NOTE TO: Robert L. Johnson, WMRP 29 November 1985

FROM: John C. Voglewede, WMEG

SUBJECT: SALT WASTE PACKAGE WORKSHOP

Enclosed are a number of documents related to the proposed Salt Waste Package Workshop scheduled for January 22-24, 1986 in Columbus:

1. NRC objectives and areas of concern [previously provided to DOE].
2. List of NRC documents applicable to the workshop.
3. List of proposed NRC staff and NRC contractor attendees.
4. DOE objectives [previously provided by DOE].
5. Proposed agenda [based on agenda previously provided by DOE].
6. List of DOE documents applicable to the workshop [previously provided by DOE].

cc: T. Johnson
C. Peterson
M. Tokar
K. Chang
E. Wick
W. Kelly
S. Bilhorn
M. McNeil
G. Birchard

WM Record File 106
WM Project 16
Docket No.
PDR ✓
LPDR ✓
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(Return to ..., 623-SS)

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PDR WASTE
WM-16 PDR

Salt Waste Package Workshop

I. Objectives

A. To determine ONWI's current thinking and approach to waste package design and licensing, including (1) the current choice of reference/conceptual design components and the rationale for that choice, (2) the relationship of specific design features to Part 60 requirements (e.g., retrievability), (3) the interaction between the waste package and the very near-field environment, (4) waste form considerations (test programs for both spent fuel and glass, potential degradation mechanisms, interactions with potential container and packing materials and/or their alteration products), (5) container failure mechanisms, data needs, test programs, and fabrication considerations, (6) radionuclide release and transport (from the waste form), and (7) performance assessment (models, expected versus unexpected conditions, WAPPA predictions, and uncertainties).

B. To determine whether there is any appropriate guidance that should be given to DOE/ONWI concerning salt waste package design, performance assessment, or the generation of quality-assured data and models needed for licensing.

II. Specific Areas of Concern

A. Waste Package Reference/Conceptual Design

1. What is the current waste package reference/conceptual design, and why is it the current reference (rather than other alternatives)?

2. What alternative designs are under consideration at the present time and what work is being performed or planned to explore the viability of these alternatives?

B. Relationship of Design Features to Part 60/Part 20 Requirements

1. What waste package design features will be provided to facilitate retrievability and how will they accomplish it?

2. What is the intended contribution of waste package shielding to satisfying Part 20 limits for radiation exposure?

3. What and how will specific waste package components contribute to necessary safety functions?

4. What waste package design features will accomodate monitoring, and how will they accomplish that?

C. Near-field Conditions

1. How will inhomogeneities (e.g., layered minerals, brine pockets, "impurities") in the host salt affect the corrosion of the overpack?

2. How might salt decrepitation and the presence of potentially unstable minerals (e.g., sodium colloid formation, dehydration of clays) affect the corrosion of the overpack?

3. How does brine chemistry (e.g., pH, redox conditions, concentration, composition of aqueous species and gases) affect the waste package?

4. By what process might anhydrite scale form on the waste container, and how would it affect the waste package?

5. What will be the magnitude of the lithostatic/hydrostatic loads on the container and the stresses (including the thermal stresses) developed within the container as a function of time?

6. How will repository construction effects (e.g., introduction of atmospheric O_2, inclusion formation, fracturing) influence near-field conditions?

7. How will the waste form affect near-field conditions (i.e., elevated temperatures, irradiation)?

8. What scenarios for accumulation of brine around the waste package are being considered? How does the waste package design allow for the possibility of relatively large volumes of intrusive or in-situ high-Mg brine contacting the waste package?

9. At what radiation levels are radiolytic effects (both in brine and in the salt itself) judged to be negligible and on what basis is this justified?

D. Waste Form

1. What test programs are in place on spent fuel and glass waste forms for waste packages in salt (as apart from generic waste form programs)? What generic programs and data are believed to be applicable to salt waste package waste forms?

2. Does the salt project expect to use any glass leaching/dissolution data developed by the Defense Waste or West Valley programs? If so, describe the type of information under consideration and how it is to be utilized.

3. What is the current status of data development on borosilicate glass waste forms (i.e., what is the current reference composition, what does the current data base on this composition consist of, what tests are being conducted or are planned and on what schedule)?

4. How are glass waste form properties and characteristics expected to change with exposure in a salt repository? Are any of these changes expected to be site specific (in the sense of brine composition effects, for example); what waste form properties or characteristics are expecially sensitive to package component design? What data exist in support of these expections?

5. What is the current reference/conceptual design for spent fuel waste packages in salt repositories?

6. What is the expected spent fuel population to consist of (BWR vs. PWR, burnups, failed vs. intact rods, etc.)? Is failed fuel to be segregated or separated from intact fuel? Discuss the implications for the various options with regard to potential effects on waste package performamce.

7. What are the potential fuel rod cladding failure mechanisms in salt waste packages, what are the predicted rates of failure, and what are the potential effects on waste package container life and subsequent radionuclide release? What data or test programs apply to this subject?

8. What are the potential effects of packing and container materials and/or their alteration products on the interaction with the waste form and release of radionuclides? Describe the test data and programs that relate to this issue.

D. Containers

1. What are the rationale and supporting data for the current container selection and design approach?

2. What is currently known about the physical and chemical properties of the reference container materials? What is known about the effects of radiation, temperature, and chemical degradation on these materials as these environmental effects will be present in salt repositories under conceivable conditions ("expected" and "unexpected")? What data exist in support of these opinions, and what data need to be yet obtained? How good are the data?

3. What are the possible failure modes for the container, and how does the design address those failure modes to assure that the package will provide substantially complete containment for 300-1000 years? Specifically, what information exists concerning the resistance of the low-carbon steel overpack to pitting corrosion, stress/corrosion cracking, H-embrittlement or H-damage, etc. in addition to the uniform corrosion-assisted mechanical failure mode that received the attention in the draft salt EAs?

4. Is it a DOE/ONWI viewpoint that stress corrosion cracking (SCC) cannot be allowed for and therefore must be proven not to occur? If so, how will SCC be excluded? Will this exclusion involve ultra low carbon levels?

5. What will be the effect of radiation and how will the potential generation of hydrogen, oxygen, and other species affect the corrosion of the overpack?

6. If the container is made of pure iron or low carbon steel, what container thickness does neglect of radiolytic effects imply and what are the implications insofar as production processes are concerned?

E. Radionuclide Release and Transport From the Waste Package

1. What are the mechanisms and rates of release of radionuclides from the waste forms, and what are the applicable data?

2. How will Eh, pH, and brine composition affect the release of radionuclides from the waste forms?

3. What will be the effect of brine flow rate, formation and transport of colloids, and liquid boundary layer effects?

4. What will be the chemical species of the radionuclides released from the waste forms?

5. How will packing, container materials (including overpacks, canisters, and any special corrosion-resistent alloys or spent fuel rod cladding, if applicable) and/or their alteration products interact with the waste form to cause its alteration and/or affect the release of radionuclides? What data exist or are being developed to address this matter?

6. How and at what rate will radionuclides migrate through failed waste package containers?

F. Performance Assessment/Uncertainty Analysis

1. What are the current waste package thermal models, how do they relate to each other, and what input assumptions are used? What are the associated uncertainties? Considering the uncertainties, what are the effects on the state-of-the-art of waste package performance assessment? What versions of the thermal models are currently available, and how do they compare with those currently in use at ONWI? What provisions are there for providing working versions of the thermal models (and other models important to waste package performance assessment) to NRC for independent assessment?

2. What procedures are used in the analyses of radiation field, and what are the principal sources of error and uncertainty? What are the potential effects of radiation on waste package container corrosion and waste form leaching? How is sodium colloid formation accounted for? What are the currently available data related to the area of radiation effects on the near-field salt and container corrosion?

3. Regarding "expected" versus "unexpected" repository conditions, how will the waste package design accomodate either variability in those conditions or the fact that "unexpected" conditions (e.g., large amounts of high-magnesium brine) may prevail?

4. What are the current WAPPA subsystem models, and when will they be made available to the NRC? Describe the QA procedures used in the development of these models, including their validation and verification.

5. Describe the reliability/uncertainty approaches in use for predicting waste package performance. In general, how are short-term/ accelerated test results applied to the prediction of waste package performance? Discuss some examples.

DOE/NRC WASTE PACKAGE WORKSHOP

Listing of NRC Reports Applicable to the Workshop

Published Reports

ATR-85(5810-01)-1ND	K. Stephens et al., Methodologies for Assessing Long-Term Performance of High-Level Radioactive Waste Packages, Aerospace Corporation Report, May 1985.
BNL Letter Report	T.M. Sullivan, Estimates of the Maximum Permissible Fractional Number of High Level Waste Container Failures and Failure Rates That Allow Post Containment Radionuclide Release Criteria to be Met During the Containment Period, Brookhaven National Laboratory Informal Report, October 1985. [Transmitted by T. Sullivan (BNL) letter to E.A. Wick (NRC) dated October 16, 1985.]
NRC Staff Report [Draft]	"Draft Site Issues for Waste Package," [Draft] Issue-Oriented Site Technical Position (ISTP) for Salt Repository Project (SRP), Permian Basin Sites, September 1984. [Transmitted by H.J. Miller (NRC) letter to W.J. Purcell (DOE) dated November 2, 1984].
NRC Staff Report [Draft]	"Draft Site Issues for Waste Package," [Draft] Issue-Oriented Site Technical Position (ISTP) for Salt Repository Project (SRP), Gulf Coast Dome Sites, September 1984. [Transmitted by H.J. Miller (NRC) letter to W.J. Purcell (DOE) dated November 2, 1984].
NRC Staff Report [Draft]	"Draft Site Issues for Waste Package," [Draft] Issue-Oriented Site Technical Position (ISTP) for Salt Repository Project (SRP), Paradox Basin Sites, September 1984. [Transmitted by H.J. Miller (NRC) letter to W.J. Purcell (DOE) dated November 2, 1984].
NRC Staff Report [Meeting Presentation]	E.A. Wick, "How Reliable Does The Waste Package Have To Be?," Proceedings of the Workshop on the Source TERM for Radionuclide Migration From High-Level Waste or Spent Nuclear Fuel Under Realistic Repository Conditions, Albequerque, NM, November 13-15, 1984 (Published July 1985).
NRC Staff Report	Draft Generic Technical Position on Waste Package Reliability. [Transmitted by J.T. Greeves (NRC) memorandum to M.R. Knapp (NRC) and H.J. Miller (NRC) dated August 27, 1985.
NRC Staff Report	Draft Generic Technical Position on Licensing Assessment Methodology for HLW Geologic Repositories, July 1984.

NUREG-0279 — Determination of Performance Criteria for High-Level Solidified Nuclear Waste, Lawrence Livermore Laboratory Report, July 1977.

NUREG/CP-0005 — Proceedings of Conference on High-Level Radioactive Solid Waste Forms, Denver, CO, December 19-21, 1978.

NUREG/CR-0895 — Solidification of High-Level Radioactive Wastes, National Academy of Engineering Report, National Academy of Sciences, July 1979.

NUREG/CR-2317
(BNL-NUREG-51449) — Container Assessment - Corrosion Study of HLW Container Materials, Brookhaven National Laboratory Report,

- Volume 1, Nos. 1-2, "Quarterly Progress Report, April - June 1981," December 1981.
- Volume 1, No. 3, Quarterly Progress Report, July - September 1981," January 1982.
- Volume 1, No. 4, Quarterly Progress Report, October - December 1981," April 1982.
- Volume 2, No. 1, Quarterly Progress Report, January - March 1982,".

(BNL-NUREG-31611) "Quarterly Progress Report, April - June 1982".
(BNL-NUREG-32047) "Quarterly Progress Report, July - September 1982".
(BNL-NUREG-32512) "Quarterly Progress Report, October - December 1982".
(BNL-NUREG-33012) "Quarterly Progress Report, January - March 1983".
(BNL-NUREG-33603) "Quarterly Progress Report, April - June 1983".
(BNL-NUREG-33940) "Quarterly Progress Report, July - September 1983".
(BNL-NUREG-34220) "Quarterly Progress Report, October - December 1983".
(Informal Report) "Quarterly Progress Report, January - March 1984".
(Informal Report) "Quarterly Progress Report, April - June 1984".
(Informal Report) "Quarterly Progress Report, July - September 1984".

NUREG/CR-2333
(BNL-NUREG-51458) — Nuclear Waste Management Technical Support in the Development of Nuclear Waste Form Criteria for the NRC, Brookhaven National Laboratory Report,

- Volume 1, "Waste Package Overview," February 1982.
- Volume 2, "Alternate TRU Technologies," February 1982.
- Volume 3, "Waste Inventory Review," February 1982.
- Volume 4, "Test Development Review," February 1982.
- Volume 5, "National Waste Package Program," February 1982.

NUREG/CR-2482
(BNL-NUREG-51494) — Review of DOE Waste Package Program, Subtask 1.1 National Waste Package Program, Brookhaven National Laboratory Report,

- Volume 1, February 1982.
- Volume 2, "Semiannual Report, September 1981 - March 1982," April 1983.

Volume 3, "April 1982 - September 1982," March 1983.
Volume 4, "October 1982 - March 1983," September 1983.
Volume 5, "April 1983 - September 1983," August 1984.
Volume 6, "October 1983 - March 1984," March 1985.
Volume 7, "April 1984 - September 1984," March 1985.

NUREG/CR-2737 — Evaluation of Bulk Properties of Radwaste Glass and Ceramic Container Materials to Determine Long-Term Stability, Catholic University of America Report, June 1982.

NUREG/CR-2755 (BNL-NUREG-51544) — Packing Material Testing Required to Demonstrate Compliance with 1000-Year Radionuclide Containment: Semiannual Report on Waste Package Verification Tests, Brookhave National Laboratory Report, January 1983.

NUREG/CR-3091 (BNL-NUREG-51630) — Review of Waste Package Verification Tests, Brookhaven National Laboratory Report,
Volume 1, Semiannual Report Covering the Period April 1982 - September 1982, April 1983.
Volume 2, Semiannual Report Covering the Period October 1982 - March 1983, August 1983.
Volume 3, Semiannual Report Covering the Period April 1983 - September 1983, February 1984.
Volume 4, Semiannual Report Covering the Period October 1983 - March 1984, June 1985.
Volume 5, Semiannual Report Covering the Period April 1984 - September 1984, June 1985.
Volume 6, Semiannual Report Covering the Period October 1984 - March 1985, July 1985.

NUREG/CR-3187 (BNL-NUREG-51653) — Crevice Corrosion of Titanium Alloy TiCode-12 in Simulated Rock Salt Brine at 150°C, Brookhaven National Laboratory Report, March 1983.

NUREG/CR-3219 (BNL-NUREG-51658) Volume 1 — Draft Technical Position Subtask 1.1: Waste Package Performance After Repository Closure, Brookhaven National Laboratory Report, August 1983.

NUREG/CR-3219 (BNL-NUREG-51658) Volume 2 — Draft Technical Position Subtask 1.2: Post-Emplacement Monitoring, Brookhaven National Laboratory Report, May 1983.

NUREG/CR-3282 (BNL-NUREG-51671) — Internal Hydrogen Embrittlement of Titanium Alloy TiCode-12 at Room Temperature, Brookhaven National Laboratory Report, May 1983.

NUREG/CR-3405 (BMI-2105) — Long-Term Performance of Materials Used for High-Level Waste Packaging, Battelle Columbus Laboratories Report,
- Volume 1, "Annual Report, March 1982 - April 1983," July 1983.

NUREG/CR-3427 (BMI-2113) — Long-Term Performance of Materials Used for High-Level Waste Packaging, Battelle Columbus Laboratories Report,
- Volume 1, "First Quarterly Report, Year Two, April 1983 - June 1983," August 1983.
- Volume 2, "Second Quarterly Report, Year Two, July 1983 - September 1983," December 1983.
- Volume 3, "Third Quarterly Report, Year Two, October 1983 - December 1983," March 1984.
- Volume 4, "Annual Report, Year Two," April 1983 - April 1984," June 1984.

NUREG/CR-3472 — Surface Properties and Performance Predictions of Alternative Waste Forms, University of Florida Report,
- Volume 1, "Annual Report - October 1, 1981 through September 30, 1982," September 1983.
- Volume 2, "Final Report," [To be published].

NUREG/CR-3699 — A Summary of Computer Codes for Waste Package Performance Assessment, CoSTAR Research Report, March 1984.

NUREG/CR-3900 (BMI-2127) — Long-Term Performance of Materials Used for High-Level Waste Packaging, Battelle Columbus Laboratories Report,
- Volume 1, "First Quarterly Report, Year Three, April 1984 - June 1984," September 1984.
- Volume 2, "Second Quarterly Report, Year Three, July 1984 - September 1984," January 1985.
- Volume 3, "Third Quarterly Report, Year Three, October 1984 - December 1984," March 1984.
- Volume 4, "Annual Report, Year Two," April 1983 - April 1984," June 1984.

NUREG/CR-4134 (ORNL/TM-9522) — H.C. Claiborne et al., Repository Parameters Relevant to Assessing the Performance of High-Level Waste Packages, Oak Ridge National Laboratory Report, May 1985.

NUREG/CR-4198 — Fracture in Glass/High-Level Waste Cannister, Iowa State University Report, May 1985.

NUREG/CR-4379 — Long-Term Performance of Materials Used for High-Level Waste Packaging, Battelle Columbus Laboratories Report,
Volume 1, "First Quarterly Report, Year Four, April - June 1985," September 1985.

NRC Reports in Preparation

NRC Staff Report (Reliability GTP) — Final Generic Technical Position on Waste Package Reliability, December 1984.

NUREG/CR-4134 (ORNL/TM-9522/R1) — H.C. Claiborne et al., Repository Parameters Relevant to Assessing the Performance of High-Level Waste Packages in Basalt, Tuff, and Salt, [This revision to ORNL/TM-9522 adds appendices on tuff and salt].

DOE/NRC SALT WASTE PACKAGE WORKSHOP
January 22-24, 1985
Columbus, Ohio

PROPOSED NRC STAFF AND CONTRACTOR ATTENDANCE

Bilhorn, Susan	NRC/WMRP
Birchard, George	NRC/RES/WM
Cialone, Henry	Battelle Columbus Laboratory
Interrante, Charles	National Bureau of Standards
Jacobs, Gary	Oak Ridge National Laboratory
Johnson, Robert	NRC/WMRP
Johnson, Timothy	NRC/WMEG
Kaufman, Michael	National Bureau of Standards
Kelly, Walton	NRC/WMGT
Markworth, Alan	Battelle Columbus Laboratory
McNeil, Michael	NRC/RES/WM
Peterson, Charles	NRC/WMEG
Soo, Peter	Brookhaven National Laboratory
Stephens, Kenneth	Aerospace Corporation
Tokar, Michael	NRC/WMEG
Voglewede, John	NRC/WMEG

DOE/NRC SALT WASTE PACKAGE WORKSHOP

DOE Objectives

1. To present the NRC staff and other participants the DOE-Salt Repository Programs current status and approach to waste package design and development and its contribution to the potential licensing of a salt geologic repository. This would include:

   (a) A description of the overall SRP waste package program approach and strategy with regard to design and performance verification.

   (b) A description of the current package design including components/functions, materials, and design rationale.

   (c) A description of SRP performance assessment approach including strategy, model development, interaction with design, treatment of uncertainties and code and model validation.

   (d) A description of the SRP Quality Assurance program and the uses of peer/technical review.

   (e) A description of the waste package near-field environment including uncertainties, issues, status of data, and waste package effects (heat, radiation, etc.).

   (f) A description of the SRP program studying waste package containment including failure/degradation processes, uncertainties and issues, and status of data.

   (g) A description of the SRP program studying waste package release including failure/release scenarios, uncertainties/issues and status of data.

2. To answer questions and receive NRC comments on the SRP waste package program and its applicability to thc requirements of 10 CFR Part 60 and NRC staff perceived licensing needs.

3. To describe the SRP near term (FY 86) planned activities in the waste package area to assist NRC and others in following the SRP program including exchange of ideas on future meetings and data reviews.

4. To have the NRC staff provide feedback to the DOE-SRP program through

   (a) Comment on the perceived appropriateness/adequacy of the SRP waste package program.

   (b) Presentations on several topics/issues which would influence the DOE program based on NRC interpretation of the requirement of 10 CFR Part 60. (See Agenda for Specific Topics)

DOE/NRC SALT WASTE PACKAGE WORKSHOP
January 22-24, 1986
Columbus, Ohio

PROPOSED AGENDA

January 22, 1986

8:30 am	Introductions ° SRP Participants ° NRC Participants ° Others
8:45 a.m.	Anouncements and Opening Remarks ° Announcements/Arrangements ° DOE Opening Remarks ° NRC Opening Remarks
9:00 a.m.	Package Program Approach and Strategy ° Program Organization ° Program Philosophy ° Design Approach ° Performance Verification Strategy
9:45 a.m.	Waste Package Concept Description ° Design Description ° Component Functions/Performance Allocation ° Design Rationale/Materials Selection ° Favorable Features ° Major Design Uncertainties ° Failure Modes and Processes ° Effects of Emplacement Mode
12:00 noon	Lunch
1:00 p.m.	Performance Assessment of Waste Packages ° Performance Assessment Strategy ° Interfaces with Design and Testing ° Development of Submodels ° WAPPA Model Description ° Treatment of Uncertainties ° Code and Model Validation ° Role in Licensing
3:30 p.m.	Break

January 22, 1986 (Continued)

3:45 p.m. — Quality Assurance and Peer/Technical Review

- Quality Assurance Programs
- Technical Test Procedures
- Technical/Peer Review

5:00 p.m. — Adjourn

January 23, 1986

8:30 a.m. — Waste Package Environment

- Preemplacement Conditions
- Heat Effects on Salt and Brine
- Thermomechanical Effects
- Radiation Effects
- Preclosure/Operational Factors
- Integrated Effects/Field Tests
- Expected/Unexpected Conditions
- Impact on Modeling
- Status of Data

11:30 a.m. — Waste Package Containment

- Failure/Degradation Processes
  - General Corrosion/Test Design
  - Nonuniform Corrosion
  - Crushing
  - Others
- Factors Affecting Processes
- Status of Data
- Major Uncertainties/Issues
- Development of Submodels

12:30 p.m. — Lunch

1:30 p.m. — Waste Package Containment (Continued)

3:30 p.m. — Waste Package Release

- Package Failure/Release Scenarios
- Expected Processes
- Status of Data
- Major Uncertainties/Issues
- Development of Models

5:00 p.m. — Adjourn

January 24, 1986

8:30 a.m.	Waste Package Release (Continued)
10:00 a.m.	Near-Term Waste Package Activities/Products ° Waste Package Environment ° Waste Package Containment ° Package Release ° Design and Development ° Performance Assessment ° Future Potential Meetings/Data Reviews
10:45 a.m.	NRC Presentations ° Summary of Observations on DOE Programs ° Substantially Complete Containment/Short Half-life Radionuclides ° Individual Radionuclide Release Data for Licensing ° Waste Package/Engineered Barrier System ° Boundary Definitions ° Pitting Studies
12:00 noon	Lunch
1:00 p.m.	General Discussions/Questions
3:00 p.m.	Preparation of Minutes
4:00 p.m.	Summary and Minutes Discussion
5:00 p.m.	Adjourn

DOE/NRC WASTE PACKAGE WORKSHOP

Listing of DOE Reports Applicable to the Workshop

Published Reports

BMI/ONWI-545	Performance Assessment Plans & Methods for the Salt Repository Project
ONWI-488	A Proposed Approach to Uncertainty Analysis
SAND 81-0433	Salt Block II Brine Migration Modeling
ORNL/TM-7310	A Statistical Sensitivity Analysis of a Simple Nuclear Waste Repository Model
ONWI-085	Thermal Gradient Brine Inclusion Migration in Salt Study, Gas-Liquid Inclusions Preliminary Models
ORNL-5607	Review of Information on the Radiation Chemistry of Materials Around Waste Canisters in Salt and Assessment of the Need for Additional Experimental Information
ONWI-464	Conceptual Waste Package Interim Product Specifications and Data Requirements for Disposal of Borosilicate Glass Defense High-Level Waste Forms in Salt Geologic Repositories
ONWI-305	Reaction and Devitrification of a Prototype Nuclear Waste Storage Glass With Hot Magnesium-Rich Brine
ONWI-462	Conceptual Waste Package Interim Performance Specifications for Waste Forms for Geologic Isolation in Salt Repositories
ONWI-483	Engineered Waste Package Conceptual Design: Defense High-Level Waste (Form 1), Commercial High-Level Waste (Form 1), and Spent Fuel (Form 2) Disposal in Salt
ONWI-242	Brine Migration Test for Asse Mine, Federal Republic of Germany: Final Test Plan
ONWI-472	EQ3/EQ6: A Geochemical Speciation and Reaction Path Code Package Suitable for Nuclear Waste Performance Assessment
ONWI-419	Workshop on Uncertainty Analysis of Postclosure Nuclear Waste Isolation System Performance

ONWI-452	WAPPA: A Waste Package Performance Assment Code
ONWI-399	Thermodynamic Properties of Chemical Species in Nuclear Waste
DOE/NWTS-34	Guidelines for the Development and Testing of NWTS Waste Package Materials
PNL-4474	State-of-the-Art Report on Corrosion Data Pertaining to Metallic Barriers for Nuclear Waste Repositories
DOE/NWTS-960 Volume 1	NWTS Waste Package Program Plan, Volume I: Program Strategy, Description, and Schedule
ONWI-275	Elemental Release From Glass and Spent Fuel
ONWI-312	Waste Package Materials Screening and Selection
PNL-3971	Actinide Leaching From Waste Glass: Air-Equilibrated Versus Deaerated Conditions
DOE/NWTS-013	Nuclear Waste Package Materials Degradation Modes and Accelerated Testing
PNL-3614	Solubility Effects in Waste-Glass/Demineralized-Water Systems
ONWI-251	An Annotated Bibliography for the Design of Waste Packages for Geologic Disposal of Spent Fuel and High-Level Waste
PNL-3791	Factors Affecting Criticality for Spent Fuel Materials in a Geologic Setting
PNL-3802	A State-of-the-Art Review of Materials Properties of Nuclear Waste Forms
ONWI-490	Waste Package Materials Testing for a Salt Repository: 1982 Status Report
BMI/ONWI-533	Assessment of the Impacts of Spent Fuel Disassembly Alternative on the Nuclear Waste Isolation System
BMI/ONWI-538	A Study of Thermal-Gradient-Induced Migration of Brine Inclusions in Salt: Final Report

DOE Reports in Process

ONWI-517/WTSD-TME-001	Waste Package Reference Conceptual Designs for a Repository
PNL Draft	FY 84 Waste Package Near-Field Environment Testing Report
PNL Draft	FY 84 Metal Barriers Testing Report
PNL Draft	FY 84 Waste Form Testing Report
PNL Draft	FY 84 Work on Corrosion & Leaching Submodels
PNL Draft	FY 83 Work Status Report