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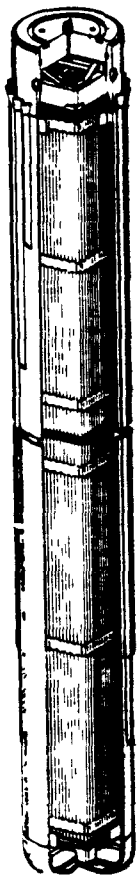

Handling & Packaging
of
Spent Nuclear Fuel &
High Level Waste

COMMERCIAL NUCLEAR WASTE RESEARCH AND DEVELOPMENT PROGRAM

QUARTERLY REPORT

April through June 1985

JULY 1985

Work performed under
Contract DE-AC08-82NV10250

WESTINGHOUSE ELECTRIC CORPORATION
Waste Technology Services Division
Nevada Operations
Mercury, Nevada

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COMMERCIAL NUCLEAR WASTE
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Prepared by Nevada Nuclear Waste Storage Investigations (NNWSI) Project participants as part of the Civilian Radioactive Waste Management Program. The NNWSI Project is managed by the Waste Management Project Office of the U. S. Department of Energy, Nevada Operations Office. NNWSI Project work is sponsored by the ofice of Geologic Repositories of the DOE Office of Civilian Radioactive Waste Management.

Work Performed Under Contract DE-AC08-82NV10250

WESTINGHOUSE ELECTRIC CORPORATION
WASTE TECHNOLOGY SERVICES DIVISION - NEVADA OPERATIONS
Post Office Box 708
Mercury, Nevada 89023

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INTRODUCTION

Nuclear waste handling, packaging, and dry storage testing for the Department of Energy (DOE) Commercial Nuclear Waste Research and Development Program are conducted at the E-MAD (Engine Maintenance, Assembly, and Disassembly) facility in Area 25 of the Nevada Test Site. The Westinghouse Electric Corporation Waste Technology Services Division (WTSD) provides the personnel and services required to perform these activities, under contract to the DOE. The services include project management, operations services, engineering support, and quality assurance surveillance. Fiscal Year 1985 objectives are to:

- Conduct fuel temperature profile simulation tests and other activities in support of the DOE Richland Operations Office Commercial Spent Fuel Management Program.

- Support the DOE Nevada Operations Office (DOE/NV) in defining requirements for utilizing the E-MAD facility in programs implementing the National Waste Policy Act and in other projects.

- Monitor and evaluate data to assess the integrity of fuel assemblies during temporary dry storage at E-MAD.

- Provide technical support to the Weapons Program in decontamination of special electronic and electrical equipment.

- Conduct welding experiments to support other DOE/NV Nevada Nuclear Waste Storage Investigations (NNWSI) waste package development work and to evaluate current E-MAD welding systems for remote waste package closure.

Brief discussions of E-MAD activities are included in this report under the tasks assigned by DOE. Significant accomplishments are listed below.

- Support was provided to DOE/NV during preparation of a proposal, requested by the DOE San Francisco office, for performance of SP-100 Ground Engineering Systems tests at the E-MAD facility. The site selection committee visited the Nevada Test Site in May for a tour and briefings on all aspects of the proposal. This was followed by a visit in June by Messrs. J. W. Vaughn, Acting Assistant Secretary for Nuclear Energy, and J. C. Bradburne, Program Liaison Director for Congressional Affairs, which included a tour and briefings on technical concepts of the program and capabilities at the E-MAD facility for performing the tests.

- The fuel assembly used in the two-year metal cask simulation test was removed from the test stand and characterized to document its post-test condition.

- Fuel assembly integrity monitoring for the second half of FY 1985 was completed of six of the fuel assemblies being stored in unwelded canisters.

- Post-storage characterization was completed on three fuel assemblies which were stored in welded canisters.

- Tours of the E-MAD facility were conducted for 1270 visitors, including the Governor of Nevada, The Acting Assistant Secretary for Nuclear Energy, The Program Liaison Director for Congressional Affairs, and citizens of Japan, Germany, and Great Britain.

- All test procedures have been completed and delivered for the Canister Assembly Launch Test Program being conducted at another Area 25 facility.

- The "Safety Assessment Document for Spent Fuel Handling, Packaging, and Storage Demonstrations at the E-MAD Facility on the Nevada Test Site," DOE/NV10250-20, was revised to be consistent with new and revised DOE Orders and Directives, and delivered to DOE/NV.

Work Task: 1

PROGRAM MANAGEMENT

Objective:

Provide for the management of all activities assigned by the DOE and provide management controls for the safe and efficient operational support of ongoing spent nuclear fuel assembly storage and integrity tests and additional projects assigned by the DOE.

Fulfill the duties of the Technical Project Officer to the Project Manager, Nevada Nuclear Waste Storage Investigations.

Provide support to DOE in defining requirements for E-MAD facility participation in implementation of the National Waste Policy Act.

Activities:

1. Support was provided to DOE/NV during preparation of a proposal, requested by the DOE San Francisco office, to perform SP-100 Program ground engineering tests at E-MAD. Technical concepts were developed for reactor testing; and facility modifications, using a portion of the E-MAD hot bay as the test area, were defined. Presentations were made on all aspects of the DOE/NV proposal for the site evaluation committee visit in May. Presentations were also made to Messrs. James W. Vaughn, Acting Assistant Secretary for Nuclear Energy, and John C. Bradburne, Program Liaison Director for Congressional Affairs, during their visit in June.

2. Information received from the Idaho National Engineering Laboratory was incorporated into the plan for shipping the 17 fuel assemblies

at E-MAD to Idaho, and the revised plan was delivered to the DOE/NV Waste Management Project Office.

3. Plans were developed, with representatives from Lawrence Livermore National Laboratories, for Tuff package closure development support, to be provided under Task 19.

4. A work plan was developed for a new task (Task 24), authorized by DOE/NV, for providing equipment decontamination support to the NTS weapons program. Following DOE/NV approval of the work plan, the FY 1985 work schedule was updated to include activities of this task.

Work Task: 2

CAPABILITY MAINTENANCE

Objective:

Maintain the E-MAD facility in a safe operating condition; maintain the capability of Westinghouse personnel and unique facility remote handling equipment for supporting ongoing spent fuel storage tests and the National Waste Policy Act as it applies to the E-MAD facility. Maintain Westinghouse Technical responsiveness to requests by DOE for expert technical assessments of present and potential E-MAD facility capabilities.

Subtask 2.1: Operator Training and Qualifications

Objective:

Provide the training/retraining and qualification/requalification of personnel to operate remote handling equipment and other equipment consistent with E-MAD facility operational support of spent fuel temperature tests, ongoing spent fuel storage tests and applicable requirements of the National Waste Policy Act. Training not oriented to this operational support is administrative in nature and will be included in Subtask 2.4.

Activities:

1. Training (169 manhours) was conducted in welding, radiation safety, and first aid/CPR. Lectures were given on "Design Reviews" and "The Westinghouse Educational Program."

2. Operator briefings, prior to remote fuel handling operations for canister cutting and fuel assembly characterization required 66 manhours.

3. Ten Westinghouse employees attended a problem solving forum conducted by Dr. A. Carter, Quality Training Manager, Westinghouse Quality and Productivity Center.

Subtask 2.2: Equipment Maintenance

Objective:

Provide for standard repair and maintenance of remote handling and other E-MAD facility equipment, including routine maintenance required to maintain the facility and its equipment in a safe operating condition, and nonroutine maintenance activities specifically oriented toward support of designated task assignments and spent fuel test operations.

Activities:

1. Facility equipment maintenance continued throughout this reporting period. Annual maintenance/inspection was completed on the facility shield doors, the rail transport system, shielded control car, and emplacement/installation vehicle; semi-annual maintenance, on the emergency generator and forklifts; and quarterly maintenance, on all hot bay cranes.

2. Required weekly, monthly, and quarterly inspections were performed on the radiation shield windows stored in the West Process Cell.

3. Sufficient cut storage canisters have been refurbished to provide for temporary storage of all E-MAD fuel assemblies following their removal from seal-welded canisters.

4. Calorimeter system operational problems were corrected, the system was checked out, and reference runs were completed.

Subtask 2.3: Engineering and Quality Assurance

Objective:

Provide the development, technical overview, and interface of all designs, drawings, technical procedures and instructions required to support specified task assignments and ongoing spent fuel test operations.

Provide for the development, utilization, and audit of Quality Assurance methods, procedures and program plans necessary to ensure safe, efficient, and productive utilization of the E-MAD facility.

Activities:

Engineering support and Quality Assurance surveillance were provided in completion of activities discussed in other sections of this report. Additional accomplishments were:

Engineering:

1. The PWR fuel rod handling tool design was revised to include a 2500 pound capacity load cell, which has been procured and is being modified with a 250 pound capacity cell for increased sensitivity.

2. Evaluation of calorimeter data was completed and a recommendation was made regarding changes in system operation and fuel assembly decay heat rate calculation.

Quality Assurance:

1. The WTSD-Nevada Operations Quality Assurance Plan and supporting Quality Methods and Procedures (QMPs) and administrative procedures were revised to satisfy DOE/NV review comments to the Plan. A new QMP was prepared covering the NNWSI Quality Classification System. Copies of all affected documents were forwarded to the DOE/NV Waste Management Project Office for final approval.

2. Internal Quality Assurance audits were performed of WTSD-Nevada Operations training, property/receiving, management of government property, and safety activities.

3. Surveillance was provided for required calibration of testing and measuring equipment and the remote area monitor (RAM) system.

Subtask 2.4: Administration

Objective:

Provide all remaining Capability Maintenance functions required to ensure safe and efficient operation of the E-MAD facility and responsive support to specified task assignments and ongoing spent fuel test operations. These administrative functions include clerical, accounting, documentation, property, security, industrial safety, radiological safety, and health physics activities. Also included are training activities requisite to maintain these functions at a level consistent with the scope of task assignments made to Westinghouse by the DOE.

Activities:

1. The WTSD-Nevada Operations Health and Safety Plan was revised to include additional management guidelines and an organization chart showing the Safety Administrator's reporting responsibilities.

2. The FY 1985 WTSD-Nevada Training Plan was updated and a copy was sent to DOE/NV as a Contract Deliverable.

3. The 1985 Affirmative Action Plan was prepared and submitted.

4. Tours of the E-MAD facility were conducted for 44 groups, totaling 1270 visitors. The visitors, or the organization which they represented, are listed below:

- Waste Management '85
- Nevada Governor, Richard H. Bryan; Congressman Harry M. Reid; James Cashman III, Nevada Development Authority President; and Major General Ralph G. Taylor (Retired), Nevada Economic Development Commissions Vice Chairman
- UNLV Engineering Department
- Nevada Energy Education II
- REECo Dependents (2 groups)
- Best Way Travel Club
- Energy Correspondent, Dallas Morning News
- LANL Technical Personnel
- DOE Headquarters Personnel
- DOE Subcontractors
- St. George, Utah Area Chamber of Commerce and Community Leaders
- Fire Departments of Clark County
- American Welding Society
- Institute for Environmental Sciences
- Japanese Atomic Industrial Forum
- Edison Electric Institute
- Representative of Office of Director for East-West Trade, Federal Republic of Germany, Ministry of Economics
- Nevada Business Groups VIII
- Sandia Employees
- LLNL Employees (5 groups)
- Atomic Energy Commission Retirees and Spouses
- Westminister United Presbyterian Church Group
- Residents of Amargosa Valley, Nevada

- Members of Local Assembly of Hokkaido
- Members of Power Reactor and Nuclear Fuel Development Corporation
- SP-100 Site Selection Committee
- Major General G. K. Withers, Deputy Assistant Secretary for Military Applications
- Representatives of Chief of Weapons Development & Testing, Office of Military Application, Weapons Research Development & Testing Division
- Greater Las Vegas Women's Club
- Henderson, Nevada Chamber of Commerce and City Officials
- Members of Senator Paul Laxalt's Staff
- Fire Departments of Nevada
- Shriners of North America
- Office of Civilian Radioactive Waste Management Outreach Committee
- Air Force Personnel
- Nevada Environmental Health Association
- Members of Congressman Harry Reid's Staff
- British Representatives from the Institute of Shaft Drilling Technology
- James W. Vaughn, Acting Assistant Secretary for Nuclear Energy, and John C. Bradburne, Program Liaison Director for Congressional Affairs

Work Task: 7

DATA COLLECTION

Objectives:

Process thermal data collected at E-MAD to document ongoing temporary dry storage of spent nuclear fuel assemblies.

Collect and distribute other data (E.G., E-MAD weather station data, E-MAD wall crack data, etc.) as deemed necessary and/or appropriate by the DOE or the Manager, WTSD-Nevada Operations.

Recommend any additional thermal data which should be collected.

Activities:

1. All E-MAD fuel assemblies are now stored in the Hot Bay Lag Storage Pit (LSP). The maximum temperatures recorded this reporting period for the two canisterized fuel assemblies in the LSP which are being monitored are listed below, with the predicted decay heat rate and fuel clad temperatures.

   a) LSP #22, FUEL ASSEMBLY D06
      Highest canister temperature, T/C #108, 58.6°C
      Predicted decay heat rate (6/25/85), 0.5127 kW
      Predicted fuel clad temperature (6/25/85, air backfill), 117.9°C

   b) LSP #8, fuel assembly B41
      Highest canister temperature, T/C #109, 47.0°C
      Predicted decay heat rate (6/18/85), 0.4100 kW
      Predicted fuel clad temperature (6/18/85, helium backfill), 77.8°C

2. With exhaust fans off, the highest LSP exhaust temperature was 35.9°C.

Engineering Evaluation:

All canisterized fuel assemblies located in the LSP are in a safe configuration. The maximum recorded canister temperatures are well below the canister design limits. The fuel assemblies being monitored reflect a normal profile.

Work Task: 9

CALTP (CANISTER ASSEMBLY LAUNCH TEST PROGRAM) SUPPORT

Objective:

Provide documentation support to Westinghouse CALTP operations for operating and test procedures for use in Phase II testing at the CALTP facility. Services to be provided include: a) word processing and reproduction of procedures; b) technical assistance (graphic arts, text editing, etc.,); c) supervision for work in a) and b).

Activities:

Word processing, editing, and graphic arts support were provided in the preparation of 14 procedure revisions for CALTP tests. All currently defined procedure requirements have been completed. Word processing support is being continued for other activities, as requested.

Work Task: 12

DRY STORAGE FUEL INTEGRITY DEMONSTRATION TESTS

Objective:

Continue to operate the Fuel Temperature Test (FTT) to provide performance and integrity data on spent nuclear fuel assembly B02. Operate the FTT on a programmed temperature profile, provided by others, with an air canister atmosphere. Obtain samples of the cover gas surrounding fuel assembly B02 on a monthly basis for laboratory analysis to determine the presence of fission products and/or noble gases or other constituents that may evidence changes to the physical characteristics of the spent fuel.

Activities:

The metal cask simulation test was completed in March 1985. The following post-test activities were performed during this period:

1. The FTT Disassembly Plan, describing post-test FTT activities, was prepared and submitted to DOE/NV for approval. The approval was received and the plan was issued.

   The FTT test assembly was dismantled in May, in accordance with Consolidated Procedure WN-CP-062 which was prepared for the remote fuel handling operations. The operations included transfer of the FTT test stand from the West Process Cell to the Hot Bay; removal of fuel assembly B02 from the test stand; and transfer of the fuel assembly, in a temporary (unwelded) storage canister, to the Lag Storage Pit.

   A brief visual inspection of the fuel assembly, while it was out of the canister, revealed no obvious defects in any of the fuel rods.

2. Post-test characterization of fuel assembly B02 was performed in June, following approval of the test plan and the Consolidated Procedure which were prepared for the operations. This included visual examination of the fuel assembly, through a periscope; videotape and photographic documentation of the appearance of the fuel; and contamination swipe sampling of the fuel surfaces, for analysis by two independent laboratories. PNL representatives were at E-MAD to perform special examinations of the fuel assembly.

   A Visual Inspection Report was issued following characterization of fuel assembly B02. In summary, the fuel assembly had the same general appearance as in the visual examination performed on October 15, 1982. A few additional marks and color changes were noted, and new abrasions appeared on the lower nozzle. Almost all distinguishable handling marks and surface conditions noted in photomosaics taken in January 1983 could be identified.

3. An operational plan has been drafted for replacing the two fuel rods which were removed from fuel assembly B02 prior to its installation into the FTT assembly.

Work Task: 16

FUEL INTEGRITY MONITORING

Objective:

Assess the fuel integrity of all fuel assemblies at the E-MAD facility through: 1) semiannual gas sampling of welded canisters; 2) semiannual contamination swipe sampling of fuel assemblies in unwelded canisters; 3) thermal monitoring of instrumented canisters and fuel assemblies; and 4) evaluation of other available data.

Activities:

1. Integrity monitoring was completed for the second half of FY 1985 for fuel assemblies B03, B43, D01, D04, D06, and D15, which are being stored in unwelded temporary canisters in the lag storage pit. In these remote handling operations, each of the canisters was retrieved from lag storage and the fuel assembly was removed; contamination swipe samples were taken from the fuel surfaces, for laboratory analysis; then the fuel assembly was returned to its canister and stored.

2. Post-storage characterization was completed on fuel assemblies D16, D18, and D35 which were stored in weld-sealed canisters. This involved collection of gas and full volume filtration samples from the canister atmosphere followed by cutting of the canisters, using the E-MAD remotely-operated canister cutter, for removal of the fuel assemblies. The fuel surfaces were then visually inspected, videotaped, and photographed; and contamination swipe samples were collected from the fuel and the interior of the cut storage canister. The fuel assemblies were installed in unwelded temporary canisters and returned to lag storage.

3. Gas samples were taken from the canister containing fuel assembly B41 and are being analyzed.

Work Task: 17

SAFETY ASSESSMENT DOCUMENTATION

Objective:

Complete revision of Safety Assessment Documentation to be consistent with both new and revised DOE orders and directives. This revision will include the current operations and, to the extent practicable, operations planned for the future.

Activities:

All review draft comments were resolved to DOE/NV10250-20, "Safety Assessment Document for Spent Fuel Handling, Packaging, and Storage Demonstrations at the E-MAD Facility on the Nevada Test Site," and the final document was approved. A copy was transmitted to DOE/NV as the Contract Deliverable, completing all activities for this task.

Work Task: 18

FUEL CALORIMETRY

Objective:

Measure the decay heat rates of designated fuel assemblies using the E-MAD boiling water calorimeter in accordance with the approved Test Plan.

Activities:

1. Calorimeter system operational problems were resolved (see Task 2). Reference runs were completed at 1 kW and 2.5 kW; and a 3 kW simulation (with 1 kW reference heater input) was performed.

2. Calorimeter data was evaluated and changes were recommended to the operating and heat rate calculation methods.

3. A Consolidated Procedure was prepared for measuring the decay heat rate of fuel assembly D34. Following approval of the procedure, the E-MAD Health and Safety Committee directed that the calorimeter system must be attended and the HVAC system be in operation at any time the total system heat input is above 6 watts (boiling). The Consolidated Procedure was revised to incorporate this information.

Work Task: 19

WASTE PACKAGE CLOSURE

Objective:

Qualify the existing two E-MAD welding systems in accordance with the requirements of the ASME B&PV Code, Section IX, for making both carbon and stainless steel weldments of the original design for which they were intended.

Perform other NNWSI waste package work as requested by and coordinated with Lawrence Livermore National Laboratories (LLNL).

Activities:

Representatives of LLNL visited E-MAD to discuss Tuff package weld development work and to develop plans for E-MAD support, involving preparation of multi-pass weld specimens for evaluation of nondestructive test methods on package closures.

Screening weld activities have been initiated. A root pass weld was performed, using a mockup prepared with a "V" groove; but the results were not satisfactory. A second weld was performed, using a mockup with a "U" groove to reduce heat loss from the root during welding. The overall appearance of this weld was good; however, some tuning of welding parameters is still needed.

Work Task: 23

QUALITY ASSURANCE (QA) SUPPORT TO DOE/NV QUALITY ASSURANCE DIVISION

Objective:

Provide personnel to assist DOE/NV in the development and implementation of the DOE/NV Quality Assurance Program. Assist in completing and maintaining the NV Quality Assurance Manual. Assist in the issuance of NV Quality Assurance Program Plans. Establish the Quality Assurance Division (QAD) records management system, including electronic data processing systems, as appropriate. Assist the QAD in identifying and preparing training materials and resources.

Activities:

1. Assistance was provided to the DOE/NV QAD in performing a status review of previous DOE audits, in prep-aration for a forthcoming DOE Headquarters audit of DOE/NV scheduled for July 1985.

2. A QAD procedure was prepared for review and approval of DOE/NV Waste Management Project Office related documents.

3. A draft DOE Nevada Test Site Office Quality Assurance Program Plan was provided for QAD review and approval.

4. QAD comments to the revision D draft of NNWSI-SOP-03-03, "Acceptance of Data or Data Interpretation Not Developed Under the NNWSI QA Plan," were resolved with SAI, Inc.

5. The following draft documents were reviewed prior to DOE/NV QAD approval:

   - NVO-196-17, Rev. 4, "NNWSI Quality Assurance Plan"
   - NNWSI-SOP-02-01, revision 1, "Quality Assurance Program Plan Requirements for Participating Organizations and NTS Support Contractors"
   - Waste Management Project Office related documents

Work Task: 24

DECONTAMINATION SUPPORT TO WEAPONS PROGRAM

Objective:

Provide technical support to Lawrence Livermore National Laboratory (LLNL) in the decontamination of electronic and other equipment provided by LLNL and/or others, utilizing E-MAD facility hot cells.

Activities:

1. Two hot cells were set up; one for decontamination, the other, post-decon survey. A booth was fabricated and installed in the decontamination cell to confine the cleaning liquid. An ultrasonic cleaner and other hardware and supplies were received and installed.

2. Training sessions were held with LLNL and EG&G on disassembly of cameras to be decontaminated.

3. A shipment of 385 packages of equipment, contaminated primarily with cesium and strontium, was received and stored in a shielded area. To date, 71 cameras have been decontaminated. The LLNL criteria are usually exceeded on the first cycle, using the ultrasonic equipment followed by the water-soluble solution.

4. A sump pump, capable of emptying 1500 gallons per hour, was procured for the radiation waste holding tanks. The pump functioned satisfactorily during the initial transfer of waste water to a REECo transporter.

5. The ultrasonic cleaner malfunctioned, requiring replacement of the power supply.

WESTINGHOUSE ELECTRIC CORPORATION
WASTE TECHNOLOGY SERVICES DIVISION-NEVADA OPERATIONS
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DISTRIBUTION LIST

B. C. Rusche (RW-1), Director
Office of Civ. Radioactive Waste Mgmt.
U. S. Department of Energy
Forrestal Building
Washington, DC 20585

W. J. Purcell (RW-20)
Office of Geologic Repositories
U.S. Department of Energy
Forrestal Building
Washington, DC 20585

V. J. Cassella (RW-22)
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, DC 20585

J. J. Fiore (RW-22)
Program Management Division
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, D.C. 20585

R. J. Blaney (RW-22)
Program Mangement Division
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, DC 20585

Ralph Stein (RW-23)
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, D.C. 20585

M. W. Frei (RW-23)
Engineering & Licensing Division
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, D. C. 20585

D. C. Newton (RW-23)
Engineering & Licensing Division
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, D.C. 20585

C. R. Cooley (RW-24)
Geosciences & Technology Division
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, D. C. 20585

Cy Klingsberg (RW-24)
Geosciences & Technology Division
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, D. C. 20585

E. S. Burton (RW-25)
Siting Division
Office of Geologic Repositories
U.S. Department of Energy
Forrestal Building
Washington, D. C. 20585

T. P. Longo (RW-25)
Program Management Division
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, D. C. 20585

B. G. Gale (RW-25)
Siting Divison
Office of Geologic Repositories
U. S. Department of Energy
Forrestal Building
Washington, D. C. 20585

R. W. Gale (RW-40)
Office Of Policy, Integration, and
Outreach
U.S. Department of Energy
Forrestal Building
Washington, D. C. 20585

J. E. Shaheen (RW-44)
Outreach Programs
Office of Policy, Integration and
Outreach
U. S. Department of Energy
Forrestal Building
Washington, D. C. 20585

Neal Duncan (RW-44)
Office of Policy, Integration, and
Outreach
U. S. Department of Energy
Forrestral Building
Washington, D. C. 20585

J. O. Neff, Manager
Salt Repository Project Office
U. S. Department of Energy
505 King Avenue
Columbus, OH 43201

S. A. Mann, Manager
Crystalline Rock Project Office
U. S. Department of Energy
9800 S. Cass Avenue
Argonne, IL 60439

O. L. Olson, Manager
Basalt Waste Isolation Project Office
U. S. Department of Energy
Richland Operations Office
P. O. Box 550
Richland, WA 99352

D. L. Vieth, Director (4)
Waste Management Project Office
U. S. Department of Energy
Post Office Box 14100
Las Vegas, NV 89114

D. F. Miller, Director
Office of Public Affairs
U. S. Department of Energy
Post Office Box 14100
Las Vegas, NV 89114

D. A. Nowack (12)
Office of Public Affairs
U. S. Department of Energy
Post Office Box 14100
Las Vegas, NV 89114

B. W. Church, Director
Health Physics Division
U. S. Department of Energy
Post Office Box 14100
Las Vegas, NV 89114

Chief, Repository Projects Branch
Division of Waste Management
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

NTS Section Leader
Repository Project Branch
Division of Waste Management
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Document Control Center
Division of Waste Management
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

P. T. Prestholt
NRC Site Representative
1050 East Flamingo Road
Suite 319
Las Vegas, NV 89109

K. Street, Jr.
Lawrence Livermore National Laboratory
Post Office Box 808
Mail Stop L-209
Livermore, CA 94550

L. D. Ramspott (3), Technical Project Officer for NNWSI, Lawrence Livermore National Laboratory, Post Office Box 808, Mail Stop L-204
Livermore, CA 94550

D. T. Oakley (4)
Technical Project Officer for NNWSI
Los Alamos National Laboratory
Post Office Box 1663
Mail Stop F-619
Los Alamos, NM 87545

R. W. Lynch
Sandia National Laboratories
Post Office Box 5800
Organization 6300
Albuquerque, NM 87185

T. O. Hunter (4), Technical Project Officer for NNWSI, Sandia National Laboratories, Post Office Box 5800
Organization 6310
Albuquerque, NM 87185

W. W. Dudley, Jr. (3), Technical Project Officer for NNWSI, U. S. Geological Survey, Post Office Box 25046
418 Federal Center
Denver, CO 80225

V. M. Glanzman
U. S. Geological Survey
Post Office Box 25046
913 Federal Center
Denver, CO 80225

J. B. Wright
Technical Project Officer for NNWSI
Westinghouse Electric Corporation
Waste Technologoy Services Division
Nevada Operations
Post Office Box 708 - Mail Stop 703
Mercury, NV 89023

M. E. Spaeth
Technical Project Officer for NNWSI
Science Applications International Corp.
2769 South Highland Drive
Las Vegas, NV 89109

SAIC-T&MSS Library (2)
Science Applications International Corp.
2950 South Highland Drive
Las Vegas, NV 89109

Timothy G. Barbour
Science Applications International Corp.
1626 Cole Boulevard, Suite 270
Golden, CO 80401

W. S. Twenhofel, Consultant
Science Applications International Corp.
820 Estes Street
Lakewood, CO 80215

W. M. Hewitt, Program Manager
Roy F. Weston, Inc.
2301 Research Boulevard, Third Floor
Rockville, MD 20850

Technical Information Center
Roy F. Weston, Inc.
2301 Research Boulevard, Third Floor
Rockville, MD 20850

H. D. Cunningham, General Manager
Reynolds Electrical & Engineering Co.,Inc., P. O. Box 14400
Mail Stop 555
Las Vegas, NV 89114

A. E. Gurrola, General Manager
Energy Support Division
Holmes & Narver, Inc.
Post Office Box 14340
Las Vegas, NV 89114

J. A. Cross, Manager
Las Vegas Branch
Fenix & Scisson, Inc.
Post Office Box 15408
Las Vegas, NV 89114

ONWI Library
Battelle Columbus Laboratory
Office of Nuclear Waste Isolation
505 King Avenue
Columbus, OH 43201

T. Hay, Executive Assistant
Office of the Governor
State of Nevada
Capitol Complex
Carson City, NV 89710

R. R. Loux, Jr., Director (3)
Nuclear Waste Project Office
State of Nevada
Capitol Complex
Carson City, NV 89710

C. H. Johnson, Technical Program Mgr.
Nuclear Waste Project Office
State of Nevada
Capitol Complex
Carson City, NV 89710

John Fordham
Desert Research Institute
Water Resources Center
P. O. Box 60220
Reno, NV 89506

Dr. Martin Mifflin
Desert Research Institute
Water Resources Center, Suite 1
2505 Chandler Avenue
Las Vegas, NV 89120

Department of Comprehensive Planning
Clark County
225 Bridger Avenue, 7th Floor
Las Vegas, NV 89155

Planning Department
Nye County
Post Office Box 153
Tonapah, NV 89049

Lincoln County Commission
Lincoln County
Post Office Box 90
Pioche, NV 89043

Economic Development Department
City of Las Vegas
400 East Stewart Avenue
Las Vegas, NV 89101

Community Planning and Development
City of North Las Vegas
Post Office Box 4086
North Las Vegas, NV 89030

City Manager
City of Henderson
Henderson, NV 89015

Director of Community Planning
City of Boulder City
Post Office Box 367
Boulder City, NV 89005

Commission of the European
Communities
200 Rue de la Loi
B-1049 Brussels
Belgium

C. L. Davis
Westinghouse Electric Corporation
Waste Technology Services Division
Post Office Box 286
Pittsburgh, PA 15663-0286

L. P. Duffy
Westinghouse Electric Corporation
Waste Technology Services Division
Post Office Box 286
Madison, PA 15663-0286

J. W. Fisch
Westinghouse Electric Corporation
Waste Technology Services Division
Post Office Box 286
Madison, PA 15663-0286

R. E. Lowder
Westinghouse Electric Corporation
Waste Technology Services Division
Post Office Box 286
Madison, PA 15663-0286

G. G. Uram
Westinghouse Electric Corporation
Waste Technology Services Division
Post Office Box 286
Madison, PA 15663-0286

M. B. Boswell
Westinghouse Electric Corporation
West Valley Nuclear Services
Post Office Box 191
West Valley, NY 14171-0191

G. L. Hohmann
Westinghouse Electric Corporation
Project Manager, WIPP Project
Post Office Box 2078
Carlsbad, NM 88221

B. Koh
Hittman Nuclear & Development Corp.
9151 Rumsey Road
Columbia, MD 21045

C. O'Connor
O'Connor Combustor Corporation
100 Kalmus Drive
Costa Mesa, CA 92626

DOE Technical Information Center (27)
Post Office Box 62
Oak Ridge, TN 37830

W. W.-L. Lee
Roy F. Weston, Inc.
2301 Research Boulevard
Third Floor
Rockville, MD 20850