The results of our tests of compliance with the laws and regulations described in the preceding paragraph disclosed no instances of noncompliance that are required to be reported herein under *Government Auditing Standards* and OMB Bulletin No. 93-06.

This report is intended for the information of the management of OCRWM and the United States Department of Energy. However, this report is a matter of public record and its distribution is not limited.

*KPMG Peat Marwick LLP*

January 2, 1998





# *Appendix B*

---

## *Key Federal Laws and Regulations*

The Office of Civilian Radioactive Waste Management must comply with the requirements set forth in the Nuclear Waste Policy Act of 1982, as amended, as well as those mandated in other applicable laws. The program must also comply with the regulations of other Federal agencies, including the Nuclear Regulatory Commission (NRC), the Department of Transportation (DOT), and the Environmental Protection Agency (EPA).

### **The Nuclear Waste Policy Act of 1982**

The Nuclear Waste Policy Act of 1982, as originally enacted, established basic policies.

**Development of geologic repositories.** The Act established a framework for siting, characterizing, constructing, and operating two permanent geologic repositories for disposal of spent nuclear fuel and high-level radioactive waste.

**Storage.** The Act provided for a limited amount of emergency interim storage and for developing a proposal to site and construct a monitored retrievable storage facility on a firm schedule. These provisions have expired.

**Intergovernmental relations.** The Act set requirements for interactions between the Federal Government and States, local governments, and Native American Tribes.

**Other Federal responsibilities.** The Act assigned responsibilities for nuclear waste management to specific Federal agencies.

**Nuclear Waste Fund.** The Act required the establishment of a fund to cover nuclear waste disposal costs. User fees on electricity generated and sold are paid into the fund.

**Office of Civilian Radioactive Waste Management.** The Act established the office within the Department of Energy.

### **The Nuclear Waste Policy Amendments Act of 1987**

The Nuclear Waste Policy Amendments Act of 1987 retained the basic policies set forth in the 1982 Act regarding Federal responsibilities, the Nuclear Waste Fund, and the Office of Civilian Radioactive Waste Management. However it significantly modified the original Act.

**Site characterization.** The Amendments Act directed the Department to characterize only the Yucca Mountain site in Nevada, to determine whether it is suitable as a repository site, and to postpone consideration of the need for a second repository until the year 2007.

**Monitored Retrievable Storage.** It authorized the siting, construction, and operation of a monitored retrievable storage facility subject to certain conditions that link the construction and operation of the facility tightly to construction and licensing of a repository.

**State and Tribal involvement.** It provided financial incentives for States and Native American Tribes on whose land a repository or monitored retrievable storage facility is sited. It authorized on-site oversight representatives of host States, Native American Tribes, and localities. And it provided for increased local government participation.

**Oversight.** It increased external oversight of OCRWM's work by establishing the Nuclear Waste Technical Review Board.

**Nuclear Waste Negotiator.** It established the Office of the Nuclear Waste Negotiator to attempt to reach an agreement with a State or Native American Tribe willing to host a repository or monitored retrievable storage facility. These provisions have expired.

## **The Energy Policy Act**

The Energy Policy Act of 1992 includes key elements of the National Energy Strategy proposed by the Administration in 1990. A number of provisions affect OCRWM.

Section 801 of the Act directed the Environmental Protection Agency to contract with the National Academy of Sciences to provide "findings and recommendations on reasonable standards for protection of the public health and safety" that would govern the long-term performance of a high-level radioactive waste repository at the Yucca Mountain site. Within 1 year of receiving the Academy's recommendations, the Environmental Protection Agency is required to promulgate public health and safety standards that "shall prescribe the maximum annual effective dose equivalent to the individual members of the public from releases to the accessible environment from radioactive materials stored or disposed of in the repository." The Nuclear Regulatory Commission is then required to modify its technical requirements and criteria consistent with the Environmental Protection Agency's standards.

Section 803 instructed the Department of Energy to evaluate whether its current programs and plans for management of nuclear waste are adequate to deal with additional volumes or categories that might be generated by nuclear power plants newly licensed after October 1992.

## **The Energy and Water Development Appropriations Act of 1996**

The Energy and Water Development Appropriations Act of 1996 provided a total of \$400 million for the program, \$85 million of which was designated to be used only for the development of an interim storage facility and only upon enactment of new statutory authority. Pending such authority, the program was effectively reduced to a \$315 million funding level, or one-half of the \$630 million funding level anticipated for the continuation of the 1994 program approach.

Congress recognized that the significant reduction in funding would require a more restricted repository program. The Conference Report accompanying the appropriations language provided the following guidance:

The conferees agree on the importance of continuing existing scientific work at Yucca Mountain to determine the ultimate feasibility and licensability of the permanent repository at that site. The conferees direct the Department to refocus the repository program on completing the core scientific activities at Yucca Mountain. The Department should complete excavation of the necessary portions of

the exploratory tunnel and the scientific tests needed to assess the performance of the repository. It should defer preparation and filing of a license application for the repository with the Nuclear Regulatory Commission until a later date. The Department's goal should be to collect the scientific information needed to determine the suitability of the Yucca Mountain site and to complete a conceptual design for the repository and waste package for later submission to the Nuclear Regulatory Commission.

## **The Energy and Water Development Appropriations Act of 1997**

The Energy and Water Development Appropriations Act of 1997 provided a total of \$382 million for the program, with specific guidance as follows:

That no later than September 30, 1998, the Secretary shall provide to the President and to Congress a viability assessment of the Yucca Mountain site. The viability assessment shall include:

- (1) the preliminary design concept for the critical elements for the repository and waste package; (2) a total system performance assessment, based upon the design concept and the scientific data and analysis available by September 30, 1998, describing the probable behavior of the repository in the Yucca Mountain geological setting relative to the overall system performance standards; (3) a plan and cost estimate for the remaining work required to complete a license application; and (4) an estimate of the costs to construct and operate the repository in accordance with the design concept.

In accordance with this direction, 85 percent of the funding provided to OCRWM in the Fiscal Year 1997 appropriations was allocated to the Yucca Mountain Project to ensure the successful completion of the viability assessment. The remainder of the Fiscal Year 1997 appropriation was used to support OCRWM's Office of Waste Acceptance, Storage, and Transportation, and for program management, systems integration, and quality assurance activities.

## **Key Regulations**

These rules are published in the Code of Federal Regulations, which is divided into volumes organized by Title and Part. For example, "10 CFR 60" refers to "Part 60 of Title 10."

10 CFR 2 (NRC) Rules of Practice for Domestic Licensing Procedures and Issuance of Orders. Specifies the licensing process and requires an electronic record-keeping system to preserve data needed for licensing.

10 CFR 20 (NRC) Standards for Protection Against Radiation. Establishes standards for radiation safety at an NRC-licensed facility.

10 CFR 50, Appendix B (NRC) Quality Assurance Criteria for Nuclear Power Plant and Fuel Reprocessing Plants. Establishes quality assurance requirements.

10 CFR 60 (NRC) Disposal of High-Level Radioactive Wastes in Geologic Repositories. Sets forth technical requirements governing development of a permanent geologic repository for spent nuclear fuel and high-level radioactive waste. Specifies NRC oversight and licensing duties.

10 CFR 71 (NRC) Packaging and Transportation of Radioactive Material. Implements Department of Transportation requirements for packaging and transporting spent nuclear fuel and high-level radioactive waste.

10 CFR 72 (NRC) Licensing Requirements for the Independent Storage of Spent Fuel and High-Level Radioactive Waste. Sets forth technical requirements for licensing private storage facilities to receive, transport, and store spent nuclear fuel, and outlines procedures by which the Department of Energy is licensed to receive, transport, and store spent fuel at a temporary facility.

10 CFR 73 (NRC) Physical Protection of Plants and Materials. Prescribes requirements for physical protection systems to protect against radiological sabotage and theft or diversion of special nuclear materials.

10 CFR 74 (NRC) Material Control and Accounting of Special Nuclear Material. Establishes requirements for control and accounting of special nuclear material, including documentation of transfer of material.

10 CFR 75 (NRC) Safeguards on Nuclear Material—Implementation of US/IAEA Agreement. Establishes a system to implement the agreement between the U.S. and the International Atomic Energy Agency on the application of safeguards.

10 CFR 960 (DOE) General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories. Promulgated to establish guidelines to compare sites; used as the basis for the 1988 Site Characterization Plan for the Yucca Mountain Project.

10 CFR 961 (DOE) Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste. Outlines the Department's contract with utilities to receive, transport, and dispose of spent nuclear fuel and high-level waste.

40 CFR 191 (EPA) Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes. Originally issued in 1985 pursuant to the Nuclear Waste Policy Act, the regulations were remanded in 1987 in response to an objection filed by the Natural Resources Defense Council. However, in 1992, the Waste Isolation Pilot Plant Land Withdrawal Act reinstated the disposal standard, except for those sections that were subject to the remand order. In addition, the Waste Isolation Pilot Plant Land Withdrawal Act exempted "the characterization, licensing, construction, operation, or closure of any site required to be characterized under Section 113(a) of Public Law 97-425" (Nuclear Waste Policy Act of 1982) from regulation under 40 CFR 191. Pursuant to Section 801 of the Energy Policy Act of 1992, the Environmental Protection Agency is developing separate standards applicable to the Yucca Mountain site.

49 CFR 171-179 (DOT) Hazardous Materials Regulations. Specifies general Department of Transportation requirements for the transportation of radioactive materials.

# Appendix C

---

## *Fiscal Year 1997 Congressional Testimony and Meetings with Regulators and Oversight Bodies*

### **Congressional Hearings**

#### *Senate*

Date	Committee/Subcommittee	Witness
January 30, 1997	Energy and Natural Resources Committee	Secretary Peña
February 5, 1997	Energy and Natural Resources Committee	Under Secretary Grumbly

#### *House of Representatives*

Date	Committee/Subcommittee	Witness
March 12, 1997	Appropriations, Energy and Water	OCRWM Acting Director Barrett
March 19, 1997	Appropriations, Energy and Water	Secretary Peña
April 29, 1997	House Committee on Energy and Power	OCRWM Acting Director Barrett

### **Nuclear Regulatory Commission (NRC)**

Date	Topic
October 22-23, 1996	87th Advisory Committee on Nuclear Waste: requirements for Radioactive Waste Land Burial Sites and other topics
October 23, 1996	Management Meeting: program plan and budget; the legislative process; update on activities of OCRWM's Office of Waste Acceptance, Storage, and Transportation; status of 10 CFR Part 960; update on DOE documentation of decisions; Seismic Topical Report III; update on the Licensing Support System; NRC quality assurance concerns
November 12-13, 1996	88th Advisory Committee on Nuclear Waste: prioritize issues for Committee's consideration
December 16, 1996	Technical Meeting: design, testing, and construction of the Exploratory Studies Facility

---

*Appendix C—Fiscal Year 1997 Congressional Testimony and Meetings with Regulators and Oversight Bodies*

---

January 15, 1997	Management Meeting: NRC High-Level Radioactive Waste Program Annual Report for Fiscal Year 1996
January 28-30, 1997	89th Advisory Committee on Nuclear Waste: site characterization at the proposed Yucca Mountain repository and other topics
February 5, 1997	Appendix 7 Meeting: Disposal Criticality Analysis Methodology Technical Report
February 6, 1997	Appendix 7 Meeting: Level of Design Detail for License Application
February 25-26, 1997	Technical Exchange: igneous activity in total system performance assessment
February 27, 1997	Appendix 7 Meeting: seismic methodology, revisions to Seismic Topical Report II
March 20-2, 1997	90th Advisory Committee on Nuclear Waste: Yucca Mountain and other topics
March 31, 1997	Technical Meeting: issues related to the design, testing, and construction of the Exploratory Studies Facility
April 22-24, 1997	91st Advisory Committee on Nuclear Waste: igneous activity related to the proposed Yucca Mountain repository
April 30, 1997	Management Meeting: repository licensing strategy, NRC's annual report
May 7-8, 1997	Appendix 7 Meeting: Disposal Criticality Analysis Methodology
May 15, 1997	Briefing to the Commissioners by Lake Barrett, OCRWM Acting Director
May 20-22, 1997	92nd Advisory Committee on Nuclear Waste: decommissioning performance assessment, the defense-in-depth approach for a high-level waste repository, the use of expert elicitation, topical safety analysis report for a central storage facility
June 11, 1997	Quarterly Technical Meeting: issues related to the design, testing, and construction of the Exploratory Studies Facility and the enhanced characterization of the repository block
June 11-12, 1997	Appendix 7 Meeting: open items on site characterization and design currently under review by NRC staff
July 16-17, 1997	Appendix 7 Meeting: DOE's three-dimensional integrated site geologic model and NRC's site geologic framework model
July 21-22, 1997	Technical Exchange: Total System Performance Assessments for Yucca Mountain
July 22-24, 1997	93rd Advisory Committee on Nuclear Waste: high-level waste performance assessment activities
July 30, 1997	Technical Exchange: DOE's licensing approach for disposal of DOE spent nuclear fuel



September 4, 1997	Management Meeting: NRC review of DOE's dry transfer system Topical Safety Analysis Report (TSAR), centralized interim storage facility TSAR, the burnup credit topical report, issue resolution status reports, waste containment and isolation strategy, DOE decision documentation initiative, DOE/NRC procedural agreement, expectations for the viability assessment
September 10, 1997	Quarterly Technical Meeting: thermal testing; program enhancements, including surface-based testing and the east-west drift
September 23, 1997	Appendix 7 Meeting: thermal testing under way and planned
September 23-25, 1997	94th Advisory Committee on Nuclear Waste: the status of DOE's viability assessment

### **Nuclear Waste Technical Review Board**

<b>Date</b>	<b>Organization</b>	<b>Topic</b>
October 9-10, 1999	Full Board	Fiscal Year 1997 planned activities, unsaturated zone flow at Yucca Mountain, concept of repository operations and effects on design
January 28-29, 1997	Full Board	Total system performance assessment, transportation, updates on program and project activities and investigations, reducing hydrologic uncertainties
June 25-26, 1997	Full Board	Performance and uncertainties of the repository design and engineered barrier system, repository performance and uncertainties in the natural system

### **National Academy of Sciences—National Research Council**

<b>Date</b>	<b>Organization</b>	<b>Topic</b>
October 25, 1996	Board on Radioactive Waste Management	Future of U.S. spent fuel and high-level waste disposal
March 24, 1997	Board on Radioactive Waste Management	Yucca Mountain Project performance assessment



# *Appendix D*

---

## *OCRWM Publications, Fiscal Year 1997*

*Nuclear Waste Fund Fee Adequacy*, October 1996 (DOE/RW-0479)

*The OCRWM Enterprise*, December 1996 (DOE/RW-0489), May 1997 (DOE/RW-0499)

*Site Characterization Progress Report Number 15*, April 1997 (DOE/RW-0498)

*OCRWM Annual Report to Congress*, May 1997 (DOE/RW-0490)

*Preliminary Estimates of the Total System Cost for the Restructured Program: An Addendum* (DOE/RW-295P)



# *Appendix E*

---

## *Selected Publications from Other Organizations, Fiscal Year 1997*

This Appendix lists publications relevant to activities discussed in OCRWM's Annual Report. The Appendix is not intended to be comprehensive; it lists only those publications that we were able to identify in the course of a limited survey. Because Congress appropriated no Fiscal Year 1997 funding for affected units of government, local units of affected government curtailed their publications.

OCRWM makes no warranty, express or implied, concerning the authenticity, accuracy, completeness, or usefulness of the information contained in the publications listed below.

### **General Accounting Office**

*Nuclear Waste: Impediments to Completing the Yucca Mountain Repository Project*, January 1997 (GAO/RCED-97-30)

### **Nuclear Waste Technical Review Board**

*Report to the U.S. Congress and the Secretary of Energy: 1996 Findings and Recommendations*, April 1997

### **Nuclear Regulatory Commission**

*Branch Technical Position on the Use of Expert Elicitation in the High-Level Radioactive Waste Program*, November 1996 (NUREG-1563)

*NRC High-Level Radioactive Waste Management Program Annual Progress Report: Fiscal Year 1996*, January 1997 (NUREG/CR-6513)

### **State of Nevada**

*Report Summarizing the Statistical Modeling of Volcanic Risk Studies at the Yucca Mountain Nuclear Waste Repository Site*, December 1996

*Final Report, Summary of Volcanism Studies Related to Probabilistic Volcanic Hazard Assessment for the Period 1986-1996*, January 1997

*Evaluation of the Geologic Relations and Seismotectonic Stability of the Yucca Mountain Area, A Final Report*, January 1997

*Summary of Yucca Mountain Oversight and Impact Assessment Findings*, January 1997

***Appendix E—Selected Publications from Other Organizations, Fiscal Year 1997***

---

*Report on the State of Nevada's Oversight of the U.S. Department of Energy's High-Level Radioactive Waste Management Program, February 1997*

*Fault-Controlled Vertical Leakage Inferred From Water-Table Temperature Variations at Yucca Mountain, Nevada, May 1997 (NWPO-TR-025-97)*

*Papoose Lake Sill: A Natural Analogue for a Potential Repository's Hydrothermal Effects, June 1997 (NWPO-TR-026-97)*

*A Preliminary Study of Sabotage and Terrorism as Transportation Risk Factors Associated with the Proposed Yucca Mountain High-Level Nuclear Waste Facility, June 1997 (NWPO-TN-018-96)*

*Nuclear Waste Transportation Security and Safety Issues: The Risk of Terrorism and Sabotage Against Repository Shipments, June 1997*

*Comments on the U.S. Department of Energy's Proposed Revisions to the Guidelines for Siting a Nuclear Waste Repository, March 1997*

**National Association of Regulatory Utility Commissioners**

*U.S. Nuclear Waste Program: Status and Issues Update, October 1996*

**League of Women Voters Education Fund**

*Transportation of Civilian Radioactive Wastes by Private Industry, February 1997*

**Conference of Radiation Control Program Directors, Inc.**

*Directory of State Agencies Involved with the Transportation of Radioactive Materials, No. 96-5, October 1996*

**Commercial Vehicle Safety Alliance**

*Recommended National Procedures and Out-of-Service-Criteria for the Enhanced Safety Inspection of Commercial Highway Vehicles Transporting Transuranics, Spent Nuclear Fuel, and High Level Radioactive Waste, May 1997*