Annual Report to Congress

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

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EXECUTIVE SUMMARY

This is the eighth annual report submitted by the Office of Civilian Radioactive Waste Management (OCRWM) to Congress. It covers activities and expenditures during Fiscal Year (FY) 1991, which ended September 30, 1991.

Fiscal year 1991 saw significant developments in the Civilian Radioactive Waste Management Program. These developments included the start of new site characterization activities at the Yucca Mountain candidate site for a repository; the selection of a design for the underground studies facility at the candidate site; the announcement of the availability of grants to study the feasibility of siting a facility for monitored retrievable storage (MRS); and new initiatives directed at enhancing the participation of affected and interested parties in the program.

Much of OCRWM's activity in FY 1991 was directed toward implementing and expanding the initiatives that Secretary of Energy James D. Watkins announced in his 1989 *Report to Congress on Reassessment of the Civilian Radioactive Waste Management Program*. These initiatives centered on (1) gaining access to the candidate repository site at Yucca Mountain in order to continue scientific investigations needed to evaluate the site's suitability; (2) establishing an integrated MRS facility; and (3) restructuring OCRWM.

New site characterization activities at Yucca Mountain, the first activities since 1986, began in July 1991 after the State of Nevada issued, under court order, the necessary air quality and underground injection control permits. The new activities included trenching in Midway Valley to investigate faulting near the proposed location of the surface facilities. Trenching was also begun to investigate the nature and age of the volcanic cones in Crater Flat and at Lathrop Wells. In addition, Trench 14, a previously excavated trench, was deepened to permit further investigation of calcite and silica deposits exposed on its walls.

As part of its effort to integrate numerous technical, management, and regulatory activities, OCRWM hired a management and operating contractor. And in August 1990, OCRWM implemented its Management Systems Improvement Strategy. This strategy uses systems engineering to integrate all of the elements of the waste management system.

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In July 1991, Dr. Bartlett announced a two-phase program to ensure that transportation casks will be available by 1998. Phase I, which encompasses the near term, will acquire current technology casks, both truck and rail. Phase II, which is long term, will continue the development of higher capacity casks. Work on General Atomics' legal-weight truck design and Babcock & Wilcox's rail/barge cask design has advanced to near readiness for external review.

In September 1991, under OCRWM direction, a request for proposals was issued for storage technologies for use at the MRS facility. OCRWM expects to select a technology (or technologies) and design in FY 1992. OCRWM is also involved in a joint project with the Sacramento Municipal Utility District in California and the Electric Power Research Institute to demonstrate technologies for spent fuel transfer and storage.

In FY 1991, OCRWM implemented a new organizational structure with clear lines of responsibility, authority, and accountability for program participants. The new structure is project oriented and includes a single office responsible for geologic disposal and another responsible for the MRS facility; the latter will be established when a suitable site is identified and then approved by Congress.

OCRWM's progress was also focused on helping achieve the objectives of the President's National Energy Strategy announced in February 1991, which commits to proper management and disposal of spent fuel through cost-effective and timely means. The ultimate result of achieving this goal will be to ensure future nuclear energy productivity by resolving environmental and other waste-related concerns that at present inhibit future energy resource development and economic growth. OCRWM fulfills a key role in the overall National Energy Strategy to preserve the nuclear option for generating the electrical energy needed to help build and strengthen our Nation's future economy.

Another highlight of the year's activities was the effort of OCRWM Director Dr. John Bartlett to build stronger working relationships with the program stakeholders by broadening their participation in decisionmaking. To this end, affected governments and interested parties joined OCRWM in a series of workshops designed to formulate the strategic principles that will guide the program.

With a major assist from the participants at these workshops, OCRWM issued, in September 1991, the draft Mission Plan Amendment for public comment. The document was distributed to over 7,000 individuals and organizations. OCRWM

also held a workshop in October 1991 to obtain input about the further development of the amendment.

To strengthen two-way communication, staff from the Yucca Mountain Site Characterization Project Office (the Project Office) gave more than 200 presentations to civic, educational, business, and professional groups. The Project Office also began a monthly series of public lectures on a wide range of technical issues about the Yucca Mountain candidate site. Since its opening in Las Vegas, OCRWM's public information office has hosted about 10,000 visitors. In March 1991, the Project Office began to offer public open houses and site tours. The tours have been a notable success, with more than 500 visitors taking the tour every month. The Project Office also displayed exhibits about the program in 30 States and abroad.

In April 1991, the Department of Energy (DOE) and Nye County, Nevada, signed a "framework" agreement for improving and formalizing their interactions. In May 1991, Secretary Watkins notified Esmeralda, Eureka, and White Pine Counties, Nevada, and Inyo County, California, that they were designated affected units of local government under the provisions of the Nuclear Waste Policy Act of 1982, as amended (NWPA). He later also designated Churchill, Lander, and Mineral Counties in Nevada as affected. These counties join Nye, Clark, and Lincoln Counties in Nevada as affected units of local government. In August 1991, two protocol documents were signed with Nye County. These documents address principles and procedures for interactions and socioeconomic monitoring and assessment. In August 1991, DOE published in the *Federal Register* a notice of interpretation for the payments-equal-to-taxes provisions of the NWPA.

OCRWM continues to promote science literacy and increase public understanding of energy and waste management. It has developed curricular materials, expanded ties with educational institutions, and supported international educational activities. During FY 1991, field testing of curricular material began in 10 States. Twenty students participated in OCRWM's graduate school fellowship program. A total of \$5.8 million was provided for independent research and analysis at several branches of the University of Nevada system.

During FY 1991, a contractor-led core team of technical experts conducted an early site suitability evaluation and prepared a draft report discussing their conclusions about the Yucca Mountain candidate site. This draft report was subsequently submitted to a group of independent experts for peer review. In March 1991, a task force completed an extensive evaluation of the priorities for

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surface-based and in situ testing. It was determined that initial testing should emphasize the need for information on the potential for long-term gaseous releases and on the geologic complexity of the candidate site in relation to ground water travel and the transport of radionuclides. Also completed in FY 1991 was the Calico Hills risk/benefit analysis, which determined that the underground testing program should include testing below the candidate repository horizon at Yucca Mountain.

OCRWM also completed a major study of design alternatives for the exploratory studies facility (ESF). The ESF alternatives study determined that access to both the candidate repository horizon and the underlying Calico Hills rock unit should be provided through mechanically excavated ramps. The findings of the study were incorporated into the ESF Title I design. In June and August 1991, the design was reviewed by two independent technical design review teams as well as affected government agencies and interested parties. In September 1991, OCRWM issued a revised summary report for the ESF Title I design.

In October 1990, OCRWM, along with observers from the Nuclear Regulatory Commission (NRC), the State of Nevada, and affected units of local government, conducted quality assurance (QA) qualification audits at OCRWM Headquarters in Washington and at the Yucca Mountain Site Characterization Project Office in Las Vegas. The audits focused on the QA program elements necessary to start new site characterization activities. NRC staff stated in March 1991 that OCRWM's QA program was acceptable for some new site characterization activities—that is, activities associated with trenching at Midway Valley and investigations of the calcite-silica deposits—provided that the recommended actions identified in the audit reports were completed and verified. The actions identified in the audit reports were completed and verified, and in August 1991 OCRWM transmitted to NRC a letter requesting that NRC lift the objection to OCRWM's QA program originally stated in the 1989 NRC Site Characterization Analysis (QA objection 2) and grant unconditional acceptance of the QA program.

Throughout FY 1991, OCRWM continued to participate in several international repository technology programs. In September 1991, new cooperative agreements were concluded with Canada and Switzerland.

In November 1990, a memorandum of understanding was signed with the Office of the Nuclear Waste Negotiator. The memorandum outlines procedures for sharing information and provides the Negotiator with the use of OCRWM services,

facilities, and personnel while maintaining the independence of each party. During the year, OCRWM provided detailed information to the Negotiator.

During FY 1991, OCRWM prepared several publications to inform the public about the MRS facility. In June 1991, OCRWM, along with the Negotiator, published notices in the *Federal Register* announcing the availability of grants to assess the feasibility of hosting an MRS facility. During FY 1991, no grants were made. However, in early FY 1992, grants were made to the Mescalero Apache Indian Tribe in New Mexico; Grant County, North Dakota; the Yakima Indian Nation in Washington State; and Fremont County, Wyoming. Further grant applications were expected.

A strategy was developed for complying with Section 180(c) of the NWPA, which directs OCRWM to provide assistance to States for the purpose of training public safety officials of local governments; the same type of assistance will be provided to Indian Tribes. This strategy incorporates the applicable portions of the Hazardous Materials Transportation Uniform Safety Amendments Act of 1990.

This annual report reviews OCRWM's progress on these and other initiatives during FY 1991. Chapter 1 of this report describes OCRWM's mission and objectives. Chapters 2 through 8 discuss activities and accomplishments during FY 1991. Financial statements for the Nuclear Waste Fund are presented in Chapter 9.

Chapter 1

INTRODUCTION

This is the eighth annual report submitted by the Office of Civilian Radioactive Waste Management (OCRWM) to Congress. This report is required by Section 304(c) of the Nuclear Waste Policy Act (Public Law 97-425) as amended by the Nuclear Waste Policy Amendments Act of 1987 (Title V, Public Law 100-203). OCRWM submits this report to inform Congress of its activities and expenditures during FY 1991.

Mission and Objectives of the Civilian Radioactive Waste Management Program

The Nuclear Waste Policy Act of 1982 established OCRWM to manage and permanently dispose of spent nuclear fuel from civilian nuclear power plants and high-level radioactive waste from the Nation's defense programs. OCRWM must carry out this mission in a manner that protects the health and safety of the public and of workers and the quality of the environment. Although embodied in the Federal repository program that began in the late 1950s, this mission was explicitly established by the Act and reaffirmed in 1987 by the Nuclear Waste Policy Act, as amended (NWPA).

As originally enacted in 1982, the NWPA provided for the recommendation by the Secretary to the President of three sites for characterization as candidate sites for the first repository, prescribed a schedule and a process for siting two geologic repositories, authorized the construction and operation of one repository subject to licensing by the U.S. Nuclear Regulatory Commission (NRC), and mandated the development of a transportation system. The NWPA included provisions for ensuring the participation of States, affected Indian Tribes, and the public in the program. To finance the waste management program, the NWPA established the Nuclear Waste Fund, which is funded through payments by the generators and owners of the waste.

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As amended in 1987, the NWPA made significant changes to the program, limiting repository site characterization to the Yucca Mountain, Nevada, candidate site. It authorized a facility for monitored retrievable storage (MRS), subject to certain conditions and to NRC licensing, and established several institutional entities with which OCRWM is to interact.

In adapting its program to the requirements of the amendments and to help focus its mission, OCRWM established the following objectives:

1. *Timely disposal capability*: to establish as soon as practicable the ability to dispose of radioactive waste in a geologic repository licensed by NRC.
2. *Timely and adequate waste acceptance*: to begin operation of the waste management system as soon as practicable, obtaining the system development and operational benefits that have been identified for the MRS facility.
3. *Schedule confidence*: to establish confidence in the schedule for waste acceptance and disposal such that the management of radioactive waste is not an obstacle to the nuclear energy option.
4. *System flexibility*: to ensure that the program has the flexibility necessary for adapting to future circumstances while fulfilling established commitments.

In early 1991, the President's National Energy Strategy proposed several measures that would, if fully implemented, increase nuclear power generation to "cleanly and safely meet a substantial portion of the additional base-load electricity generating capacity the United States will require by 2030." OCRWM's effort to site and license a permanent repository and MRS facility under current law is fully compatible with, and supportive of, these specific goals.

Complexity and Uniqueness of the Program

The development of a system for transporting, storing, and disposing of radioactive waste is a complex undertaking that presents unprecedented technical, institutional, and management challenges. The OCRWM program has a longer time horizon than virtually any other Government undertaking. The waste management system will operate for many decades, and there are long lead times for planning and constructing it. It will be necessary to predict how the repository will

perform for thousands of years into the future and demonstrate that it will meet environmental protection standards and performance objectives set by the U.S. Environmental Protection Agency (EPA) and NRC. For both DOE and NRC, repository licensing presents a special challenge: a first-time effort, it will require the evaluation, coordination, and integration of large amounts of technical information.

Numerous affected governments and interested parties and the public have a stake in the success of the program. They bring many different, and often conflicting, goals and points of view to a subject that is inherently controversial and can arouse intense emotions. Ensuring that all external parties are fully informed and able to exercise their rights to participate in and oversee the program is a continuing challenge. Over the past year OCRWM has strengthened its efforts to ensure a constructive dialogue between itself and those with a stake in the program.

In meeting these challenges, OCRWM must meet the highest standards of technical excellence and public accountability while controlling costs and schedules.

Strategic Principles

To implement the initiatives the Secretary presented in his 1989 reassessment of the program and to establish a foundation for the program, the OCRWM Director, Dr. John Bartlett, undertook the development of a set of strategic principles. During FY 1991, three workshops were held with external parties to obtain their views on the strategic principles and the future of the program. The input received from participants in the workshops contributed substantially to the draft Mission Plan Amendment, which was issued for public comment in September 1991. As discussed in the amendment, OCRWM's strategic principles are as follows:

Management Principles

- Maintain the focus of the program on permanent disposal.
- Provide facilities for the timely acceptance of spent fuel.
- Maintain strict environmental compliance programs.
- Ensure that funds are spent in a cost-effective manner.
- Maintain standards of excellence.
- Ensure that all quality assurance requirements are met.
- Consider public trust and confidence in program decisions.

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- Assign equal importance to institutional and technical activities.
- Diminish uncertainties related to spent fuel management by the utilities.
- Provide alternatives and contingency plans.
- Coordinate the technical, institutional, and management activities of the program.
- Apply lessons learned.
- Assess own performance rigorously.

Technical Principles

- Apply the concept of safety through defense in depth in waste management and disposal.
- Use systems engineering techniques in developing and designing waste management facilities and operations.
- Use simple and proven designs and technologies.

Institutional Principles

- Provide for the involvement of affected governments and interested parties in the decisionmaking process.
- Work cooperatively with affected governments and interested parties.
- Share information and data.
- Provide for outside review.
- Provide support to educational programs.
- Evaluate socioeconomic issues in cooperation with affected governments.
- In siting, designing, and constructing waste management facilities, consider potential benefits to the host States, affected units of local government, and communities.

Focus of Activities

During FY 1991, OCRWM has worked to implement the Secretary's initiatives in keeping with these principles. It is investigating the candidate site at Yucca Mountain to determine its suitability for a repository. It is planning for the development of the MRS facility and is supporting efforts to obtain a volunteer MRS site through the Office of the Nuclear Waste Negotiator. And OCRWM is developing a transportation system.

In addition, OCRWM has been implementing two initiatives mandated by the President's National Energy Strategy: intensifying efforts to provide meaningful participation by affected parties and developing contingency plans. Building

constructive working relationships and working toward earning public trust and confidence have always been essential elements of the program, but in FY 1991 OCRWM implemented significant initiatives in the institutional arena, as discussed in Chapter 2.

In FY 1991, OCRWM established a step-by-step process for timely analysis and action on contingencies that could significantly affect the achievement of key goals and objectives. This process involves defining contingencies of the highest priority, developing a full range of options, analyzing and evaluating those options, framing a final set of key options and recommendations, and laying out the timeframe for key decisions and actions on those options.

Among the situations identified in FY 1991 as having high priority for consideration were two related to the repository: (1) inability to conduct major site characterization activities because of failure to obtain environmental permits, and (2) unsuitability of the Yucca Mountain candidate site. Now that the State of Nevada has begun issuing environmental permits, the first contingency has been diminished in importance; nonetheless a workable plan of action has been developed. Another contingency that emerged in FY 1991 was cuts in funding that could severely affect the momentum of the program.

For the MRS facility, contingency planning addressed the efforts of the Nuclear Waste Negotiator to find a volunteer host. If this preferred method of siting (see Chapter 4) is unsuccessful, several alternative approaches are possible, including siting through a DOE-directed process of survey and evaluation.

As part of the National Energy Strategy, the President requested Congress to enact legislation addressing the need for a timely determination of the suitability of the Yucca Mountain candidate site and the need to develop an MRS facility independent of the repository. Legislation covering these issues was introduced in the House of Representatives as H.R. 776, the Comprehensive National Energy Policy Act.

Chapter 2

EARNING PUBLIC TRUST AND CONFIDENCE

Strengthening public trust and confidence in the waste management program is essential to the success of OCRWM's mission. While interactions with external parties have often been productive, the program has engendered heated controversy, political reaction, and extensive litigation. Eight years after its creation, nontechnical factors continue to have a major effect on its progress. Clearly, OCRWM must develop ways to function more effectively in a difficult institutional environment. Its actions must be open to scrutiny. It must provide a forum in which differing interests can be expressed so that all parties better understand each other. Most important, OCRWM must be responsive to the concerns those parties express.

Numerous States, units of local government, Indian Tribes, interested parties, and the public have a stake in the development of the waste management system, and OCRWM is working hard to involve them in the program. In FY 1991, the external relations efforts focused on broadening participation in decisionmaking, strengthening communication, building ties to the scientific and educational communities, and working cooperatively with parties involved in the program. As required by the NWPA, OCRWM also provided financial assistance to affected governments and certain other organizations to support their participation in the program.

Broadening Participation in Decisionmaking

One of OCRWM's most significant initiatives last year concerned the strategic principles that guide program implementation. Affected governments and interested parties were invited to a series of three workshops on the strategic principles, which form the core of the Mission Plan Amendment. These workshops, which were open to the public, were held in Salt Lake City, Utah, on December 4-5, 1990; Washington, D.C., on January 15-16, 1991; and Denver, Colorado, on April 3-4, 1991. The views of the participants were carefully con-

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sidered in developing the draft Mission Plan Amendment, which was issued in September 1991 for a 60-day public comment period. OCRWM also scheduled a follow-up workshop on the amendment on October 22-23, 1991, in Denver.

As one of the steps in implementing the Mission Plan Amendment, OCRWM is establishing a Director's Forum for representatives of affected governments, interested parties, and the public. The Forum will meet regularly to exchange information and views on upcoming program decisions, policy alternatives, and the effectiveness of OCRWM's external relations efforts. It will be coordinated with the external interactions of the Project Office in Nevada, as well as interactions with parties involved in the MRS and transportation programs.

Many units of government, organizations, businesses, and individuals are interested in the program, in addition to those that are specified as "affected" under the NWPA. OCRWM began a new initiative during FY 1991 to exchange information and explore possibilities for further interactions with a broader range of participants, including environmental groups, unions, other government agencies, and citizen groups. Dr. Bartlett inaugurated this effort in July 1991 by meeting with representatives of some national environmental organizations and later met with national representatives of organized labor.

OCRWM also interacted with a number of regional and national organizations to exchange information and take advantage of their expertise. It has cooperative agreements with the National Conference of State Legislatures, the National Congress of American Indians, the Western Interstate Energy Board, the Southern States Energy Board, the Midwest Council of State Governors, and the Commercial Vehicle Safety Alliance.

Strengthening Communication

OCRWM used a full range of approaches for improving communication with external parties. These included exhibits, public information materials, open houses and site tours, public meetings, speaking engagements, a telephone hotline, and a computerized data base accessible by telephone. OCRWM also expanded its outreach to the media.

In FY 1991, OCRWM displayed exhibits about the program at meetings of professional societies, educational institutions, and public meetings in 30 States and abroad. The Project Office displayed exhibits at 20 malls and fairs in Nevada alone. The exhibits have proved to be useful for providing information about the

program to interested persons and addressing their concerns on a one-to-one basis.

OCRWM expanded the distribution of existing publications and tried new approaches for communicating with external parties. For example, the *OCRWM Bulletin*, a monthly publication that reports significant program developments, is now distributed to more than 7,000 readers. OCRWM distributed the draft Mission Plan Amendment to the individuals and organizations who receive the *OCRWM Bulletin*. A toll-free telephone number was established for callers with questions about the program. (The telephone number is 1-800-225-NWPA; for callers from Washington, D.C., the number is 202-488-5513.) Printed materials, including fact sheets, brochures, program publications, educational materials, and videotapes, are available to the caller. External parties are encouraged to use OCRWM's publicly accessible, interactive computer data base, INFOLINK, to obtain on-line information about the program.

OCRWM has increased its outreach activities in Nevada. For example, two sets of public project update meetings are held each year to provide the public with an overview of the project and current developments. Meetings are held in Nye and Clark Counties, northern Nevada, and other locations, as requested. Staff from the Project Office have given more than 200 presentations to civic, educational, business, and professional groups since 1990. The Project Office also began a monthly series of public lectures on technical and socioeconomic issues. Public information offices in Las Vegas and Beatty continue to serve as resource centers for information about the project. More than 10,000 people, including some 500 students, have visited the information office in Las Vegas since it opened in February 1990. In March 1991, the Project Office began to offer monthly public open houses and site tours of the Yucca Mountain candidate site. These have been a notable success. More than 500 visitors have taken the tour every month. Numerous information products on the project and nuclear energy issues are also available. Other initiatives include a rural outreach program to reach interested persons, groups, and media outside the urban centers of Nevada and working with the Boy Scouts of America to establish a merit badge on nuclear energy. The Project Office also supports numerous educational activities, as discussed below.

The media have a major role in providing information to external parties and in shaping their views of the program. OCRWM interacts with the media by issuing news releases and notes to editors, responding to inquiries, holding news conferences, and providing background information and video footage.

In November 1989, the Secretary released his report on the reassessment of the program. OCRWM received 120 comments on the report from 28 commenters and issued a comment-response document in November 1990. In general, the commenters supported the Secretary's revised program strategy, more aggressive management of the program, new emphasis on surface-based testing at Yucca Mountain, and the use of litigation to obtain access to the site, along with greater attention to the concerns of affected parties.

Building Ties to the Scientific and Education Communities

Education Programs

Through its education program, OCRWM seeks to promote science literacy and to increase public understanding of energy and waste management in order to provide workers for the waste management industry in the future and promote public confidence in the U.S. system for managing radioactive waste. The education efforts focus on developing curricular materials, improving teacher skills, providing new opportunities to students, expanding ties with educational institutions, and supporting international education initiatives (Figure 1).

OCRWM developed curricular materials designed to improve scientific problem-solving skills and increase understanding of the program in grades K through 12. The elementary education curriculum focuses on providing students in grades 4 through 8 with factual information about radioactive waste. A four-unit curriculum for science and social studies students and teachers in grades 8 through 12 has also been developed. The curriculum, entitled "Science, Society, and America's Nuclear Waste," includes 30 lesson plans, a student reader, videotapes, computer software, and other hands-on activities that present information on the characteristics and management of radioactive waste. After a pilot test of the curriculum in the fall of 1989, OCRWM is preparing to begin broader field testing, with some 20 teachers in at least 10 States. To supplement its national curriculum efforts, OCRWM also developed 23 hands-on independent study modules in support of a Center for Applied Technology at Garside Junior High School in Las Vegas.

At the university level, OCRWM has sought to broaden opportunities available to students through its radioactive waste management fellowships, support to

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Figure 1. Education activities sponsored by OCRWM.

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Historically Black Colleges and Universities and the Nevada Partnership Program, and cooperative agreements with the University of Nevada system.

OCRWM's graduate school fellowship program supports highly capable students in disciplines related to waste management, including nuclear engineering, health physics, environmental engineering, geology, chemistry, and radiation sciences. As part of the program, fellows spend at least 3 months at DOE Headquarters, a DOE laboratory, the Project Office, or another DOE-approved site. This experience exposes the fellows to research and development programs and provides opportunities to interact with DOE and contractor staff. The program is also designed to encourage universities to support and improve research activities and academic programs related to waste management. Since the beginning of the program in 1985 through September 1990, 50 fellowships have been awarded. In FY 1991, 20 students participated in the program at 18 universities.

Significant financial support is provided for independent research and analysis at several branches of the University of Nevada system. In FY 1991, OCRWM provided \$375,000 to the University of Nevada at Reno (UNR), with an additional \$200,000 for international education studies; \$150,000 to the Desert Research Institute; \$975,000 to the University of Nevada at Las Vegas (UNLV) for research by the School of Business and Economics, the Engineering Department, and the Environmental Research Institute; and an additional \$4,146,000 for infrastructure studies and other research and development work at UNLV and UNR.

OCRWM has sponsored research programs at Historically Black Colleges and Universities since 1984 to broaden opportunities for faculty members at these institutions to participate in research sponsored by DOE. Between 1984 and 1990, 11 subcontracts were awarded in response to 38 proposals for faculty research projects at Historically Black Colleges and Universities. During FY 1991, OCRWM provided \$186,000 in support to these projects.

In cooperation with the Organisation for Economic Cooperation and Development/Nuclear Energy Agency and the Swiss radioactive waste management organization, OCRWM organized and participated in the first international workshop on education in the field of radioactive waste management, which was held on June 16-20, 1991, in Engelberg, Switzerland. The workshop provided an opportunity for participants to share their experiences and evaluate new instructional methods and curricula. Dr. Bartlett chaired the workshop and delivered the opening address. Future activities will include developing an international baseline for education programs, establishing a global communication link among educators, holding workshops and other activities, providing country-

specific workshops and in-service training, and evaluating national and international education efforts.

Maintaining the Support of the Scientific Community

OCRWM participated extensively in both national and international conferences sponsored by scientific, technical, and professional organizations. This participation not only kept these communities informed, it exposed OCRWM's work to scientific and technical scrutiny and encouraged independent technical comment.

As cofounder of the annual International High-Level Radioactive Waste Management Conference held in Las Vegas, Nevada, OCRWM worked closely with the conference cosponsors, the American Society of Civil Engineers and the American Nuclear Society, in the successful implementation of the second annual scientific and technical conference, held on April 28 through May 3, 1991. The conference was attended by about 1,000 persons, with 170 attendees from foreign countries, including Argentina, Australia, Japan, Sweden, the Union of Soviet Socialist Republics, and the United Kingdom. OCRWM also participated in the Waste Management '91 conference in Tucson, Arizona, in February 1991.

Both of these conferences provided major national forums in which participants deliberated on various issues surrounding civilian nuclear power technology and its environmental, social, public health and safety, and economic implications. Among the scientific and technical issues discussed was a key component of the National Energy Strategy: the continuing development of a system for the management of civilian radioactive waste as part of a strategy for increasing nuclear power generation over the long term on a cost-effective basis.

Working Cooperatively with External Parties

The NWPAs require that DOE work with affected governments and Indian Tribes to resolve concerns about the potential public health and safety, environmental, and economic impacts of facility development.

DOE is also required to provide financial assistance to affected States, Indian Tribes, and units of local government to support their participation in the program and assess and mitigate socioeconomic impacts. The potential for economic growth and other benefits that may be derived from the location of storage or disposal facilities can also be assessed with these funds. Creation of employment

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and training opportunities, both in the nuclear industry and through collateral commercial and industrial development, is of primary concern in evaluating the advantages such facilities could offer to local communities.

A number of other Federal agencies and organizations have different roles as regulators or advisors to the program. OCRWM interacts with all these parties through a variety of formal and informal agreements, hearings, workshops, site visits, meetings, and reviews of program documents.

Formal Agreements

Section 117 of the NWPA requires the Secretary of Energy to seek to enter into negotiations with affected States and Indian Tribes to reach binding consultation and cooperation (C&C) agreements that specify formal procedures for interactions between the participants. The amendments to the NWPA did not alter these C&C provisions. OCRWM continues to hold open its offer to the State of Nevada to enter into C&C negotiations. To date, the State of Nevada has declined the offer.

OCRWM supports negotiations of formal procedures for interactions with affected units of local government. Effective April 2, 1991, DOE and Nye County, Nevada, agreed to a "framework" for improving and formalizing interactions. This agreement is the first step in defining how Nye County and DOE will formally address issues of concern. On August 29, 1991, Dr. Bartlett signed two implementing protocols with Nye County on socioeconomic monitoring and assessment and on principles and procedures for interactions.

Section 170 of the NWPA provides for the Secretary to attempt to enter into a benefits agreement with the State of Nevada for the repository and a host State or Indian Tribe for the MRS facility. Section 171 specifies the level of benefits allowed under such an agreement. Parties to a benefits agreement would waive the right to disapproval of the site and to receive impact assistance. The State of Nevada has declined the Secretary's offer to negotiate a benefits agreement.

Affected Status

On May 20, 1991, Secretary Watkins notified Esmeralda, Eureka, and White Pine Counties in Nevada and Inyo County in California that they were designated as affected units of local government under provisions in the NWPA. The Secretary subsequently designated Churchill, Lander, and Mineral Counties in Nevada as affected. The Secretary's decision follows a ruling by the U.S. Court of Appeals

for the Ninth Circuit on February 20, 1991, concerning the extension of affected county status to Esmeralda and Inyo Counties (*County of Esmeralda v. Department of Energy*, 925 F.2d 1216 (9th Cir. 1991)). As affected units of local government, these counties will be eligible to receive financial assistance for participating in and overseeing OCRWM activities at the Yucca Mountain candidate site, and for assessing the impacts of site investigations and potential development. These counties join Nye, Clark, and Lincoln Counties in Nevada as affected units of local government. With these additions, all counties contiguous to Nye County, the local government with jurisdiction over the Yucca Mountain candidate site, have been designated as affected.

No Indian Tribes are currently designated as affected. However, Project Office staff continued to meet informally with 16 Indian Tribes and Tribal groups that have traditional cultural and spiritual ties to Yucca Mountain and consulted with them in accordance with the programmatic agreement between DOE and the Advisory Council on Historic Preservation, the American Indian Religious Freedom Act, and related statutes.

Other Interactions in Nevada

There are many informal interactions between OCRWM and affected governments, including frequent staff contacts, information exchanges, and meetings, workshops, and hearings sponsored by either OCRWM or Nevada organizations. For example, representatives of the State of Nevada and local governments attended the OCRWM project update meetings at various locations in Nevada and participated in the strategic principles workshops. They also participate extensively in the repository technical program, such as the design reviews for the exploratory studies facility. State and local representatives attend OCRWM's meetings with NRC and the meetings of the Nuclear Waste Technical Review Board. They observe quality assurance audits, receive technical data, and comment on technical documents. The State has general access permits to the site in order to observe site characterization activities. In addition, the University of Nevada system is carrying out several technical and scientific projects through agreements with OCRWM (see Education Programs, above).

The NWPA provides for any State, Indian Tribe, or local government with jurisdiction over a candidate repository or MRS site to designate an onsite oversight representative whose expenses will be paid out of the Nuclear Waste Fund. The Governor of Nevada assigned the duty of oversight to the Nevada Agency for Nuclear Projects/Nuclear Waste Project Office. Nye County is exploring ways to implement its oversight representation authority.

Financial Assistance

Section 116 of the NWPA provides for financial assistance to the State of Nevada, affected units of local government, and affected Indian Tribes. Grants enable recipients to participate in facility development review activities, develop requests for impact assistance, perform independent monitoring and testing, keep residents informed, and request information from, and make comments to, OCRWM.

For FY 1991, the State of Nevada received \$4.15 million; affected units of local government, \$5.4 million; and the University of Nevada system, \$4.975 million. For FY 1992, direct payments will be provided instead of grants, as follows: the State of Nevada, \$5 million; affected units of local government, \$4 million; and the University of Nevada system, \$3.5 million. Direct payments are preferred over grants since they impose fewer administrative requirements on recipients.

Affected governments are also eligible to receive financial assistance for the monitoring and mitigation of potential socioeconomic impacts of site characterization and facility development. In its oversight role the Nevada Nuclear Waste Project Office has used such funding for assessing potential perception-based impacts. No affected government, however, has applied for financial assistance to actually mitigate any socioeconomic effects of site characterization.

As a Federal agency, DOE is not subject to State and local taxes. The NWPA, in Section 116(c)(3)(A), provides for DOE to make payments each fiscal year to eligible jurisdictions equal to the amount they would receive if authorized to tax site characterization activities. On August 27, 1991, DOE published in the *Federal Register* a notice of interpretation and procedures for the payments-equal-to-taxes (PETT) provisions of the NWPA. Eligible States, affected units of local government, and affected Indian Tribes will be able to apply for payments during site characterization activities at candidate sites. As defined by the NWPA, PETT would ultimately extend throughout the development, construction, and operation of a repository or an MRS facility, although the *Federal Register* notice is limited to site characterization activities at candidate repository sites.

An independent appeals process for PETT disbursements has been established through DOE's Office of Hearings and Appeals. No payments were made during FY 1991.

The NWPA authorized the Secretary to make grants to States, Indian Tribes, and affected units of local government to assess the feasibility of siting an MRS facility (see the section on the Nuclear Waste Negotiator, below). On June 5, 1991, DOE

published in the *Federal Register* a notice inviting eligible States, Indian Tribes, and affected units of local government to apply for grants to explore the feasibility of hosting an MRS facility. No requests for feasibility grants or formal expressions of interest were submitted during FY 1991. However, the Mescalero Apache Indian Tribe in New Mexico and Grant County, North Dakota, requested and received feasibility grants in October and November 1991, respectively. In January 1992, Fremont County, Wyoming, and the Yakima Indian Nation of Washington State applied for and received feasibility grants. Other applicants are the Prairie Island Indian Nation of Minnesota, the Sac and Fox Indian Nation of Oklahoma, and the Chickasaw Indian Nation of Oklahoma.

Interactions with Regulatory Bodies

OCRWM's principal regulator is NRC, from which it must obtain licenses for the repository and the MRS facility. OCRWM's interactions with NRC include technical exchanges and meetings, monthly management meetings, bimonthly quality assurance meetings, quarterly meetings for scheduling future interactions, and meetings with the Advisory Committee on Nuclear Waste and the Center for Nuclear Waste Regulatory Activities.

NRC is also responsible for regulating the transportation of radioactive waste, along with the U.S. Department of Transportation. NRC is responsible for safety of the receipt, possession, and transfer of radioactive materials, whereas the Department of Transportation regulates safety in the transportation of all hazardous materials, including radioactive waste.

EPA is responsible for issuing the environmental standards for the management and disposal of spent nuclear fuel and high-level waste. Pursuant to the decision of the U.S. Court of Appeals in *Natural Resources Defense Council v. U.S.E.P.A.* (824 F.2d 1258 (1st. Cir. 1987)), EPA has been revising the standards it issued as 40 CFR Part 191. DOE established a steering group that includes OCRWM to provide comments to EPA on working drafts of revisions to this regulation. The steering group has provided comments on Working Draft 3 and will review and comment on subsequent revisions and the proposed rule when they are issued.

The Nuclear Waste Technical Review Board

The Nuclear Waste Technical Review Board was established by Congress to provide independent expert review of the scientific and technical aspects of the waste management program and to report its findings and recommendations to Congress and the Secretary of Energy. The Board holds meetings and public

EARNING PUBLIC TRUST AND CONFIDENCE

hearings with representatives of OCRWM and its contractors, other Federal agencies, the national laboratories, the State of Nevada, and interested organizations. The Board has eight members (11 are authorized), who were appointed by the President from nominees selected by the National Academy of Sciences. They participate in one or more of seven internal panels: Structural Geology and Geoengineering, Hydrogeology and Geochemistry, Risk and Performance Analysis, Transportation and Systems, Environment and Public Health, Engineered Barrier System, and Quality Assurance.

During FY 1991, 4 meetings of the full Board and 16 panel meetings were held. OCRWM representatives attended all open meetings and provided background information and made technical presentations at the Board's request. OCRWM has developed a data-base management system to help track and respond to the Board's observations and recommendations.

The Nuclear Waste Technical Review Board is required to report its findings and recommendations to Congress and the Secretary of Energy at least twice a year. Its *Second Report to the U.S. Congress and the U.S. Secretary of Energy*, issued in November 1990, made 20 recommendations in 7 categories; it also presented the responses of OCRWM to recommendations in the Board's first report. The Board's third report, issued in May 1991, made 15 recommendations in 6 categories and presented OCRWM's responses to the second report. The Board's fourth report, issued in December 1991, made 10 recommendations in 5 categories and presented OCRWM's responses to the third report.

On March 12, 1991, the Chairman of the Nuclear Waste Technical Review Board, Dr. Don Deere, testified before the U.S. Senate Committee on Energy and Natural Resources. The Committee asked Dr. Deere to answer two questions: (1) Is OCRWM prepared to initiate site characterization activities, and (2) is there any reason to disqualify Yucca Mountain at this time? Dr. Deere stated that, in the Board's view, OCRWM was prepared to begin a progression of site characterization activities as soon as it gained access to the site. He said that, given existing data, there appeared to be no scientific or technical reason to abandon the site at that time.

The Nuclear Waste Negotiator

The NWPA created the Office of the Nuclear Waste Negotiator to seek a State or Indian Tribe willing to host an MRS facility or a repository under conditions to be specified in a negotiated agreement. The President nominated Mr. David Leroy

to serve as the Negotiator, and he was confirmed by the U.S. Senate in August 1990.

The Negotiator is independent of DOE, with his own staff and budget. In November 1990, OCRWM signed with the Negotiator a memorandum of understanding that outlines procedures for sharing information; providing the Negotiator with the use of OCRWM services, facilities, and personnel as appropriate; and maintaining the independence of each party.

Under the provisions of the National Energy Strategy, all Federal agencies are mandated to assist the Nuclear Waste Negotiator's efforts to identify potential hosts for MRS facilities. During FY 1991, OCRWM provided the Negotiator with comprehensive information about the waste management system and kept him informed of program developments. At the Negotiator's request, OCRWM also prepared background reports on the MRS facility and public information materials to help potentially interested parties understand the potential benefits and impacts of hosting an MRS facility.

On October 7, 1991, the Negotiator issued a formal request for expressions of interest in exploring the possibility of hosting an MRS facility or a repository. As stated, the Mescalero Apache Indian Tribe; Grant County, North Dakota; the Yakima Indian Nation of Washington State; and Fremont County, Wyoming, applied for and received feasibility grants of \$100,000 early in FY 1992. OCRWM will work with the Negotiator in evaluating requests for grants or expressions of interest as they are received.

The Secretary of Energy Advisory Board

On April 29, 1991, Secretary Watkins established a 14-member task force of the Secretary of Energy Advisory Board to investigate the issue of public trust and confidence in DOE's radioactive waste management programs. At the first meeting of the task force, on May 14, 1991, Secretary Watkins asked it to identify steps that can be taken to increase public trust and confidence, consider whether these efforts affect other program objectives, and consider how to implement its guidance and recommendations. The task force asked the National Academy of Sciences/National Research Council and the National Academy of Public Administration to conduct workshops in early FY 1992 on building trust and confidence. The task force will consider the recommendations developed in the workshops and prepare its own report, which is due in late 1992. OCRWM is supporting the task force by providing briefings and background information on request.

Nuclear Electric Utilities

As generators of spent fuel, the nuclear electric utilities and their ratepayers and other waste generators have a special interest in the progress of the program. OCRWM interacts regularly with the Edison Electric Institute; the U.S. Council for Energy Awareness; the American Committee on Radioactive Waste Disposal, a group of utility chief executive officers; the American Nuclear Energy Council; the Electric Power Research Institute; and the National Association of Regulatory Utility Commissioners.

Chapter 3

GEOLOGIC DISPOSAL

The repository program made significant progress during FY 1991, including the production of a report on the early evaluation of site suitability, the selection of an improved design for the underground testing facility, the establishment of new priorities for site characterization, and the start of limited new surface-disturbing site characterization activities at the Yucca Mountain candidate site.

Site Characterization Plan

In 1988, in accordance with the NWPA, OCRWM issued a Site Characterization Plan (SCP) to investigate the suitability of the candidate site, to provide data for the designs of the repository and the waste package, and ultimately to provide data for licensing the repository. The SCP is a comprehensive multivolume document presenting the rationale for more than 100 studies comprising some 300 separate activities. More detailed descriptions of the studies in the SCP are provided in companion study plans. By the end of FY 1991, over half of those study plans were under preparation or completed; 28 study plans had been transmitted to NRC.

The SCP defines a site characterization program based on regulatory requirements for the siting and licensing of a repository. OCRWM recognizes that changes, reevaluations, and redirections are an inevitable part of site characterization, and it has developed plans to implement these changes. Changes to the site characterization program are considered as new data are analyzed and comments from both internal and external sources are received. Changes are documented according to established change control procedures for the site characterization program baseline and new or revised study plans. OCRWM reports on changes in periodic progress reports. In FY 1991, the second and third progress reports were issued, and the fourth and fifth reports were in preparation.

The SCP was reviewed by a number of agencies, affected governments, and interested parties. In December 1990, OCRWM responded to comments by NRC, EPA, the Department of the Interior, the Edison Electric Institute, the Utility Nuclear Waste Management Group, the Commissioners of Lincoln County, Nevada, and the California Energy Commission. OCRWM fulfilled its commitment to respond to all SCP review comments with the September 13, 1991, issuance of a comprehensive comment response package addressing the State of Nevada's comments. Significant progress was also made in resolving NRC's two objections to the SCP. On August 21, 1991, OCRWM transmitted information describing its efforts to resolve NRC's objection to the quality assurance program and requested that the objection be lifted. On September 16, 1991, NRC was informed of efforts to resolve its objection to the design control process. These objections were expected to be lifted early in FY 1992.

Start of New Site Characterization Activities

On June 12, 1991, the State of Nevada issued a long-awaited air quality permit. OCRWM began new surface-disturbing work, mainly excavating trenches, the following month. Trenches are used for detailed studies of geologic faults and the characteristics of soils and rocks, and to examine evidence of past climates.

In July 1991 trenching in Midway Valley, the location proposed for the surface facilities of the repository, was started to investigate nearby faulting. Trenching was also started at Crater Flat and at Lathrop Wells to investigate the nature and age of volcanic cones. In addition, Trench 14, a previously excavated trench, was deepened to permit further investigation of calcite and silica deposits exposed in the walls of the trench. The investigation of these deposits will help to evaluate the ground water system in the Yucca Mountain area. Figure 2 shows Trench 14 as a bulldozer begins to deepen it.

If a repository is developed at the Yucca Mountain candidate site, it will be constructed in the unsaturated zone—the rock mass between the surface of the land and the water table. To characterize this unsaturated zone, dry drilling and coring techniques will be used for many boreholes at the site, rather than the conventional wet drilling. The purpose is to conduct testing and sampling under conditions that are as close as possible to the original conditions in the rock formation. Because the combination of dry drilling and coring is unconventional, OCRWM established a prototype dry drilling and coring program to develop and evaluate equipment for dry drilling and coring, to refine drilling methods, and to prepare technical procedures for the use of these techniques.

Figure 2. New site characterization activities at Yucca Mountain: a bulldozer deepens Trench 14, used to study certain mineral deposits.

Prototype drilling activities in Utah and Arizona resulted in improvements in the design of the drill rig to be used for dry drilling, the LM-300 drill rig. The LM-300 rig will be used at the Yucca Mountain candidate site to drill deep boreholes. The drill rig has completed acceptance testing and was brought to Yucca Mountain during FY 1992 to begin site characterization drilling. The prototype operations in Arizona also provided an opportunity for the Sample Management Facility to improve its procedures for handling drilling samples.

Major Initiatives in Site Characterization

Recently, major initiatives have been undertaken in the plans for site characterization. The most important of these initiatives is an early evaluation of site suitability. Activities completed in FY 1991 included an initial evaluation of priorities for site characterization tests, an analysis of the risks and benefits of investigating the rock layers of the Calico Hills unit beneath the candidate

repository horizon, and an evaluation of design alternatives for the underground testing facility.

In FY 1991, OCRWM formed integration teams and organized workshops involving project scientists from participating laboratories and government agencies, and consequently has improved communications within the technical program and created a more productive working environment.

Early Evaluations of Site Suitability

OCRWM recognizes the importance of evaluating the suitability of the candidate site throughout site characterization and has changed the priorities of the site characterization program to focus on those features or conditions that might indicate the candidate site is not suitable for a repository. If the early evaluation indicates that the Yucca Mountain candidate site merits further study, OCRWM will continue making evaluations as more information is collected and as performance assessment tools are refined. The commitment to early evaluations of site suitability is also intended to make the site characterization program as cost effective as possible.

To conduct the early evaluation of site suitability, the technical support contractor for the Project Office convened a core team of experts to provide a technical assessment of the suitability of the Yucca Mountain candidate site. The Early Site Suitability Evaluation (ESSE) core team assessed the technical suitability of the Yucca Mountain candidate site and prepared a draft report discussing its conclusions in FY 1991. The ESSE report has been submitted to a peer review group consisting mainly of academic experts in the appropriate fields. The peer review will be completed early in FY 1992, and the final ESSE report will be submitted to OCRWM shortly thereafter. Once the peer review has been completed, and before Dr. Bartlett takes action on the ESSE report, OCRWM will seek comments from affected governments and interested parties.

The evaluation is based on the siting guidelines issued in 1984 as 10 CFR Part 960. As required by the NWPA, these siting guidelines specify both qualifying and disqualifying conditions for characteristics important to the short- and the long-term safety of a repository, such as geochemistry, climatic changes, and tectonics. The guidelines also specify potentially adverse and potentially favorable conditions that provide further basis for the evaluation of the candidate site.

In 1986, OCRWM conducted a preliminary evaluation of the suitability of the Yucca Mountain candidate site and reported its findings as part of the environ-

mental assessment of the site. That assessment reviewed the available information about the site and evaluated the ability of the site to meet the conditions of each siting guideline. Since 1986, additional information has been collected. The ESSE core team used all available information in its technical assessment, including the information used in the environmental assessment and all information collected subsequently.

Setting New Priorities for Testing

In March 1991, a task force completed an extensive evaluation of the priorities for surface-based and in situ testing. The task force had two main objectives:

1. To develop a method that can be used throughout site characterization to reevaluate priorities for testing as new information is collected.
2. To establish testing priorities by evaluating the relative importance of potential concerns and the effectiveness of tests that could investigate these concerns.

The potential concerns were derived from the potentially adverse and disqualifying conditions identified in the siting guidelines, the potentially adverse conditions identified in NRC regulations (10 CFR Part 60), and other significant conditions that might disqualify the Yucca Mountain candidate site.

The initial phase of the test priorities task focused on concerns about the performance of the repository after its permanent closure. The task force adopted an iterative approach to determining priorities and developed an initial set of recommended test priorities. The priorities emphasize two areas where information is needed:

1. The potential for gaseous releases over the long term.
2. The geologic complexity of the Yucca Mountain candidate site as related to ground water and the transport of radionuclides.

In FY 1991, these initial recommendations were used to help set priorities for early site characterization activities.

The Calico Hills Study

During FY 1991, the Calico Hills risk/benefit analysis was completed to determine whether in situ testing should be conducted in the Calico Hills rock unit that lies below the candidate repository horizon. The analysis, performed in response to an objection raised by NRC staff on the consultation draft of the SCP, looked at the benefits of testing and the possible risk to the performance of the site resulting from a penetration of the Calico Hills unit.

The Calico Hills study summarized the types of data that would be needed from the rock formation, identified applicable testing techniques, developed alternative testing strategies, and finally established and implemented a method for a comparative evaluation of the testing strategies. OCRWM determined that the design for the underground testing facility—that is, the exploratory studies facility—should accommodate extensive drifting and testing in the Calico Hills unit and within the potential repository block; OCRWM also determined that this drifting and testing would pose little risk to the performance of the site.

The Exploratory Studies Facility

The exploratory studies facility (ESF) at the Yucca Mountain candidate site will allow the evaluation of the geologic and thermal conditions in the potential host rock and the surrounding rocks at planned depth of the repository. Original plans called for an "exploratory shaft facility," to consist of two vertical shafts for access to the underground test facility and horizontal drifts excavated by drill-and-blast techniques to major geologic structures for characterizing. However, NRC and the Nuclear Waste Technical Review Board recommended that OCRWM consider providing access to the underground facility by means of ramps and mechanical mining instead of drilling and blasting to minimize the potential for disturbing the host rock and to accelerate the underground excavations. The Board also suggested extending the exploratory drilling to ensure that the data collected would be representative of underground conditions and to identify structural features that might not be detected from the surface.

OCRWM evaluated these recommendations in the ESF alternatives study. This study, completed in FY 1991, was a comprehensive evaluation of configuration and construction alternatives for the ESF. OCRWM discussed the study and its results during several public meetings with the Nuclear Waste Technical Review Board and with NRC.

The ESF alternatives study incorporated the recommendations of the Calico Hills study. These studies indicated that an ESF with access to both the candidate repository horizon and the Calico Hills unit through mechanically excavated ramps is more advantageous than the original configuration.

Integration Teams and Review of the Site Characterization Program

OCRWM is committed to the process of independent peer review as a method of enhancing and refining its knowledge, while providing a means to increase public confidence and build consensus within the scientific community and regulatory arena. In FY 1990, OCRWM requested a peer review to evaluate the work done by the Yucca Mountain project participants in developing an understanding of unsaturated-zone hydrology at the Yucca Mountain site. The Unsaturated Zone Hydrology Peer Review Team completed its review in late September 1990, providing positive comments on the hydrology program along with suggestions for improvements to the program. One of the recommendations was as follows: "To fully capitalize on the research strengths of the individual research teams, there is a need for improved program integration and interagency communication in the Yucca Mountain Program." As a result of this suggestion, in January 1991, OCRWM formed the Hydrology Integration Task Force, a group that will provide integration between technical participants and those responsible for technical oversight of the hydrology program. The Task Force convened a workshop on ground water travel time in November 1991.

At the suggestion of the Nuclear Waste Technical Review Board, OCRWM convened a radionuclide adsorption workshop for its technical participants in September 1990 to exchange ideas, evaluate current efforts in sorption studies, and consider future program direction. Independent researchers were also invited to participate, and observers from NRC and the State of Nevada were invited.

This workshop led to the establishment, in July 1991, of a second group, the Geochemistry Integration Team, to integrate internal aspects of the geochemistry program and to interface with groups involved in studies of hydrology and in performance assessment. The Geochemistry Integration Team is planning a working group meeting for early FY 1992 to evaluate the geochemical data required and the schedule for obtaining these data for the total-system and engineered-barrier-system performance assessments required for determining suitability and licensing.

Other Studies

In parallel with the new site characterization activities at the Yucca Mountain candidate site, ongoing monitoring activities continued throughout FY 1991. These activities included monitoring meteorologic conditions, streamflow, seismicity, and ground water levels.

Performance Assessment

During FY 1991, progress in performance assessment continued. The probabilistic model that will be used in determining the time of ground water travel was further developed, and OCRWM continued to identify events and processes that will need to be modeled before licensing, to develop a model of gas-phase releases, and to develop a total-system analysis that will describe the behavior of the repository system under both expected and unexpected conditions so that compliance with regulations can be evaluated. At OCRWM's request, a parallel, independent effort to develop a total-system performance assessment model was undertaken by Golder Associates in FY 1991. The initial results from Golder's efforts are expected to be produced by mid-FY 1992. In order to assess options for heat loading in support of design efforts, OCRWM also performed a series of sensitivity studies designed to calculate temperature distributions throughout the underground repository.

Design Activities

To be cost effective, OCRWM is limiting major activities related to advanced designs for the repository and the waste package until more information about the site is available.

The Design of the Exploratory Studies Facility

Part of the ESF alternatives study was an evaluation of alternative configurations, including repository design concepts that would be compatible with these configurations. OCRWM incorporated the recommended ESF concept into a revised ESF Title I design. The design revision was performed by the architect/engineer for the facility. The design revision process included two independent technical design reviews in June and August 1991. A wide variety of technical experts from participating and outside organizations attended the design reviews. Also invited were the State of Nevada, local counties, NRC, the Nuclear Waste Technical Review

Board, the Mine Safety and Health Division of the Occupational Safety and Health Administration, and other organizations to observe the review process. All review comments were resolved, and a revised ESF Title I design was completed. A revised summary report for the ESF Title I design was issued in September 1991; it outlines the most favorable design options. Final approval to proceed with the ESF Title II design was given by DOE's Energy Systems Acquisition Advisory Board on December 30, 1991.

The Design of the Waste Package

Should the Yucca Mountain candidate site be found suitable for development as a repository, the principal engineered barrier will be the waste package. The waste package will be designed to meet the regulatory requirement that it provide substantially complete waste containment for at least 300 to 1000 years. Thereafter, the waste package must be able to limit the rate of release of radionuclides to levels below the regulatory requirements for waste isolation.

In FY 1991, model development continued for the interactions among the host rock, ground water, the waste package, and other components of the engineered barrier system. OCRWM is also conducting studies of the characteristics and behavior of waste form materials and potential container materials. These studies will provide input to more advanced designs for the waste package and the repository.

OCRWM has solicited advice from affected governments and interested parties on the desirability of a waste package that would significantly exceed regulatory standards. Such a waste package could offer significant advantages in the licensing of the repository and might contribute to public confidence. However, there is no intent to use such a waste package to compensate for any serious deficiencies that might be discovered at the Yucca Mountain candidate site.

Consequently, an effort was initiated to consider new design concepts, inviting private industry and other parties to submit their qualifications in waste package design. OCRWM selected the most qualified applicants, gave them the waste package requirements and the available information about the site, and asked them to prepare design concepts. These design concepts were discussed at the Yucca Mountain Engineered Barrier System Concept Workshop held in July 1991. The most promising concepts will be evaluated and considered for further development. OCRWM expects to decide on the most feasible design concepts during FY 1992.

Protection of the Environment

In FY 1991, various environmental studies continued at the Yucca Mountain candidate site. Their purpose is to collect the data required by the Environmental Monitoring and Mitigation Plan and for obtaining various environmental permits. Data were collected for the five environmental disciplines of terrestrial ecosystems, air quality, water resources, archaeological resources, and radiation studies. Monitoring will ensure that any unexpected adverse environmental impacts, should they occur, are detected and minimized before they become significant.

OCRWM continued consultations with 16 Indian Tribes that have traditional religious or cultural ties to the Yucca Mountain area. These consultations ensure compliance with the programmatic agreement between DOE and the Advisory Council on Historic Preservation, the American Indian Religious Freedom Act (Public Law 95-351), the National Historic Preservation Act (Public Law 89-665), and related statutes.

Air quality and underground injection control permits were obtained from the State of Nevada regulatory agencies to allow new surface-disturbing site characterization activities to begin. A water appropriation permit was granted in March 1992. Various compliance actions are being taken to satisfy the conditions of these permits.

Socioeconomics

OCRWM continues to focus its socioeconomic program on assessing and monitoring impacts that could occur as a result of scientific investigations at the Yucca Mountain candidate site. Since issuing the *"Section 175 Report: Secretary of Energy's Report to the Congress Pursuant to Section 175 of the Nuclear Waste Policy Act, As Amended"* in December 1988, OCRWM has developed a socioeconomic plan for the Yucca Mountain project. The plan describes the socioeconomic program for the scientific investigations phase and is designed to integrate data collection, data analyses, and reporting efforts.¹ A consultation draft of the plan was issued in April 1991. OCRWM is working to resolve the comments that have been received.

In 1991, the Project Office continued to monitor the size, location, and distribution of the project-related workforce population. These reports continue to be issued quarterly and, along with other community information, will be used to monitor and assess the potential impacts of the Yucca Mountain project in Nevada. The

Project Office has also been working with Nye County, Nevada, to develop mechanisms for sharing socioeconomic data and to otherwise involve Nye County in the development of OCRWM's socioeconomic program. OCRWM expects to work closely with other affected counties on similar socioeconomic activities.

Access to the Yucca Mountain Candidate Site

For several years, the State of Nevada did not act on DOE's applications filed in 1988 and 1989 for environmental permits required for site characterization activities. In addition to the refusal to act, the Nevada State Legislature passed a law that allegedly constituted a "notice of disapproval" of Yucca Mountain as a repository site pursuant to the NWPA. On September 19, 1990, the U.S. Court of Appeals for the Ninth Circuit ruled that Nevada's attempted veto, or "notice of disapproval," was invalid under the NWPA, and on March 4, 1991, the U.S. Supreme Court denied Nevada's petition for certiorari.

Following the U.S. Supreme Court's denial of the petition in the "notice of disapproval" case, the U.S. District Court for the District of Nevada issued an order requiring the State of Nevada to take final action on DOE's applications for an air quality surface disturbance permit and an underground injection control permit by July 17, 1991. Those permits were granted on June 12, 1991, and July 16, 1991, respectively. Hearings on DOE's water appropriation permit application commenced on September 24, 1991, and the Nevada State Engineer approved the application on March 2, 1992.

Because of the importance of continuing site characterization without further interruption, OCRWM supports legislative proposals that would require the appropriate Federal agencies, rather than the State of Nevada, to process the requisite environmental permits required by Federal regulations. These legislative proposals require that DOE meet applicable environmental standards and thus would not involve any substantive changes in requirements for environmental compliance.

Chapter 4

MONITORED RETRIEVABLE STORAGE

Role of an MRS Facility

The NWPA authorized DOE to site, construct, and operate an MRS facility as an integral component of the Federal waste management system, subject to specific limits on storage capacity and linkages between the schedule for the development of an MRS facility and the repository.

The MRS facility will provide temporary aboveground storage for spent fuel shipped to it from commercial nuclear reactors. When the geologic repository begins operating, spent fuel will be shipped from the MRS facility to the repository for permanent disposal. As a storage and staging facility that links the dissimilar requirements of utility and repository operations, the MRS facility will add reliability and flexibility to the waste management system and may improve the efficiency of the nationwide system for transporting spent fuel.

An MRS facility that can begin accepting waste well in advance of the start of repository operations will reduce utilities' need to expand onsite storage capacity for their spent fuel. It will also provide an important demonstration of the Federal Government's ability to manage spent fuel safely and reliably. Technically suitable sites for the MRS facility can be found throughout the continental United States.

Siting the MRS Facility

The NWPA established two paths for siting an MRS facility. The first is to site the facility through a survey-and-evaluation process directed by the Secretary of Energy. However, current statutory linkages between an MRS facility and the repository make it impossible to accept waste at an MRS facility sited by DOE

on a schedule independent from that of the repository. DOE supports proposed legislative changes that would delink the repository schedule from the MRS schedule.

The second siting path is through the efforts of the Nuclear Waste Negotiator. The Negotiator is to seek a State or Indian Tribe with a technically qualified site and is to negotiate a proposed agreement on reasonable terms. A negotiated agreement could include terms that differ from the current statutory linkages. Any proposed agreement would be submitted to Congress for approval before becoming effective.

OCRWM believes that the Negotiator's efforts offer the best approach to siting an MRS facility. Consequently, its near-term role in MRS siting is to support the Negotiator's efforts as requested. To this end, in November 1990, OCRWM signed a memorandum of understanding with the Negotiator, providing for the use of OCRWM's services, facilities, and personnel and ensuring a timely flow of information between the two offices.

In addition to its support of the Negotiator's efforts, OCRWM prepared a number of publications that are being used to inform the public about the MRS facility, including a booklet entitled *A Monitored Retrievable Storage Facility: Technical Background Information* and a document entitled *Preliminary Site Requirements and Considerations for an MRS Facility*. In early FY 1992, a pamphlet entitled *Spent Fuel Storage at the Monitored Retrievable Storage Facility* was prepared.

Although OCRWM would prefer to site an MRS facility through the efforts of the Negotiator, it has initiated the development of a contingency plan for the DOE siting of an MRS facility.

Activities of the Nuclear Waste Negotiator

On May 3, 1991, the Negotiator sent a letter explaining his office and its statutory mandate to the Governors of all States and to Indian Tribal leaders. In the June 5, 1991, *Federal Register*, he announced the operating procedures he will use to solicit interest, conduct negotiations, and present a proposed agreement to Congress. This notice also outlined how the Negotiator would coordinate with DOE in reviewing and evaluating requests for feasibility grants.

On October 7, 1991, the Negotiator issued a formal invitation for dialogue and participation in the siting and operation of an MRS facility to States and Indian Tribes.

As a result of these communications, the Negotiator has received numerous requests for information and discussions.

Feasibility Grants

On May 8 and June 5, 1991, DOE published notices in the *Federal Register* of grant availability, eligibility, and application procedures. These notices invited States, Indian Tribes, and units of local government to apply for grants to assess the feasibility of hosting an MRS facility. The grants are to be disbursed in two phases. Phase I grants are preliminary grants of up to \$100,000 to be used to study the feasibility of siting an MRS facility in the applicant's jurisdiction. Phase II grants are to be used for a more detailed examination of the feasibility of hosting an MRS facility. Total grant availability during FY 1991 was \$1,097,000. No eligible parties applied for these grants during FY 1991. However, several parties expressed preliminary interest. Early in FY 1992, the Mescalero Apache Indian Tribe in New Mexico applied for and received a Phase I feasibility grant (Figure 3). Later in FY 1992, Grant County, North Dakota; the Yakima Indian Nation of Washington State; and Fremont County, Wyoming, also applied for and received a Phase I feasibility grant. Other grant applications were expected.

Design of an MRS Facility

To meet the objective of timely spent fuel acceptance, it is necessary to provide limited waste acceptance at an MRS facility in 1998. To do so, OCRWM will use proven technologies, to the maximum extent practicable, and an MRS facility configuration that would support early spent fuel acceptance. During FY 1991, OCRWM continued to evaluate various technologies and configuration alternatives.

Cooperative Demonstration Project with the Sacramento Municipal Utility District

Pursuant to H.R. 101-889, the conference report accompanying the Energy and Water Development Appropriations Act for FY 1991, OCRWM is involved in a

Figure 3. A Phase I grant to study the feasibility of MRS siting has been approved for the Mescalero Apache Indian Tribe of New Mexico. OCRWM Director Dr. John Bartlett (left) with Fred Peso, Secretary of the Tribe (right), shake hands at the approval ceremony.

cooperative demonstration project with the Sacramento Municipal Utility District and the Electric Power Research Institute. This project will demonstrate a dry cask-to-cask transfer system that may have application for the early acceptance of spent fuel. The project will be carried out at the now-idled Rancho Seco Nuclear Power Station near Sacramento, California. The reactor, shut down as a result of a voter referendum, is in the process of being decommissioned. Funding for this project comes from the Civilian Research and Development account rather than the Nuclear Waste Fund.

Chapter 5

TRANSPORTATION

Role of Transportation

A key element of the waste management program is the development and operation of a safe, publicly acceptable, and cost-effective waste transportation system that is available when needed. OCRWM will transport spent fuel from its storage locations to the MRS facility or directly to the repository, depending on the location of the initial storage site. All high-level radioactive waste will be shipped directly to the repository. All spent fuel and high-level waste will be shipped in casks whose design has been certified by NRC. Shipments will be made by rail, truck, or barge, and all shipments will be in full compliance with all applicable Federal regulations; DOE procedures; and State, Tribal, and local government requirements that are consistent with Federal law.

The transportation program is organized into four major areas: cask systems development, economic and system studies, operational planning and support systems development, and institutional interactions.

Cask Systems Development

In July 1991, Dr. Bartlett announced a two-phase program to further ensure that casks will be available by 1998. In phase I, OCRWM will acquire casks that employ currently available NRC-certified technologies for initial waste shipments. The phase I cask fleet may include new casks that use current-technology existing casks or modifications to existing casks. Phase II casks will use more-advanced technical approaches to increase efficiency. In FY 1991, the design for a legal-weight truck cask and the design for a rail/barge cask (phase II casks) neared completion. OCRWM expects a 2-year NRC review cycle. As part of the cask

development program, a series of meetings were held during FY 1991 with NRC to discuss technical design and certification testing issues.

Economic and Systems Studies

To ensure physical compatibility between the transportation system and the capabilities of waste-generating and storage facilities, OCRWM conducted two studies. The first study, the facility interface capability assessment, evaluated cask shipping and handling capabilities at the 122 reactors and other facilities where DOE has contracted to accept spent fuel. The second study, the near-site transportation infrastructure project, assessed the capabilities of 75 reactor sites and one storage site to ship by truck, rail, or barge. It focused on the transportation infrastructure from the reactor gate to the Federal highway system and/or the Nation's railway networks. During FY 1992, OCRWM will compare and evaluate the results of these studies.

Operational Planning and Support Systems Development

During FY 1991, OCRWM began developing site-specific service planning documents. These documents will serve as the bases for specific procedures and plans for the shipment of waste from each reactor site. Although eventually a plan will be developed for each reactor site, initial plans concentrate on the reactors where OCRWM might first accept waste, as listed in the Annual Capacity Report. As part of the Management Systems Improvement Strategy, OCRWM also began developing both the programmatic and the physical systems requirements for the "transport waste" function (see Chapter 6).

In response to recommendations from the Nuclear Waste Technical Review Board, OCRWM initiated planning for systems safety and human factors engineering to provide guidance to specifically incorporate these disciplines throughout the life cycle of the transportation program.

Institutional Interactions

The key to a successful transportation program lies in earning and maintaining public trust and confidence. The public must be confident that DOE is able to safely transport radioactive waste.

In FY 1991, OCRWM continued to use formal cooperative agreements with the Southern States Energy Board, the Midwestern Office of the Council of State Governments, and the Western Interstate Energy Board to address regional institutional and technical concerns. These organizations prepared and reviewed reports on transportation issues such as emergency response. They also drafted primers on hazardous materials transportation and rail transportation capabilities and trends.

In addition to its agreements with regional groups, OCRWM maintains national cooperative agreements with the National Congress of American Indians (NCAI) and the National Conference of State Legislatures (NCSL). The NCAI disseminates information about the radioactive waste management program to Indian Tribes and provides feedback on Tribal interests and concerns. The NCSL develops legislative reports on transportation issues, provides input from its high-level waste committee, and, beginning in FY 1992, will maintain the transportation legislative data base.

Under other cooperative agreements, the Commercial Vehicle Safety Alliance (CVSA) developed draft recommended national inspection procedures for future radioactive waste shipments. In FY 1991, draft radiological inspection procedures prepared by the Conference of Radiation Control Program Directors were incorporated into the CVSA procedures. The objective of this effort is to develop uniform State inspection procedures and to minimize or eliminate the duplication of en route State inspections.

Section 180(c) of the NWPA directs DOE to provide technical and funding assistance to States for the purpose of training the public safety officials of local governments; the same type of assistance will be provided to Indian Tribes. This training is to cover procedures required for safe, routine transportation of spent fuel and for emergency response situations. OCRWM is developing a strategy describing the steps that will be taken to provide this funding and technical assistance. The strategy was issued in preliminary draft form in December 1990. It has been modified to reflect verbal and written comments from the Transportation Coordination Group and to reflect the passage of the Hazardous Materials Transportation Uniform Safety Amendments Act of 1990, which requires Federal agencies to coordinate training assistance for emergency response. The strategy will be released early in 1992, and its release will be announced in the *Federal Register*.

Chapter 6

SYSTEMS INTEGRATION AND REGULATORY COMPLIANCE

In developing the waste management system, OCRWM must integrate numerous technical, management, and regulatory activities. Systems integration refers to those activities that link the individual parts of the system together to maximize the safety, efficiency, and cost effectiveness of the system as a whole. Systems engineering plays a key role in OCRWM's efforts to integrate the waste management system. In FY 1991, important progress was made in integrating the system by hiring a management and operating contractor (see Chapter 8); implementing the management strategy presented in OCRWM's Management Systems Improvement Strategy (MSIS), issued in August 1990; and revising system requirements and description documents.

Among the requirements OCRWM has to meet are standards and procedures established by NRC and EPA. In parallel with its systems integration efforts, OCRWM continued its ongoing interactions with NRC and EPA to identify and resolve regulatory compliance issues.

Management Systems Improvement Strategy

The MSIS provides a new framework for achieving the program mission. This strategy recognizes that, just as facilities and equipment composing the physical waste management system must perform certain functions, so must various programmatic and management functions be performed in order to bring the physical system into being.

The MSIS is intended to integrate the various parts of the program by rigorously applying principles of systems engineering. Systems engineering is an iterative

process that identifies the functions that must be performed to achieve the mission; defines the requirements each function must meet; creates design concepts to satisfy the requirements; selects the preferred system; and builds, tests, and demonstrates the chosen system. During FY 1991, OCRWM made progress in implementing the MSIS and carrying out systems studies of various parts of the waste management system.

OCRWM has undertaken two separate but coordinated systems engineering efforts as part of the MSIS: (1) a functional analysis of the physical system and (2) a functional analysis of the program. The MSIS identified four functions that the physical system must perform: accept waste, transport waste, store waste, and dispose of waste. In FY 1991, draft physical system requirements documents were completed for the overall waste management system, the exploratory studies facility, and the "store waste" function. The physical system studies are undergoing formal internal review. In support of the physical system studies, a series of system tradeoff studies were begun. When completed, these studies will form the basis for a structured approach to resolving issues and selecting preferred design concepts and components of the physical system. OCRWM expects to complete the analysis of the "accept waste" and "transport waste" functions in FY 1992.

OCRWM will also perform a functional analysis of the programmatic actions required to bring the operating system into being. The programmatic functions reflect the requirements of the waste management program, such as obtaining licenses from NRC and maintaining relations with external parties. The functional analysis of the program is to be completed during FY 1992.

Waste Management System Requirements and Description

The program technical baseline is specified in the Waste Management System Requirements (WMSR) and Waste Management System Description (WMSD) documents. The WMSD was revised in March 1990. Three of the four WMSR documents were also revised. These represent the current technical baseline against which program performance and progress can be measured. The WMSR provides the top level of a hierarchy of increasingly detailed documents that will be prepared for each program element. The WMSR also provides a consistent reference for controlling the technical development of the system. The WMSD describes the reference system. It contains the system assumptions and definitions and describes the interfaces between the top level elements of the system. When completed, the functional analyses of the physical system and program being

conducted as part of the MSIS will serve as the basis for revising the program technical baseline.

During FY 1991, OCRWM continued the development of a configuration management plan. This plan ensures that the technical requirements for physical components of the system are clearly defined and controlled and that the system components acquired by the program meet the requirements.

Regulatory Compliance

One of OCRWM's main tasks is to ensure that the waste management system being developed complies with the requirements of applicable laws and regulations. Requirements for determining the suitability of a candidate repository site are given in the DOE siting guidelines, 10 CFR Part 960. The construction, operation, and closure of a repository can only be undertaken under authorization or license by NRC, under the requirements specified in 10 CFR Part 60, which implement and enforce the radiation protection standards promulgated by EPA as 40 CFR Part 191. The construction and operation of the MRS facility are also subject to NRC regulation under 10 CFR Part 72, which enforces the applicable portion (Subpart A) of 40 CFR Part 191. The design of transportation casks is regulated by NRC under 10 CFR Part 71.

Portions of EPA's environmental standards, 40 CFR Part 191, were remanded by judicial mandate in 1987. In FY 1991, EPA continued its revision of the regulation. OCRWM reviewed and commented on each working draft of the regulation and participated in workshops and meetings with EPA to present its views.

Licensing Strategy

In order to prepare for the development of a license application, OCRWM has accepted the NRC staff's suggestion that OCRWM prepare an annotated outline of the license application for a geologic repository.

The purpose of developing an annotated outline, using NRC guidance such as the format and content regulatory guide and industry experience, is to ascertain what information will be needed to develop the license application and how such information will be obtained. The annotated outline will be iterated several times,

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both internally and externally, by a process of review, revision, and refinement until the license application can be developed.

Although the development of the annotated outline will be independent of efforts to determine site suitability, the license application will not be prepared until the site is determined to be suitable for a geologic repository.

Chapter 7

INTERNATIONAL PROGRAMS

Secretary Watkins and Dr. Bartlett continue to emphasize the need to internationalize the OCRWM program because many waste management and other environmental and energy issues increasingly cross national boundaries. Moreover, international cooperative research and development programs are also cost-effective ways of maximizing limited resources, building consensus on common issues in radioactive waste management, and broadening OCRWM's knowledge base.

OCRWM and its predecessor office have participated in international activities since 1976 and continue to broaden OCRWM's technical and institutional knowledge through bilateral agreements, cooperative projects, and international working and advisory groups. In FY 1991, \$6.4 million of OCRWM's budget was earmarked for international activities.

Participation in international cooperative research and information exchange programs is designed to facilitate the development and licensing of the waste management system. These programs cover various areas, including the handling, storage, and transportation of radioactive wastes; repository development; performance assessment; the regulation of system design and operations; and public information and education.

Repository Technology Projects

OCRWM participates in several international cooperative repository technology projects. The STRIPA Project (Sweden), sponsored by the Nuclear Energy Agency (NEA) of the Organisation for Economic Cooperation and Development (OECD), scheduled for completion in late 1991, is studying site investigation,

remote-sensing technologies, and radionuclide transport. The Alligator Rivers Project (Australia), scheduled for completion in 1992, involves the study of natural analogs (analyses of the migration patterns of naturally occurring uranium decay products). The INTRAVAL Project (Sweden) involves 22 participant organizations from 12 nations and is managed by the Swedish Nuclear Power Inspectorate. It focuses on the validation of performance assessment models used to predict the movement of radionuclides in the repository system. In FY 1991, another multinational natural analog project was completed in Brazil (Pocos de Caldas Project). It investigated the movement of uranium from an ore body exposed in an open-pit mine. OCRWM participated in an international workshop sponsored by NEA on hydrology and in a meeting of the NEA expert group on cost analysis. OCRWM also continued participation in the NEA thermochemical data base project.

Bilateral and Cooperative Testing Agreements

During FY 1991, OCRWM finalized a series of bilateral and cooperative testing agreements with the following countries:

Canada

OCRWM and its predecessor office have maintained a bilateral agreement with Canada on radioactive waste management since 1976. Subsidiary Agreement I (1986-88) focused on the transfer of performance assessment codes, in situ test results, and general geologic characterization at the Underground Research Laboratory in Manitoba. Subsidiary Agreement II was signed in September 1991. It continues cooperative research on engineered barriers, instrumentation development, materials characterization, performance assessment, field and laboratory testing related to radionuclide migration, and a natural analog study.

Switzerland

OCRWM has maintained a bilateral agreement with the Swiss National Cooperative Project for the Disposal of Radioactive Waste (NAGRA) since 1985. Project Agreements I and II focused on the development and testing of geologic models and seismic instrumentation. Project Agreement III, signed in September 1991, focuses on studies of fluid transport in fractured rock, geophysical measurement techniques, borehole logging and seismic imaging, and laboratory studies of radionuclide sorption. At the same time as the agreement was signed, the bilateral umbrella agreement with Switzerland was extended until 1996.

Sweden

OCRWM and its predecessor office have maintained a cooperative agreement with Sweden since 1977. In 1991, the umbrella bilateral agreement was extended for another 5 years. Under these agreements, OCRWM has acquired site-specific Swedish data bases to verify geochemistry and saturated flow, radionuclide transport, geology and tectonics, and siting methodologies, and OCRWM has hosted staff from the Swedish Nuclear Fuel and Management Company at the Yucca Mountain Site Characterization Project Office. In FY 1991, OCRWM continued negotiations to develop technical scopes of work for its proposed involvement with the Swedish hard rock laboratory. This underground research facility is being constructed in Sweden to support repository development.

In addition to its cooperative agreements, OCRWM continues information exchanges with several countries and organizations, including Belgium, France, the United Kingdom, Japan, and the Commission of the European Communities.

International Organizations

OCRWM is a member of a number of international organizations interested in radioactive waste management, such as the OECD/NEA Radioactive Waste Management Committee and the United Nations International Atomic Energy Agency (IAEA). The Radioactive Waste Management Committee supports national demonstration programs through generic studies of technical data, consensus statements, recommendations and guidance on criteria, and methods and procedures for its 23 participating member countries. OCRWM also is an active member of the IAEA Safeguards Group and participates in the Natural Analogue Working Group of the Commission of the European Communities.

New Initiatives

In FY 1991, several new initiatives were begun to improve communication and coordination between OCRWM program offices and to assist the program offices in developing priorities for managing the international program. An international program plan was developed. A description of the international program is being developed, and the international procedures document is being revised. An OCRWM-wide International Program Working Group was established. It meets to review the international program, discuss relevant issues and developments,

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and develop recommendations for new initiatives. In cooperation with the OECD, NAGRA, and the NEA's Public Information Working Group, OCRWM participated in several international science and energy education initiatives (see Chapter 2). OCRWM is considering establishing a bilateral agreement with Spain and participating in several new multinational natural analog studies.

Chapter 8

PROGRAM MANAGEMENT

Effective management is critical to the success of the waste management program, and since the inception of the program, management has received a great deal of attention from Congress, the electric utility industry, and affected governments and interested parties. To achieve success, management must be responsive to the demands imposed by the program's combination of requirements: technical excellence, regulatory compliance, the involvement of affected governments and interested parties, public confidence, and fiscal responsibility. To perform the technical work, OCRWM relies on the Nation's best scientific and engineering expertise. To control the program, OCRWM will use integrated technical, cost, and schedule baselines subject to strict change control.

Organization

In FY 1991, OCRWM implemented a new organizational structure intended to establish clear lines of responsibility, authority, and accountability for program participants. The new organization clearly separates the Headquarters policy and guidance role from the field office implementation role. The new structure is project oriented and now includes a single project office responsible for geologic disposal. An MRS project office will be established when a suitable site is identified and approved by Congress.

As shown in Figure 4, OCRWM's organization consists of five offices headed by associate directors and three offices headed by office directors, all of whom report directly to Dr. Bartlett. A brief description of the responsibilities of each is given below.

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Figure 4. Organization of the Office of Civilian Radioactive Waste Management.

Office of Quality Assurance: responsible for developing quality assurance requirements for the program, overseeing compliance with the requirements, and interfacing with the quality assurance requirements of NRC.

Office of Strategic Planning and International Programs: responsible for strategic, long-range, and contingency planning and for managing relations with programs in other nations.

Office of External Relations: responsible for managing intergovernmental relations and interactions with affected governments and interested parties and for managing education and public information programs.

Office of Program and Resources Management: responsible for controlling the program's schedule and cost, managing the Nuclear Waste Fund, managing program information systems and budget activities, and for providing administrative support services, including the acquisition and development of human resources.

Office of Geologic Disposal: responsible for directing the Yucca Mountain Site Characterization Project (a major system acquisition) to include the scientific evaluations needed to determine whether the Yucca Mountain site is suitable for a geologic repository.

Office of Systems and Compliance: responsible for establishing systems requirements based on regulatory, legislative, and other external requirements, overseeing the implementation of program requirements, and providing systems integration.

Office of Storage and Transportation: responsible for directing the MRS project (a major system acquisition) to include developing a transportation system, developing systems for spent fuel acceptance, and systems logistics activities.

Office of Contract Business Management: responsible for managing business relations with the management and operating contractor and support services contractors and for consolidating contractor services.

Management and Operating Contractor

On February 12, 1991, OCRWM awarded a management and operating (M&O) contract. The M&O contractor is responsible for the design and analysis of the waste management system to ensure that the system is optimized and that interfaces between system elements are clearly specified and controlled. The contractor is also responsible for supporting OCRWM's efforts to ensure that the Yucca Mountain candidate site is characterized in accordance with regulatory requirements and for assisting OCRWM in obtaining a license for a repository from NRC. For the MRS facility, the M&O contractor will assist in siting and will provide design and licensing services. In addition, the M&O contractor will integrate the work of the various program participants. OCRWM expects the contractor to provide the best possible information and advice on the improvement of program schedules and cost efficiencies.

Quality Assurance

NRC requires that OCRWM have a fully qualified quality assurance (QA) program, and Secretary Watkins and Dr. Bartlett are dedicated to ensuring high quality in all activities, at all levels of the program. For this reason, all program activities important to radiological safety and waste isolation and certain activities not related to safety are subject to QA requirements. In FY 1991, NRC conditionally accepted the OCRWM QA program as meeting the requirements of NQA-1, the consensus standard for the application of quality assurance to nuclear facilities and the requirements of NRC. The development and implementation of the QA program is a major achievement for OCRWM.

The QA program provides for both the achievement and verification of quality. This means that all DOE and contractor personnel performing quality-affecting work must be certified as being professionally qualified (i.e., possess the requisite experience, education, and training) to perform their assigned duties and responsibilities and that acceptable QA requirements and procedures are established for the work to be done.

In October 1990, the OCRWM Office of Quality Assurance (OQA), along with observers from NRC, the State of Nevada, and affected units of local government conducted QA qualification audits at OCRWM Headquarters in Washington and at the Project Office. The audit focused on the QA program elements necessary to start new site characterization activities. NRC staff subsequently stated in March 1991 that the OCRWM QA program is acceptable for some new site char-

acterization activities—namely, those associated with trenching at Midway Valley and investigations of certain calcite-silica deposits—provided that the recommended actions identified in the audit report were completed and verified. The actions identified in the audit reports were completed and verified, and in August 1991 OCRWM transmitted a letter requesting NRC to lift its objection to the OCRWM QA program (QA objection 2 in the 1989 NRC Site Characterization Analysis) and grant unconditional acceptance of the OCRWM QA program.

As another measure of performance, Dr. Bartlett directed the performance of a QA management assessment in May 1991. This assessment evaluated the status, adequacy, compliance, and effectiveness of the OCRWM QA program. It determined that the OCRWM QA program was adequate and its implementation was effective.

In FY 1991, NRC also found that the OCRWM Quality Assurance Requirements Document (QARD) and the OCRWM Quality Assurance Program Description (QAPD) were generally acceptable as meeting requirements for monitored retrievable storage and the transport of spent fuel and high-level waste, provided that certain open issues were resolved. The August 1991 letter documented the resolution of these open issues.

Since it will perform quality-affecting activities, the M&O contractor prepared a Quality Assurance Program Description (QAPD) for its own operations and submitted it to OCRWM for acceptance. To date, this QAPD has been given conditional acceptance by OCRWM. Full acceptance will be given upon submittal and acceptance of the M&O contractor's Software Quality Assurance Plan.

In July 1991, OCRWM instituted a quality concerns program that gives anyone with quality-related concerns about the program an opportunity to call a toll-free telephone hotline to discuss their concerns. Callers do not have to provide their names. The hotline team will investigate all quality-related concerns and take appropriate actions to ensure that they are addressed.

Financial Management

OCRWM's primary financial management responsibility is the management of the Nuclear Waste Fund (NWF) established by the NWPA to ensure that the Government recovers from the generators and owners of high-level waste and spent fuel the full cost of activities related to the services it provides. In addition to preparing, submitting, and executing budgets, NWF management includes reviewing and recommending fees, handling investments, accounting for revenue and

expenses, developing estimates of the total-system life-cycle costs, and establishing and maintaining the program's cost baseline.

In addition to civilian radioactive waste, OCRWM is responsible for the permanent disposal of high-level radioactive waste generated by DOE defense activities. The Office of Environmental Restoration and Waste Management made an initial payment of \$5 million into the NWF in FY 1991, and an additional \$7.5 million was appropriated by Congress for FY 1992 toward the Government's share of the cost of the waste disposal system.

A certified public accounting firm conducts annual independent audits of the NWF financial statements. The report of the firm for the year ended September 30, 1991, is included herein.

The Nuclear Waste Fund

For FY 1991, the NWF had total revenue of \$909 million, compared to \$872 million in FY 1990. The total revenue includes payments of fees (1.0 mill per kilowatt-hour), the interest earned on one-time spent fuel fees and U.S. Treasury securities, and the net gain (or loss) on sales of U.S. Treasury securities. On September 30, 1991, the book value of NWF investments was approximately \$3.2 billion, as compared to \$2.6 billion at the end of FY 1990. For the years ended September 30, 1991 and 1990, interest earned on the NWF's investments totaled \$249 million and \$199 million, respectively. The financial statements in Chapter 9 provide further information on NWF revenue and expenses.

On March 17, 1989, the U.S. Court of Appeals for the District of Columbia Circuit in *Consolidated Edison v. U.S. Department of Energy* (870 F.2d 694 (D.C. Cir. 1989)) ruled that DOE's definition of the term "net kilowatt-hours generated" did not conform to the "generated and sold" provision in Section 302(a)(2) of the NWPA. The Court held that, to meet the definition of electricity "generated and sold," DOE is required to "implement some reasonable and fair method" to account for losses in the transmission and distribution of electricity and electricity used off the site in addition to deductions for normal onsite nuclear service station loads. The Court thus concluded that the ongoing fee under Section 302(a)(2) applies only to electricity that is "both generated and actually sold." On September 7, 1990, DOE issued a notice of proposed rulemaking to change the basis of the fee, consistent with the Court's ruling. Estimated fees to be reimbursed or credited total \$410 million (with interest) as of the end of FY 1991.

Total-System Life-Cycle Cost

Each year OCRWM performs a comprehensive analysis of the total cost of the waste management system over its complete life cycle. The analysis is intended to follow as closely as possible the most current program strategy, plans, and policies. The primary purpose of the total-system life-cycle cost (TSLCC) analysis is to provide cost data needed to determine whether the fees paid by the waste generators will be sufficient to fully cover the costs of the program (the fee adequacy analysis). In May 1989, OCRWM published its fifth *Analysis of the Total System Life Cycle Cost for the Civilian Radioactive Waste Management Program*. Shortly afterward, the Secretary of Energy issued his reassessment of the program. OCRWM decided that the analysis of the adequacy of the fee should incorporate impacts of the restructured program, requiring an addendum to the May 1989 TSLCC. In December 1990, OCRWM therefore issued *Preliminary Estimates of the Total-System Cost for the Restructured Program: An Addendum to the May 1989 Analysis of the Total-System Life Cycle Cost for the Civilian Radioactive Waste Management Program*.

For the restructured program, the total-system cost estimates ranged from \$25.6 billion to \$34.6 billion (in constant 1988 dollars), depending on assumptions about the number of repositories and the projected quantities of spent fuel. The defense waste share of the total-system cost is estimated to range from \$3.8 billion (single-repository system) to \$5.8 billion (two-repository system), or 15 to 17 percent of the total-system cost.

Fee Adequacy Assessment

In November 1990, OCRWM issued *Nuclear Waste Fund Fee Adequacy: An Assessment*. This evaluation, the sixth in a series of fee adequacy reports, considers all program changes that have taken place since the last report was published in June 1987. In developing the assessment, OCRWM analyzed a variety of scenarios involving the development of either one or two repositories and various inflation rate and real interest projections. On the basis of the findings for a base case scenario with an inflation rate of 4 percent and a real interest rate of 3 percent, OCRWM did not recommend adjusting the fee of 1.0 mill per kilowatt-hour. OCRWM also analyzed the fee for a scenario involving a resurgence of the nuclear industry (the upper reference spent fuel projections of the Energy Information Administration). This analysis supported the conclusions of the fee adequacy assessment.

Program Management System

The Program Management System Manual

The Program Management System Manual (PMS Manual) is OCRWM's top-level management directive. It describes the hierarchy of plans required to develop and maintain the program's baselines and establishes the management policies and procedures to be used in implementing the program. It assigns responsibilities for the preparation, concurrence, and approval of the baseline, policy, and procedural documents and changes thereto. The PMS Manual was revised and issued as Revision 4 in July 1991. Revision 4 incorporates revised mission and function statements that reflect the new organizational structure.

Cost and Schedule Control

In March 1991, OCRWM issued Revision 1 of the Program Cost and Schedule Baseline (PCSB) consistent with the technical baseline and planned activities. The document establishes cost values and milestones that are subject to formal change control at the Acquisition Executive (level 0) and Program (level 1) levels. Because the control of the cost, schedule, and technical baselines is coordinated and integrated, a measurable basis exists for analyzing the cross impacts of one on the others.

During FY 1991, OCRWM began developing a hierarchy of network schedules to track activities necessary for the achievement of PCSB milestones. When completed, the network will allow program officials to quickly review the major program milestones and the supporting activities that must precede them.

An integrated cost-and-schedule computer model is also being developed to allow program officials to assess with ease impacts of changes in program direction and/or funding.

Project Management System

Significant progress was made during the year in preparing for an Energy System Acquisition Advisory Board (ESAAB) review of key decision 2, approval to start final ESF Title II design, and key decision X, approval to start new surface-based testing, for the Yucca Mountain Site Characterization Project, which is a designated major system acquisition (MSA). As a prerequisite to this ESAAB review, the Yucca Mountain Project Plan, which includes technical, cost, and schedule baselines, was submitted for ESAAB approval. Interim, limited ESAAB

approval for key decisions 2 and X was received on September 27, 1991, and on December 30, 1991, respectively. Full authorization to proceed with surface-based testing at Yucca Mountain and Title II design for the ESF has been received.

OCRWM initiated development of an MRS facility conceptual design report and project plan in preparation for an ESAAB review of key decision 1, approval to start Title II design, expected to be held late in FY 1992.

Project Decision Schedule

Section 114(e) of the NWPA requires that the Secretary of Energy issue and update, as necessary, a Project Decision Schedule (PDS). The purpose of the PDS is to portray the optimum way to obtain operation of a geologic repository. The PDS lists activities and deadlines for Federal agencies and serves as a commitment by those agencies for taking action to support OCRWM's repository schedule.

The NWPA requires any Federal agency that cannot comply with a deadline in the PDS and any agency that fails to comply to submit a written report to the Secretary of Energy and to Congress to explain its failure or expected failure to meet that deadline. The Secretary, in turn, is required to submit to Congress a response to that agency's report, including any reasons that the Secretary could not amend the PDS to accommodate the Federal agency involved.

OCRWM issued a revised PDS in June 1991, which constitutes the first revision of the PDS since the original document was issued in 1986. The revised PDS accounts for changes in the program since the 1987 Amendments Act and the Secretary's 1989 reassessment of the program. The schedules in the PDS are based on OCRWM's program schedule baseline.

The Annual Capacity Report and the Acceptance Priority Ranking

In December 1990, OCRWM issued the 1990 Annual Capacity Report (ACR), as required by the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste. The ACR projects the annual receiving capacity of the Federal waste management system and an annual acceptance ranking of contract holders for 10 years after the projected commencement of DOE facility operations.

In May 1991, OCRWM issued a draft Acceptance Priority Ranking (APR), which is also required by the contract. The APR establishes the order in which DOE

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will allocate Federal waste acceptance capacity. The draft APR provided contract holders the opportunity to verify the accuracy of information contained in the ranking. The 1991 APR was issued in December 1991.

Reclamation and Closeout

Reclamation and closeout activities continued during 1991, pursuant to the provisions of the NWPA. OCRWM's reclamation policy requires the return of sites, as nearly as practicable, to their original condition, including reseeding to replace natural vegetation. Outstanding issues with the State of Mississippi concerning the decommissioning of wells at the Richton and Cypress Creek salt domes were resolved during the reporting period. Work having been completed in Texas, Louisiana, and Utah in previous years, reclamation activities at all salt sites are now considered complete. Reclamation activities conducted by the Basalt Waste Isolation Project in Washington State continued but were not completed during 1991.

Information Resources Management

During FY 1991, OCRWM had two major information management initiatives under way. The first was to continue to expand and refine the highly technical and complex planning processes necessary to ensure successful, cost-effective information resources management (IRM). To facilitate the planning process and ensure that the needs of users are met, OCRWM established two planning and communication entities: (1) the OCRWM Point-of-Contact Committee and (2) IRM special interest groups responsible for key information resources areas such as software management, office automation, telecommunications, and information and records management. These planning efforts have helped promote OCRWM's IRM strategy of integrating programmatic and information technology efforts through a comprehensive, coordinated approach.

Also during FY 1991, a major system design called Infostreams (INFOrmation Storage Retrieval Access Management System) was initiated. Infostreams builds on the office automation, telecommunications, and records management infrastructure already installed by OCRWM Headquarters and the Project Office. It uses design components from the Licensing Support System (LSS) and replaces DOE records capture stations proposed for the LSS.

Infostreams logically organizes program information into "streams" that can be processed, stored, accessed, and disseminated to accomplish OCRWM goals and

objectives. The license application itself will be developed through a "stream" of data and information. Users will be linked through personal computers into local- and wide-area networks and into mainframe capabilities. Groupware will enable them to create, route, concur on, and track documents, while an audit trail is automatically generated to satisfy quality assurance requirements and to generate the institutional record of the program. Documents will be linked to supporting or related documents and data for ease of retrieval, dissemination, and eventual disposition. Appropriate access to technical data will be provided through interfaces and communications links.

Components of Infostreams will be available in FY 1992, with system completion projected for FY 1995. During FY 1991, preparatory work for the Infostreams system was initiated, including a revision of the OCRWM records management policy, a new approach to records dispositions schedules, and screening procedures for the "streams" of information.

Self-Assessment

The Secretary of Energy has issued a directive requiring that all DOE programs assess their own performance in meeting environment, health, and safety standards. OCRWM made significant progress in developing such a program in FY 1991. OCRWM's self-assessment program provides a mechanism for independent review, planning, implementation, and verification of performance in such areas as environmental safety and health, nuclear safety, the reporting of unusual occurrences, and evaluations of performance indicators. To implement the program, a self-assessment unit was created in the Office of Systems and Compliance; it will be staffed with five specialists. A management plan that describes requirements, strategies, responsibilities, and approaches for implementing the self-assessment program has been prepared, and separate implementation plans for each of the self-assessment areas are being developed. These plans establish approaches, training requirements, reporting requirements and responsibilities, corrective action procedures, and schedules. The results of surveys and appraisals performed for the program will be published in site visit reports and periodic summaries.

Risk Management

Since the beginning of the program OCRWM has been working to characterize the risks of waste management and to communicate with external parties about

PROGRAM MANAGEMENT

those risks. OCRWM is now trying to better integrate its risk assessment, decisionmaking, and communication activities. This is a long-term commitment that begins with program staff sharing an understanding of risk management techniques. In FY 1991, OCRWM focused on investigating the risk-management efforts of other organizations both in the Federal Government and in the private sector and conducted seminars for OCRWM staff on risk management and communication. OCRWM began to focus on which approaches to risk management would be feasible and effective within the structure of the program.

Chapter 9

FINANCIAL STATEMENTS

The NWPA authorizes program expenditures for civilian radioactive waste management under three accounts. Two of these—the Interim Storage Fund (Section 136) and the Nuclear Waste Fund (Section 302)—are special funds established in the U.S. Treasury. The third, the Civilian Radioactive Waste Research and Development (R&D) account, provides for expenditures from the General Fund on taxpayer-supported programs authorized under Sections 151, 218, 222, and 223 of the NWPA. There has been no request for Federal interim storage services. Thus, that fund has not been activated, and there are no plans to submit a budget request for that purpose. This chapter presents financial statements for the two active accounts, the Nuclear Waste Fund and the Civilian Radioactive Waste R&D account.

Nuclear Waste Fund

OCRWM secured the services of a certified public accounting firm to provide an independent audit of the Fund's financial statements for those who finance the waste management program. This section contains the report of the auditors, KPMG Peat Marwick, on the financial statements for FY 1991 and FY 1990.

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

Financial Statements

September 30, 1991 and 1990

(With Independent Auditors' Report Thereon)

Certified Public Accountants

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

Independent Auditors' Report on Financial Statements

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

We have audited the accompanying balance sheets of the Nuclear Waste Fund as of September 30, 1991 and 1990, and the related statements of operations and cash flows for the years then ended and cumulatively from inception (January 7, 1983) to September 30, 1991. These financial statements are the responsibility of the Fund'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 and Government Auditing Standards issued by the U.S. General Accounting Office. 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. ..

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Nuclear Waste Fund at September 30, 1991 and 1990, and the results of its operations and its cash flows for the periods indicated above, in conformity with generally accepted accounting principles as prescribed in Title 2 of the General Accounting Office's Policy and Procedures Manual for Guidance of Federal Agencies.

KPMG Peat Marwick

December 20, 1991

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

Balance Sheets

September 30, 1991 and 1990

(Dollars in thousands)

<u>Assets</u>	<u>1991</u>	<u>1990</u>
Cash	\$ 2,118	2,489
U.S. Treasury securities (note 2)	3,182,140	2,630,169
Receivables from utilities (note 3):		
One-time spent fuel fees	893,784	896,875
KWH fees	136,800	131,600
Interest on one-time spent fuel fees	<u>788,005</u>	<u>685,707</u>
	<u>1,818,589</u>	<u>1,714,182</u>
Receivable from Department of Energy for defense high-level waste disposal costs (note 1(b))	-	-
Accrued interest on U.S. Treasury securities (note 2)	79,798	92,264
Other receivables and advances	411	586
Capital equipment, less accumulated depreciation of \$25,476 in 1991 and \$24,209 in 1990	<u>31,354</u>	<u>31,238</u>
	<u>\$ 5,114,410</u>	<u>4,470,928</u>
 <u>Liabilities</u>		
Accounts payable and accrued expenses	38,368	31,352
Estimated payable to utilities on overpayment of KWH fees (note 3)	350,000	280,000
Deferred revenue	<u>4,726,042</u>	<u>4,159,576</u>
Total liabilities	5,114,410	4,470,928
Fund balance	-	-
Contingencies (notes 3 and 8)		
	<u>\$ 5,114,410</u>	<u>4,470,928</u>

See accompanying notes to financial statements.

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

Statements of Operations

Years ended September 30, 1991 and 1990
and cumulatively from January 7, 1983, date of inception
to September 30, 1991

(Dollars in thousands)

	<u>1991</u>	<u>1990</u>	<u>Cumulative</u>
Revenue:			
Fees (note 3):			
One-time spent fuel fees	\$ -	-	2,334,777
KWH fees	548,872	551,512	3,608,919
Defense high level waste fees (note 1(b))	5,000	-	5,000
Interest:			
One-time spent fuel fees (note 3)	105,235	121,503	809,953
U.S. Treasury securities	237,323	199,428	1,045,448
Gain (loss) on sale of U.S. Treasury securities	<u>12,161</u>	<u>17</u>	<u>44,359</u>
	908,591	872,460	7,848,456
Less amount deferred	(566,466)	(474,903)	(4,726,042)
	<u>342,125</u>	<u>397,557</u>	<u>3,122,414</u>
Expenses:			
First repository	188,353	203,304	2,153,275
Second repository	26	249	108,885
Monitored retrievable storage	5,459	2,109	47,334
Transportation and systems integration	44,586	39,875	200,841
Program management	64,051	61,191	459,604
Interest (notes 1 and 3)	20,000	60,000	98,008
Transfer appropriations (note 5)	<u>19,650</u>	<u>30,829</u>	<u>54,467</u>
	<u>342,125</u>	<u>397,557</u>	<u>3,122,414</u>
Excess of revenue over expenses	\$ <u>-</u>	<u>-</u>	<u>-</u>

See accompanying notes to financial statements.

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

Statements of Cash Flows

Years ended September 30, 1991 and 1990

(Dollars in thousands)

	<u>1991</u>	<u>1990</u>	<u>Cumulative</u>
Cash flows provided by operating activities:			
Excess of revenue over expenses	\$ -	-	-
Adjustments to reconcile excess of revenue over expenses to net cash provided by operating activities:			
Depreciation expense	3,700	7,648	36,709
Amortization of premiums and accretion of discounts on U.S. Treasury securities	55,522	62,484	293,530
Net book value of dispositions and charge-offs of capital equipment	2,976	6,929	29,165
Net gain on sale of securities	(12,161)	(17)	(44,359)
Increase in receivables from utilities	(91,766)	(136,304)	(1,898,798)
Increase (decrease) in accounts payable and accrued expenses	7,016	(36,156)	38,368
Increase in estimated payable to utilities on overpayment of KWH fees	70,000	80,000	350,000
Increase in deferred revenue	<u>566,466</u>	<u>474,903</u>	<u>4,726,042</u>
Net cash provided by operating activities	<u>601,753</u>	<u>459,487</u>	<u>3,530,657</u>
Cash flows from investing activities:			
Purchase of U.S. Treasury securities	(1,899,572)	(1,054,326)	(7,643,508)
Proceeds from sales and maturities of U.S. Treasury securities	1,304,240	610,234	4,212,065
Purchases of capital equipment	<u>(6,792)</u>	<u>(14,102)</u>	<u>(97,096)</u>
Net cash used in investing activities	<u>(602,124)</u>	<u>(458,194)</u>	<u>(3,528,539)</u>

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

Statements of Cash Flows, Continued

(Dollars in thousands)

	<u>1991</u>	<u>1990</u>	<u>Cumulative</u>
Cash flows from financing activities:			
Borrowings from U.S. Treasury	\$ -	-	264,964
Repayments of borrowings from U.S. Treasury	-	-	(264,964)
Borrowings from DOE for capital equipment	-	-	9,739
Repayments of borrowings from DOE for capital equipment	<u>-</u>	<u>-</u>	<u>(9,739)</u>
Net cash used in financing activities	<u>-</u>	<u>-</u>	<u>-</u>
Net increase (decrease) in cash	(371)	1,293	2,118
Cash, beginning of period	<u>2,489</u>	<u>1,196</u>	<u>-</u>
Cash, end of period	\$ <u>2,118</u>	<u>2,489</u>	<u>2,118</u>

See accompanying notes to financial statements.

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

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

September 30, 1991 and 1990

(1) Organization and Summary of Significant Accounting Policies

(a) Organization

The Nuclear Waste Policy Act (the Act) was signed into law on January 7, 1983. The Act establishes a framework for the financing, siting, licensing, operating and decommissioning of one or more permanent repositories for the Nation's spent nuclear fuel and high-level radioactive waste. In addition, the Act contains several other features 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 Department of Energy (DOE).

Committing the federal government to study monitored retrievable storage (MRS) concurrent with mined geologic repositories.

Provision for contracts with the owners and generators of nuclear power plants and other waste producing facilities for DOE initial acceptance of spent nuclear fuel no later than January 31, 1998 in return for payment of specified fees to the NWF.

A requirement that consideration be given to the disposal of waste resulting from atomic energy defense activities (defense waste) through use of the civilian repositories. 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 use.

Under the Act, the NWF can perform only nongeneric research. Costs incurred for this nongeneric research relative to repository media and general and administrative costs are expensed as incurred.

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Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

In June 1987, DOE issued the Office of Civilian Radioactive Waste Management (OCRWM) Mission Plan Amendment. The amendment, which was submitted to Congress, revised the schedule for the first repository extending the date for accepting spent nuclear fuel until the year 2003.

On December 22, 1987, the President signed into law The Omnibus Budget Reconciliation Act of 1987 (Amendments Act), which contained amendments to the Act. The legislation directs DOE to characterize the Yucca Mountain site in Nevada as a candidate site for the first repository. Drilling of an exploratory shaft at the Yucca Mountain site may begin upon completion of the site characterization plan and public hearings required by the Act.

The legislation also provided for the termination of site specific activities for the Hanford, Washington and Deaf Smith County, Texas sites within 90 days of enactment. In the event that the Yucca Mountain site proves unsuitable for use as a repository, DOE is required to terminate site-specific activities and report to Congress.

Additionally, the legislation annulled and revoked DOE's MRS proposal, submitted to Congress on March 31, 1987, to construct an MRS facility in Oak Ridge, Tennessee. However, the legislation authorizes an MRS facility and DOE's conducting of a survey of potentially suitable sites subsequent to submission of the MRS Review Commission's report which was submitted on November 1, 1989. The selection of a site for an MRS may not be made until after the Secretary of Energy recommends to the President a site for development of the first repository.

Further, the legislation authorized DOE to pay interest on overpayments of KWH fees consistent with the December 5, 1985 ruling of the United States Court of Appeals as discussed in note 3. Interest on these overpayments of KWH fees was fully paid or credited as of September 30, 1990.

NUCLEAR WASTE FUND
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Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

On November 29, 1989, the Secretary of Energy made a report to Congress on the reassessment of the Civilian Radioactive Waste Management program. At the direction of the Secretary, a comprehensive review of the schedule for repository-related activities was performed resulting in a schedule based on a realistic assessment of activity durations and past experience. This schedule shows a significant slip for the expected start of repository operations from the year 2003 to approximately 2010. In developing the revised schedule, the DOE was mindful that certain activities, such as the issuance of environmental permits by the State of Nevada and the Nuclear Regulatory Commission (NRC) review of the license application, are outside the DOE's control.

One new emphasis of the program's efforts will be on completing an integrated array of near-term milestones directed at the scientific investigation of the potential site at Yucca Mountain in Nevada. To promote the DOE's ability to achieve such milestones and goals, the Secretary announced the initiation of a three-point action plan. This plan centers on a restructuring of the Office of Civilian Radioactive Waste Management, initiatives to gain access to the Yucca Mountain site to continue the scientific investigations needed to evaluate the site's suitability for a repository, and an initiative for establishing an integrated MRS with a target for spent-fuel acceptance in 1998.

In its report of November 1, 1989, the MRS Review Commission found that "cumulatively the advantages of an MRS would justify the building of an MRS if: (1) there were no linkages between the MRS and the repository; (2) the MRS could be constructed at an early date; and (3) the opening of the repository were delayed considerably beyond its presently scheduled date of operation." The MRS Review Commission recommended that the Congress authorize the construction of a federal emergency storage facility to provide storage before permanent geologic disposal.

Although the Amendments Act prohibits the selection of an MRS site through a DOE-directed site-survey process until the repository site is formally selected, it allows for expedited siting to proceed via a Negotiator, who may negotiate a proposed agreement with a State or Indian Tribe that offers a technically qualified site on reasonable terms.

NUCLEAR WASTE FUND
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
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Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

(b) Significant Accounting Policies

Basis of Accounting - Under the authority of the Budget and Accounting Act of 1950, GAO published Title 2 of its Policy and Procedures Manual for Guidance of Federal Agencies, which codified what it considered to be the relevant generally accepted accounting principles to be implemented by all federal departments and agencies in the preparation of their annual financial statements. In 1991, GAO participated with the Office of Management and Budget (OMB) and the Treasury Department in the establishment of the Federal Accounting Standards Advisory Board (FASAB). The FASAB was organized to make recommendations regarding the accounting standards to be implemented by departments and agencies. The resulting standards will be concurrently issued by GAO and OMB. In the interim, and in accordance with FASAB's recommendation that agencies continue to prepare financial statements using their current accounting policies, the NWF continues to prepare its financial statements based upon the accounting principles included in Title 2.

Revenue recognition - A one-time fee (see note 3) was recorded by the NWF as of April 7, 1983 for spent nuclear fuel generated prior to that date. Fees based upon kilowatt-hours (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 is deferred. The life cycle of the program is expected to extend over a period of nearly 100 years.

The Act requires an annual evaluation of the adequacy of fees to insure full cost recovery and provides for adjustment of such fees, as needed, with the approval of Congress. As of November 1990, the total-system cost for the system with a repository at Yucca Mountain, Nevada, a facility for MRS, and a transportation system is estimated at \$26 billion (expressed in constant 1988 dollars). In the event that a second repository is required and is authorized by the Congress, the total-system cost is estimated at \$34 to \$35 billion, depending on the quantity of spent fuel and high-level waste to be disposed of.

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(Dollars in thousands unless otherwise noted)

To estimate the share of the total-system costs that should be allocated to the disposal of defense high-level waste in the civilian repositories, the methodology announced by the DOE in the Federal Register in August 1987 was used. Estimates of the defense-waste share of the costs are approximately \$4 billion (15 percent of the total) for the single-repository system and approximately \$6 billion (17 percent of the total) for the two-repository system.

To date, the Office of Environment Restoration and Waste Management has not entered into an agreement with the Office of Civilian Radioactive Waste Management for payment of fees and interest to the NWF on DOE's defense high-level waste share of costs. NWF has estimated that approximately \$657,000 of costs incurred to date by the NWF, including interest of \$180,000, if assessed from passage of the Act (January 1983), are attributable to defense high-level waste based on the methodology previously published.

For the year ended September 30, 1991, Congress had appropriated and DOE paid the NWF \$5,000 towards its share of defense high-level waste costs. However, as there is no agreement stipulating DOE's current and future liability for its share of high-level waste costs or as to payment of fees and calculation of interest, no accrual has been included in these statements for fees from DOE's defense waste programs. For the year ended September 30, 1992, Congress has appropriated \$7,500 for DOE to pay the NWF towards its share of defense high-level waste costs.

U.S. Treasury Securities - U.S. Treasury securities are stated at cost, adjusted for amortization of premiums and accretion of discounts, which are recognized as adjustments to interest income using the effective interest method.

Capital Equipment - Capital equipment is capitalized at cost and depreciated over the estimated useful lives of the assets which range from 5 to 30 years. Capital equipment purchased prior to the Act and permanently transferred to nuclear waste activities, was recorded as an asset of the NWF with a corresponding liability to the federal government at the net book value of the transferring agency at the date of acquisition. Maintenance costs are borne by the NWF for equipment either on loan from non-NWF programs or shared with other programs.

NUCLEAR WASTE FUND
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UNITED STATES DEPARTMENT OF ENERGY

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

Tax status - The NWF, as a part of the Department of Energy which is a federal agency, is not subject to federal, state or local income taxes.

(2) U.S. Treasury Securities

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

	<u>1991</u>		<u>1990</u>	
	<u>Book</u>	<u>Market</u>	<u>Book</u>	<u>Market</u>
	<u>value</u>	<u>value</u>	<u>value</u>	<u>value</u>
Due within 1 year	\$ 18,765	18,765	356,870	356,842
Due after 1 year but within 5 years	2,099,694	2,178,298	2,105,117	2,092,425
Due after 5 years but within 10 years	<u>1,063,681</u>	<u>1,100,462</u>	<u>168,182</u>	<u>161,108</u>
	\$ <u>3,182,140</u>	<u>3,297,525</u>	<u>2,630,169</u>	<u>2,610,375</u>

Accrued interest receivable on U.S. Treasury securities as of September 30, 1991 and 1990 totalled \$79,798 and \$92,264, respectively.

(3) Receivables - Utilities

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

The Act specifies two fees to be paid to the NWF for disposal services: (a) a one-time charge per kilogram of heavy metal in the high-level waste and spent nuclear fuel existing prior to April 7, 1983; and (b) an adjustable fee payable quarterly, initially one mill per kilowatt-hour, on all net electricity generated by nuclear reactors after April 6, 1983. The contracts provided three options for payment of the one-time spent fuel fee, one of which must have been selected by June 30, 1985, or within 2 years of contract execution. The options were:

- (1) 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;

NUCLEAR WASTE FUND
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Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

- (2) 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;
- (3) Payment of the amount due, any time prior to June 30, 1985, or 2 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.

During 1991 and 1990, payments (refunds) of one-time spent fuel fees by (to) owners and generators of civilian high-level waste and spent nuclear fuel consisted of:

	<u>1991</u>	<u>1990</u>
Option (1)	\$ 3,090	2,784
Option (2)	-	-
Option (3)	<u>-</u>	<u>-</u>
	<u>\$ 3,090</u>	<u>2,784</u>

Receivables from utilities at September 30 of each year consisted of:

	<u>1991</u>	<u>1990</u>
One-time spent fuel fees:		
Option (1)	\$ 158,468	161,559
Option (2)	<u>735,316</u>	<u>735,316</u>
	<u>893,784</u>	<u>896,875</u>
Kilowatt-hour fees	<u>136,800</u>	<u>131,600</u>
Interest on one-time spent fuel fees:		
Option (1)	132,038	115,864
Option (2)	<u>655,967</u>	<u>569,843</u>
	<u>788,005</u>	<u>685,707</u>
	<u>\$ 1,818,589</u>	<u>1,714,182</u>

NUCLEAR WASTE FUND
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Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

On December 5, 1985, the United States Court of Appeals for the District of Columbia ruled against the DOE regarding the calculation of kilowatt-hour (KWH) fees. Consistent with the ruling, utilities were requested to recalculate their fees since April 7, 1983 and submit their request for reimbursement to NWF for approval and subsequent refund or credit against KWH fees. Fees reimbursed or credited since 1986 as a result of this ruling totaled \$42,936.

On March 16, 1988, a Petition for Review was filed before the U.S. Court of Appeals for the District of Columbia regarding a portion of the final rule on the calculation of net generation in determining on-going (KWH) fees to be paid by the utilities. The petition sought judicial review of DOE's treatment of transmission and distribution losses in calculating net generation. On March 17, 1989, the Court decided that transmission and distribution losses should not be included in the calculation of net generation. On September 7, 1990, DOE issued a Notice of Proposed Rulemaking to change the basis of the fee, consistent with the Court ruling. Estimated fees to be reimbursed or credited total \$270 million of which \$50 million and \$20 million were charged against KWH fees for 1991 and 1990, respectively.

In November 1990, Congress granted approval for DOE to pay or credit interest to the utilities on the estimated \$270,000 of KWH overpayments discussed above. NWF management has estimated that the liability for interest to be paid or credited to the utilities totals \$80 million, of which \$20 million and \$60 million were charged to interest expense for 1991 and 1990, respectively. NWF management expects to process the utilities' claims for excess KWH fees paid and permit the utilities to claim credits for these amounts, plus interest, over the next four years.

(4) Financing

The Act 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
- . Investment income from authorized investments

NUCLEAR WASTE FUND
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
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Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

Expenditures may be made from the NWF subject to appropriations which require triennial authorization. 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 Act, additional borrowings may be made from the U.S. Treasury. The Act limits the NWF from incurring expenditures, entering into contracts and obligating amounts to be expended, except as provided in advance by appropriation Acts.

(5) Transfer Appropriations

During 1991 and 1990, Congress authorized certain funds to be transferred directly from the NWF to various entities to pay for necessary expenses of the NWF. Amounts transferred consist of:

	<u>1991</u>	<u>1990</u>	<u>Cumulative</u>
Nuclear Regulatory Commission	\$ 19,650	22,870	42,520
Nuclear Waste Technical Review Board	-	2,000	5,988
Office of the Nuclear Waste Negotiator	<u>-</u>	<u>5,959</u>	<u>5,959</u>
	\$ <u>19,650</u>	<u>30,829</u>	<u>54,467</u>

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 NWF, 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, is to seek a State or Indian Tribe willing to host a repository or MRS facility, at a technically qualified site, on reasonable terms.

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UNITED STATES DEPARTMENT OF ENERGY

Notes to Financial Statements

(Dollars in thousands unless otherwise noted)

(6) Pension Plan

The employees of the Office of Civilian Radioactive Waste Management (OCRWM) of the DOE are covered by the Civil Service Retirement System or the Federal Employees Retirement System. As required by law, employees make contributions to the plans based on a percentage of their salaries with an equal amount contributed by OCRWM. Data regarding the Civil Service Retirement System's and the Federal Employees Retirement System's actuarial present value of accumulated benefits, assets available for benefits, and unfunded pension liability are not allocated to individual departments and agencies and therefore not disclosed by the NWF.

The total pension expense for 1991 and 1990 was \$515 and \$485, respectively.

(7) Related Parties

The Act established the Office of Civilian Radioactive Waste Management within DOE to carry out the provisions of the Act and created a separate fund in the Treasury of the United States. All of the investment and borrowing powers of the NWF are limited to transactions with the U.S. Treasury. In discharging its obligations under the Act, DOE contracts for services with numerous contractors including other federal government agencies. Further, significant administrative services are provided by DOE. The authority to incur indebtedness or enter into contracts obligating the federal government are effective only to such extent as is provided in advance by appropriation Acts.

As of September 30, 1991 and 1990, the NWF owed other government agencies \$3,624 and \$7,403, respectively, for services and costs provided to the NWF. For the years ended September 30, 1991 and 1990, the NWF had incurred costs of \$20,961 and \$24,314, respectively, for services and costs provided by other government agencies.

(8) Contingencies

During 1989, the State of Nevada sought declaratory relief in the U.S. Court of Appeals on the claim that action by the Nevada State Legislature constitutes notice of disapproval under Section 116 of the Act, thus barring further study of Yucca Mountain as a possible nuclear waste repository site. Additionally, Nevada sought an order directing DOE to terminate all site characterization activities and to reclaim the site, as well as costs of its suit.

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On September 19, 1990, the U.S. Court of Appeals for the Ninth Circuit ruled that the State of Nevada's attempted "veto" of the Yucca Mountain site was ineffective because it did not comply with the notice of disapproval procedures set forth in the Act, and rejected the State's constitutional challenges to the mandate of the Amendments Act that focuses site investigation on Yucca Mountain. On December 17, 1990, the State filed a petition for certiorari in the U.S. Supreme Court. The petition was denied on March 4, 1991.

The NWF is currently involved in other litigation arising from its activities. Resolution of this other litigation is not expected to have a material effect on the financial position of the NWF.

Under the Act, the NWF is also responsible for payment of amounts, equal to the taxes that each state or local government would receive if they were authorized to tax site characterization activities at each site, to each state and unit of local government which was recommended as a candidate site. No provision for these amounts has been made as the method of calculating the taxes is final, but the liability has not been determined. These amounts are not expected to have a material effect on the financial statements.

Civilian Radioactive Waste R&D Account

The year-end statements for OCRWM's Civilian Radioactive Waste R&D accounts for fiscal years 1990 and 1991 are provided in the table on the next page. Civilian Radioactive Waste R&D activities are authorized by Title II of the NWPA. The financial data contained in the table are unaudited.

SUMMARY STATEMENTS OF ACCRUED COSTS
CIVILIAN RADIOACTIVE WASTE R&D ACCOUNT
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
ACCRUED COST

(Dollars in Millions)
(Unaudited)

Spent Fuel Storage	<u>1991</u>	<u>1990</u>
Development		
Operating Expenses	\$ 0.8	\$ 2.1
Plant and capital equipment	<u>0.0</u>	<u>0.2</u>
Subtotal	0.8	2.3
Alternative Disposal Concepts		
Operating expenses	0.0	0.0
Plant and capital equipment	<u>0.0</u>	<u>0.0</u>
Subtotal	0.0	0.0
Generic Methods and Supporting Studies		
Operating Expenses	<u>0.0</u>	<u>0.0</u>
Subtotal	0.0	0.0
Program Direction		
Operating Expenses	<u>0.0</u>	<u>0.0</u>
Subtotal	0.0	0.0
TOTALS		
Operating Expenses	0.8	2.1
Plant and capital equipment	<u>0.0</u>	<u>0.2</u>
Total Civilian Radioactive Waste R&D	\$ 0.8	\$ 2.3

LIST OF ACRONYMS

ACR	Annual Capacity Report
CFR	Code of Federal Regulations
CVSA	Commercial Vehicle Safety Alliance
ESAAB	Energy System Acquisition Advisory Board
ESF	Exploratory studies facility
ESSE	Early Site Suitability Evaluation
FY	Fiscal year
IRM	Information Resources Management
M&O	Management and operating contractor
MRS	Monitored retrievable storage
MSIS	Management Systems Improvement Strategy
NRC	Nuclear Regulatory Commission
NWF	Nuclear Waste Fund
NWPA	Nuclear Waste Policy Act, as amended
OCRWM	Office of Civilian Radioactive Waste Management
OECD	Organisation for Economic Cooperation and Development
PCSB	Program Cost and Schedule Baseline
PDS	Project Decision Schedule
PETT	Payments-equal-to-taxes
PMS	Program Management System
QA	Quality assurance
QAPD	Quality Assurance Program Description
QARD	Quality Assurance Requirements Documents
SCP	Site Characterization Plan
TSLCC	Total-System Life-Cycle Cost
WMSD	Waste Management System Description
WMSR	Waste Management System Requirements
UNLV	University of Nevada at Las Vegas
UNR	University of Nevada at Reno