

#### UNITED STATES NUCLEAR REGULATORY COMMISSION ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS WASHINGTON, D.C. 20555-0001

January 17, 2008

MEMORANDUM TO:	ACNW&M Members ACNW&M Staff
FROM:	Antonio Dias, Chief / <b>RA</b> / ACNW&M Branch
SUBJECT:	CERTIFIED MINUTES OF THE 185 <sup>th</sup> MEETING OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS (ACNW&M) December 17 - 19, 2007

Attached are the certified Minutes for the 185<sup>th</sup> Meeting of the Advisory Committee on

Nuclear Waste & Materials, December 17 – 19, 2007.

cc: A. Bates, SECY (O-16C1) S. Jones, NMSS (T-8A23) D. Pelton, EDO (O-16E15) J. Mitchell, RES G. Deegan, FSME CERTIFIED

Date Issued: 01/23/08 Date Certified: 01/17/08

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## MINUTES OF THE 185<sup>TH</sup> MEETING OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE & MATERIALS December 17 - 19, 2007 Rockville, Maryland

The **185th** meeting of the Advisory Committee on Nuclear Waste & Materials was held in Conference Room 2B3, Two White Flint North Building, Rockville, Maryland, on **December 17 - 19, 2007**. Notice of this meeting was published in the *Federal Register* on **December 3, 2007** (72 FR **231**) (Appendix I). The purpose of this meeting was to discuss and take appropriate action on the items listed in the meeting schedule and outline (Appendix II). The meeting was open to public attendance.

A transcript of selected portions of the meeting is available in the NRC's Public Document Room at One White Flint North, Room 1F-19, 11555 Rockville Pike, Rockville, Maryland. Copies of the transcript are available for purchase from Neal R. Gross and Co., Inc., 1323 Rhode Island Avenue, NW, Washington, DC 20005. Transcripts are also available at no cost to download from, or review on, the Internet at http://www.nrc.gov/ACRS/ACNW.

## ATTENDEES

ACNW&M Members: Dr. Michael T. Ryan (ACNW&M Chairman), Mr. Allen Croff (ACNW&M Vice Chairman), Dr. James H. Clarke, Dr. William J. Hinze, and Dr. Ruth Weiner attended this meeting. For a list of other attendees, see Appendix III.

I. <u>Chairman's Report</u> (Open)

[Note: Mr. Antonio Dias was the Designated Federal Official for this portion of the meeting.]

Dr. Michael T. Ryan, Committee Chairman, convened the meeting at 8:30 A.M. He announced in his opening remarks that the meeting was being conducted in accordance with the provisions of the Federal Advisory Committee Act. In addition, he reviewed the agenda for the meeting and noted that no written comments or requests for time to make oral statements from members of the public had been received. Dr. Ryan also noted that a transcript of the open portions of the meeting was being kept and speakers were requested to identify themselves and speak with clarity and volume. He discussed the items of current interest and administrative details for consideration by the full Committee.

### II. <u>Electric Power Research Institute's (EPRI's) Report on Drift degradation at Yucca</u> <u>Mountain</u>

[Note: Mr. Neil Coleman was the Designated Federal Official for this portion of the meeting.]

Dr. John Kemeny, from the University of Arizona and representing EPRI, addressed the Committee on his recent results when modeling thermal spalling of the tuff host rock found in underground excavations at the proposed Yucca Mountain Repository. He defined rock spalling as rock failure at the boundary of a rock mass, usually forming slabs that bulge from the rock and may eventually detach, causing rockfall. Progressive spalling can occur due to changing stress conditions and time-dependent behavior. Dr. Kemeny emphasized that progressive

spalling that leads to total drift collapse only occurs in extreme conditions: (a) extremely high stresses relative to the rock strength (in-situ stresses greater than five times rock mass strength; maximum tangential stress at boundary greater than 10 times rock mass strength); (b) very low stresses and a very weak rock mass. These extreme conditions are not expected to occur for the static stresses and thermal loading expected at Yucca Mountain.

Dr. Kemeny commented that the opinion of the Center for Nuclear Waste Regulatory Analyses (CNWRA), i.e., that thermal stresses would cause relatively large rock failure zones, was based on an elastic structural analysis with a worst-case assumption about post-peak rock behavior in the failed zones. EPRI modeling, instead, was performed using a continuum model (FLAC) and a discontinuum model (UDEC). Various model results were presented for a variety of rock types and conditions. The FLAC results show that if the strain softening parameter is small enough, a large amount of spalling could occur. However, Dr. Kemeny noted that for all categories of lithophysal tuff, the actual values of the rock strain softening parameter were significantly greater than the critical value needed for large spalling. The model therefore predicts stable drifts with isolated rockfall in the initially overstressed region. The UDEC results indicate that only isolated blocks within the damaged zone would be expected to produce rockfall and most of the damage would occur within the first 50 -150 years. Dr. Kemeny reported that there is good correlation between the FLAC and UDEC results. None of the computer code results predict large amounts of spalling under thermal loading that would fill the drifts with rock blocks.

Dr. Kemeny commented that his model results are consistent with actual observations in the drifts, such as the small amount of spalling that has occurred at the drift-scale heater test in the nonlithophysal tuff. He referred to this test as the best analog available for the thermal effects. If "runaway spalling" is not seen in the nonlithophysal tuff, it definitely would not be seen in the lithophysal tuffs that make up most of the proposed repository. Dr. Kemeny said that the CNWRA does not consider this a good analog because the test drift was outfitted with rock bolts and mesh. However, the support stress provided by a rock bolt is very small compared to the thermal stress in the rock; therefore, the rock bolts would not likely change the dynamic of the spalling region, as confirmed by his model results.

### III. Update on NRC Rulemaking on Groundwater Protection at In-Situ Leach Uranium Mining Facilities

[Note: Mr. Latif Hamdan was the Designated Federal Official for this portion of the meeting.]

NRC staff Gary Comfort and Mike Fliegel from the Office of Federal and State Materials and Environmental Management Programs briefed the Committee on the NRC rulemaking on groundwater protection at in-situ leach uranium mining facilities. Staff provided background information, including Commission directives, and discussed the rulemaking development activities and the status of the rulemaking effort. The Committee was updated on ongoing and planned interactions with the U.S. Environmental Protection Agency (EPA), with regard to the appropriate standard to be used as well as EPA comments on preliminary language for the draft rule that staff had requested the EPA to review. Staff also discussed the planned activities and indicated that they expect to complete an updated draft rule and submit it to the rulemaking working group by early 2008, and a version that can be submitted to the Commission in the fall of 2008. The staff noted that all of the Committee recommendations included in a May 9, 2007, Committee letter report to the Commission have been addressed.

## IV. Vendor's View on the Transportation-Aging-Disposal Performance Specifications

[Note: Mr. Chris Brown was the Designated Federal Official for this portion of the meeting.]

Mr. Charles Pennington from NAC International, a commercial cask vendor, briefed the Committee on NAC's views on the Department of Energy (DOE) Transportation-Aging-Disposal (TAD) performance specification (PS). Mr. Pennington discussed four technical issues in the PS that NAC believes are important and should be given attention by both the industry and NRC. Mr. Pennington addressed the use of borated stainless steel neutron absorber material in the TAD basket design as a structural material. To date, NRC has not approved borated stainless steel as a structural material in cask designs. In order to do so, the NRC staff will probably need the evaluation of an American Society of Mechanical Engineers (ASME) code case. In addition, questions linger about the weldability and the use of flux traps for a borated stainless steel basket. Mr. Pennington also informed the Committee that current designs for NAC's commercial storage/transport canisters have a design life of 40 to 50 years. However, the PS specifies a canister design life of 60 years at reactor sites and 50 years at an aging facility. Mr. Pennington said that NAC foresees no limitations on design life requirements, but justification to demonstrate such a change is not clear to the industry. Mr. Pennington discussed issues associated with the disposable control rod assembly (DCRA), such as the need for more design information on thick Zircaloy spent fuel cladding and extended poison coverage. He also told the Committee that water displacement by the DCRAs may make flux traps a more important issue for DOE to consider in the design of the TAD. The PS requires analysis of canister drops at the GROA [geological repository operations area] from seismic or handling events. NAC feels that these analyses may have some impact on the TAD's design requirements for storage and transportation.

## V. <u>Status of Operations at the Barnwell Low-Level Radioactive Waste (LLW) Disposal</u> <u>Facility</u>

[Note: Mr. Michael Lee was the Designated Federal Official for this portion of the meeting.]

Mr. William House, a representative from Energy Solutions, the operator of the Barnwell LLW disposal site, briefed the Committee on planned activities at this commercial disposal facility in anticipation of scaled-back operations. In 2000, the South Carolina State Legislature voted to implement a permanent moratorium (to take effect in July 2008) on non-Compact waste disposal at the Barnwell site. Mr. House stated that the Barnwell site is estimated to have about 30 to 50 years of remaining operational life based on projected volumes of in-region wastes representing about 1.2 million cubic feet of disposal capacity. This volume is considered sufficient for the fleet of existing nuclear power reactors sited within the Atlantic LLW compact. Transitioning to in-region operations is also expected to have an impact on the cost-structure for future waste disposal operations at the Barnwell site since those costs will no longer benefit from economies of scale formerly associated with higher-volume disposal operations. The speaker outlined that those future disposal costs might be based on three different operational scenarios. To ease the transition to in-region only operations, the speaker also noted that Energy Solutions has decided to commence certain long-term site stabilization activities that would facilitate disposal site decommissioning and long-term institutional care at some later date. This would include the installation of 8 to 10 new groundwater monitoring wells. Mr. House noted that it will take about two years of modified in-region operations to acquire estimates of new disposal costs for in-region LLW generators.

### VI. NRC 2006 Commercial Low-Level Radioactive Waste (LLW) Strategic Planning Initiative

[Note: Mr. Mike Lee was the Designated Federal Official for this portion of the meeting.]

Mr. James Kennedy, representing NRC's Office of Federal and State Materials and Environmental Management Programs (FSME), briefed the Committee on SECY-07-0180. Over the last several years, there have been a number of external activities and initiatives underway that may have a bearing on the future of commercial LLW management in the United States. As a result, the NRC staff decided to conduct a strategic assessment of its LLW regulatory program. The ultimate objective of this assessment was to identify and prioritize activities that the NRC staff could undertake to address vulnerabilities in the current regulatory framework, while also factoring in and addressing future needs and changes that may occur in the nation's commercial LLW management system. NRC staff solicited stakeholder views on these issues by publishing a request in the Federal Register in July 2006. Following a review of the comments received, the staff issued their LLW strategic assessment as SECY-07-0180 in October 2007. Mr. Kennedy noted that 20 tasks/activities were identified for consideration in the assessment. Appendix C to SECY-07-0180 provides a comprehensive summary showing the relationship of each of the 20 proposed products/activities to NRC strategic goals, the relative need for the task, the estimated level of effort required, anticipated benefits, potential unintended consequences, and ranking of each task as low, medium, or high priority. During the briefing, it was emphasized that the LLW strategic assessment was considered to be more of a management tool to describe what specific tasks/activities the staff intends to undertake in the near-term rather than a broader examination of what can be done to improve the development of new LLW disposal capacity within the nation. Mr. Kennedy noted that there were about nine LLW tasks the staff intends to undertake and complete in fiscal years 2008-09.

### VII. <u>Review of Planned Waste Management Activities at DOE Mixed-Oxide Fuel Fabrication</u> <u>Facility</u>

[Note: Mr. Latif Hamdan was the Designated Federal Official for this portion of the meeting.]

Mr. David Tiktinsky from NRC's Office of Nuclear Material Safety and Safeguards (NMSS) briefed the Committee on the proposed waste management activities at a planned DOE Mixed Oxide Fuel Fabrication Facility (MFFF) in Aiken, South Carolina. Mr. Tiktinsky informed the Committee that a Construction Authorization for the MFFF facility was issued in March 2005, and that nuclear construction began in August 2007. A License Application to possess and use radioactive material was submitted in September 2006 and accepted for docketing in December 2006. Mr. Tiktinsky indicated that the application is currently under review and provided information on the review schedule. A description of the facilities and buildings under construction was provided with specific focus on the status of the waste solidification building and an overview of the MFFF process and the types and quantities of solid and liquid waste that will be generated. Mr. Tiktinsky discussed the liquid waste streams and liquid waste holdup capabilities and transfer protocol. He also addressed the controls for the interface between the MFFF and the Savannah River Site (SRS) for disposition of waste from the MFFF operation, as well as the potential impacts and response in case the SRS operations are disrupted or have to be suspended. Mr. Tiktinsky concluded that the storage capacity for the low level liquid waste stream is limiting and that the MFFF has contingency plans to shutdown in a safe state if the SRS is unavailable for disposition of waste.

## VIII. <u>Briefing on Tritium Task Force Actions to Revise the Significance Determination Process</u> to Address Spills and Leaks

[Note: Mr. Derek Widmayer was the Designated Federal Official for this portion of the meeting.]

Ms. Elaine Keegan and Mr. John Thompson from NRC's Office of Nuclear Reactor Regulation, Division of Inspection and Regional Support, briefed the Committee on proposed changes to the reactor Significance Determination Process (SDP) to address spills and leaks. These changes are in response to actions identified in the Liquid Radioactive Release Lessons Learned (Tritium) Task Force Report. The changes to the SDP were approved by the Commission in Staff Requirements Memorandum SRM-SECY-07-0112. First, Mr. Thompson provided an overview of the Reactor Oversight Process, of which the SDP is one component in determining the safety status of operating reactors. This explanation was intended to provide the Committee with background and perspective on how the changes to the SDP would work when they are implemented. Ms. Keegan then provided information on the changes to NRC Inspection Manual Chapter 0609, Appendix D, Public Radiation Safety; these changes add leaks and spills to the areas of review conducted to determine the significance of inspection findings concerning public radiation safety from normal operations of operating reactors. The proposed changes discussed are: (a) to eliminate the white finding from the environmental branch of the SDP; (b) to modify the radioactive effluent release branch of the SDP to specifically include spills and leaks; and, (c) to indicate that the white finding in the radioactive effluent release branch of the SDP is appropriate.

## IX. <u>Executive Session</u>

[Note: Mr. Antonio Dias was the Designated Federal Official for this portion of the meeting.]

# RECONCILIATION OF ACNW&M COMMENTS AND RECOMMENDATIONS/EXECUTIVE DIRECTOR FOR OPERATIONS COMMITMENTS

During its Planning and Procedures meeting on December 17, 2007, the Committee considered:

- The response of the Executive Director for Operations (EDO) dated August 7, 2007, to comments and recommendations included in the June 28, 2007, ACNW&M letter entitled "Working Group Meeting on 10 CFR 20.1406 Minimization of Contamination and Proposed Regulatory Guide 4012." The Committee decided that it was not satisfied with the EDO's response. Instead of writing a rebuttal letter to the EDO's response, the Members wrote a new letter report to the Commission ("Review of Regulatory Guide 4012," dated November 27, 2007) on the same topic but with stronger and clearer recommendations. The discussion, among the Committee members, on how to address the EDO's response actually began in the previous Planning and Procedure meeting, on November 13, 2007.
- The EDO's response dated November 3, 2007, to comments and recommendations included in the October 1, 2007, ACNW&M letter entitled "Low-Level Radioactive Waste Minimization Strategies and Views on Commercial Low-Level Waste Management." The Committee decided that it was satisfied with the EDO's response in that the staff is currently engaged in the areas identified by the Committee, and they committed to seek the Committee's advice on the adequacy of those actions once they reach fruition.

• The EDO's response dated November 6, 2007, to comments and recommendations included in the September 25, 2007, ACNW&M letter entitled, "Engagement with the International Commission on Radiological Protection." The Committee decided that it was satisfied with the EDO's response.

## PROPOSED SCHEDULE FOR THE 186<sup>th</sup> ACNW&M MEETING

The Committee agreed to consider the following topics during the 186<sup>th</sup> ACNW&M meeting to be held on February 12-14, 2008:

- Working Group Meeting on Management of Low-Level Radioactive Waste Using RCRA
   Disposal Facilities
- Combined NMSS Office and Division Directors Semi-Annual Briefing to Discuss Items of Mutual Interest
- Corrosion Performance of Waste Package and Drip Shield Materials
- Draft Guidance on Preventing Legacy Sites
- Proposed Regulatory Framework for Phased Decommissioning at West Valley Site

The meeting was adjourned on December 19, 2007 at 5:00 PM.

• The EDO's response dated November 6, 2007, to comments and recommendations included in the September 25, 2007, ACNW&M letter entitled, "Engagement with the International Commission on Radiological Protection." The Committee decided that it was satisfied with the EDO's response.

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- Draft Guidance on Preventing Legacy Sites
- Proposed Regulatory Framework for Phased Decommissioning at West Valley Site

The meeting was adjourned on December 19, 2007 at 5:00 PM.

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Professor Emeritus of Economics, Pennsylvania State University\*

Discussion Item: The Board is examining the extent to which cost sharing impacts participation in Federal research funding opportunities.

3:15 p.m. Roundtable Discussion: Options for Revision to Board Cost Sharing Policy for NSF Discussion Moderator: Dr.

Droegemeier

4:15 p.m. Summary and Next Steps 4:30 p.m. Adjourn

\* pending acceptance of invitation

**Note:** This roundtable discussion will not involve National Science Board deliberations and is not subject to 5 U.S.C. 552b.

#### Michael P. Crosby,

Executive Officer and NSB Office Director. [FR Doc. E7–23323 Filed 11–30–07; 8:45 am] BILLING CODE 7555–01–P

#### NUCLEAR REGULATORY COMMISSION

#### Advisory Committee on Nuclear Waste and Materials; Meeting Notice

The Advisory Committee on Nuclear Waste and Materials (ACNW&M) will hold its 185th meeting on December 17– 19, 2007, at 11545 Rockville Pike, Rockville, Maryland.

#### Monday, December 17, 2007, Room T–2B3

8:30 a.m.–8:35 a.m.: Opening Remarks by the ACNW&M Chairman (Open)—The Chairman will make opening remarks regarding the conduct of today's sessions.

8:35 a.m.–10 a.m.: Electric Power Research Institute's Report on Drift Degradation at Yucca Mountain (Open)—A representative from the Electric Power Research Institute will summarize the approach, methods, and conclusions of their 2007 report on drift degradation.

1 p.m.–2:30 p.m.: Update on NRC Rulemaking on Groundwater Protection at the In-Situ Leach Uranium Mining Facilities (Open)—NRC staff from the Office of Federal and State Materials and Environmental Management Programs (FSME) will brief the Committee on the status of the rulemaking on groundwater protection at in-situ leach uranium recovery sites.

2:45 p.m.–3:30 p.m.: Vendor's View on the Transportation-Aging Disposal Performance Specifications (Open)—A representative from NAC International, a commercial cask vendor, will brief the Committee on their views on the Transportation-Aging-Disposal (TAD) performance specifications, possible challenges the vendor may be facing, and suggestions for expediting NRC approval of any TAD license application.

3:30 p.m.–5 p.m.: Discussion of ACNW&M Letter Reports (Open)—The Committee will discuss potential and proposed ACNW&M letter reports.

#### Tuesday, December 18, 2007, Room T–2B3

8:30 a.m.–8:35 a.m.: Opening Remarks by the ACNW&M Chairman (Open)–The Chairman will make opening remarks regarding the conduct of today's sessions.

8:35 a.m.-9:30 a.m.: Status of Operations at the Barnwell Low-Level Radioactive Waste Disposal Facility (Open)—The Barnwell low-level radioactive waste (LLW) disposal facility is scheduled to close to noncompact states in July 2008. A representative of the site's operator, Energy Solutions, will update the Committee on activities at this commercial disposal facility in anticipation of scaled-back operations.

9:45 a.m.-11:30 a.m.: NRC 2006 Commercial LLW Strategic Planning Initiative (Open)—Representatives from the Office of FSME will brief the Commistee on their recently-issued Commission Paper (SECY-07-0180) containing specific recommendations on the scope of work to be considered in any future NRC commercial LLW program. This briefing is also expected to include a summary of the public comments received in 2005.

1 p.m.-2 p.m.: Review of Planned Waste Management Activities at U.S. Department of Energy Mixed-Oxide Fuel Fabrication Facility (Open)—NRC staff from the Office of Nuclear Material Safety and Safeguards will brief the Committee on planned waste management activities at U.S. Department of Energy's (DOE) Mixed-Oxide Fuel Fabrication Facility in Aiken, South Carolina.

2 p.m.-3 p.m.: Briefing on Tritium Task Force Actions to Revise the Significance Determination Process to Address Spills and Leaks (Open)—A representative from the Office of Nuclear Reactor Regulation will report on the revisions to its Significance Determination Process to address radioactive liquid spills and leaks in response to an action recommended in the Tritium Task Force Report.

3:15 p.m.–5 p.m.: Discussion of ACNW&M Letter Reports (Open)—The Committee will discuss potential and proposed ACNW&M letter reports.

# Wednesday, December 19, 2007, Room T–2B1

8:30 a.m.–8:35 a.m.: Opening Remarks by the ACNW&M Chairman (Open)—The Chairman will make opening remarks regarding the conduct of today's sessions.

8:35 a.m.–3 p.m.: Discussion of ACNW&M Letter Reports (Open)—The Committee will continue discussion of proposed ACNW&M letter reports.

*3 p.m.–4 p.m.: Miscellaneous* (Open)—The Committee will discuss matters related to the conduct of ACNW&M activities and specific issues that were not completed during previous meetings, as time and availability of information permit. Discussions may include content of future letters and scope of future Committee Meetings.

Procedures for the conduct of and participation in ACNW&M meetings were published in the Federal Register on September 26, 2007 (72 FR 54693). In accordance with those procedures, oral or written views may be presented by members of the public. Electronic recordings will be permitted only during those portions of the meeting that are open to the public. Persons desiring to make oral statements should notify Dr. Antonio F. Dias (Telephone 301-415-6805), between 8:15 a.m. and 5 p.m. (ET), as far in advance as practicable so that appropriate arrangements can be made to schedule the necessary time during the meeting for such statements. Use of still, motion picture, and television cameras during the meeting may be limited to selected portions of the meeting as determined by the ACNW&M Chairman. Information regarding the time to be set aside for taking pictures may be obtained by contacting the ACNW&M office prior to the meeting. In view of the possibility that the schedule for ACNW&M meetings may be adjusted by the Chairman as necessary to facilitate the conduct of the meeting, persons planning to attend should notify Dr. Dias as to their particular needs.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, as well as the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefore can be obtained by contacting Dr. Dias.

Video teleconferencing service is available for observing open sessions of ACNW&M meetings. Those wishing to use this service for observing ACNW&M meetings should contact Mr. Theron Brown, ACRS/ACNW&M Audio Visual Assistant (301–415–8066), between 7:30 a.m. and 3:45 p.m., (ET), at least 10 days before the meeting to ensure the availability of this service. Individuals or organizations requesting this service will be responsible for telephone line charges and for providing the equipment and facilities that they use to establish the video teleconferencing link. The availability of video teleconferencing services is not guaranteed.

During the days of the meeting, phone number 301–415–7360 should be used in order to access anyone in the ACNW&M Office.

ACNW&M meeting agenda, meeting transcripts, and letter reports are available through the NRC Public Document Room at *pdr@nrc.gov*, or by calling the PDR at 1–800–397–4209, or from the Publicly Available Records System (PARS) component of NRC's document system (ADAMS) which is accessible from the NRC Web site at *http://www.nrc.gov/reading-rm/ adams.html* or *http://www.nrc.gov/ reading-rm/doc-collections/acnw* (ACNW&M schedules and agendas).

Dated: November 27, 2007.

#### Andrew L. Bates,

Advisory Committee Management Officer. [FR Doc. E7–23331 Filed 11–30–07; 8:45 am] BILLING CODE 7590–01–P

#### NUCLEAR REGULATORY COMMISSION

#### [EA-07-252]

In the Matter of All Licensees Identified in Attachment 1 and All Other Persons Who Seek or Obtain Access to Safeguards Information Described Herein; Order Imposing Fingerprinting and Criminal History Records Check Requirements for Access to Safeguards Information (Effective Immediately)

Ι

The Licensee identified in Attachment 1<sup>1</sup> to this Order, holds a license issued in accordance with the Atomic Energy Act (AEA) of 1954, as amended, by the U.S. Nuclear Regulatory Commission (NRC or Commission), authorizing them to engage in an activity subject to regulation by the Commission or Agreement States. On August 8, 2005, the Energy Policy Act of 2005 (EPAct) was enacted. Section 652 of the EPAct amended Section 149 of the AEA to require fingerprinting and a Federal Bureau of Investigation (FBI) identification and criminal history records check of any person who is to be permitted to have access to Safeguards Information (SGI).<sup>2</sup> The NRC's implementation of this requirement cannot await the completion of the SGI rulemaking, which is underway, because the EPAct fingerprinting and criminal history records check requirements for access to SGI were immediately effective upon enactment of the EPAct. Although the EPAct permits the Commission by rule to except certain categories of individuals from the fingerprinting requirement, which the Commission has done (see 10 CFR 73.59, 71 FR 33,989 (June 13, 2006)), it is unlikely that licensee employees or others are excepted from the fingerprinting requirement by the "fingerprinting relief" rule. Individuals relieved from fingerprinting and criminal history records checks under the relief rule include Federal, State, and local officials and law enforcement personnel; Agreement State inspectors who conduct security inspections on behalf of the NRC; members of Congress and certain employees of members of Congress or Congressional Committees, and representatives of the International Atomic Energy Agency (IAEA) or certain foreign government organizations. In addition, individuals who have a favorably-decided U.S. Government criminal history records check within the last five (5) years, or individuals who have active federal security clearances (provided in either case that they make available the appropriate documentation), have satisfied the EPAct fingerprinting requirement and need not be fingerprinted again. Therefore, in accordance with Section 149 of the AEA, as amended by the EPAct, the Commission is imposing additional requirements for access to SGI, as set forth by this Order, so that affected licensees can obtain and grant access to SGI. This Order also imposes requirements for access to SGI by any person, from any person,<sup>3</sup> whether or

not a Licensee, Applicant, or Certificate Holder of the Commission or Agreement States.

#### II

The Commission has broad statutory authority to protect and prohibit the unauthorized disclosure of SGI. Section 147 of the AEA grants the Commission explicit authority to issue such Orders as necessary to prohibit the unauthorized disclosure of SGI. Furthermore, Section 652 of the EPAct amended Section 149 of the AEA to require fingerprinting and an FBI identification and a criminal history records check of each individual who seeks access to SGI. In addition, no person may have access to SGI unless the person has an established need-toknow the information and satisfies the trustworthy and reliability requirements described in Attachment 3 to Order EA-07 - 251

In order to provide assurance that the Licensees identified in Attachment 1 to this Order are implementing appropriate measures to comply with the fingerprinting and criminal history records check requirements for access to SGI, all Licensees identified in Attachment 1 to this Order shall implement the requirements of this Order. In addition, pursuant to 10 CFR 2.202, I find that in light of the common defense and security matters identified above, which warrant the issuance of this Order, the public health, safety and interest require that this Order be effective immediately.

#### III

Accordingly, pursuant to Sections 81, 147, 149, 161b, 161i, 161o, 182 and 186 of the Atomic Energy Act of 1954, as amended, and the Commission's regulations in 10 CFR 2.202, 10 CFR parts 30 and 73, it is hereby ordered, effective immediately, that all licensees identified in attachment 1 to this order and all other persons who seek or obtain access to safeguards information, as described above, shall comply with the requirements set forth in this order.

A. 1. No person may have access to SGI unless that person has a need-toknow the SGI, has been fingerprinted or who has a favorably-decided FBI identification and criminal history records check, and satisfies all other applicable requirements for access to SGI. Fingerprinting and the FBI identification and criminal history records check are not required, however, for any person who is relieved from that requirement by 10 CFR 73.59 (71 FR 33,989 (June 13, 2006)), or who has a favorably-decided U.S. Government criminal history records

<sup>&</sup>lt;sup>1</sup> Attachment 1 contains sensitive information and will not be released to the public.

<sup>&</sup>lt;sup>2</sup> Safeguards Information is a form of sensitive, unclassified, security-related information that the Commission has the authority to designate and protect under section 147 of the AEA.

<sup>&</sup>lt;sup>3</sup> Person means (1) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than the Commission or the Department of Energy, except that the Department of Energy shall be considered a person with respect to those facilities of the Department of Energy specified in section 202 of the Energy Reorganization Act of 1974 (88 Stat. 1244), any State or any political subdivision of, or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing.



#### UNITED STATES NUCLEAR REGULATORY COMMISSION ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS WASHINGTON, D.C. 20555-0001

November 27, 2007

## AGENDA 185<sup>th</sup> ACNW&M MEETING DECEMBER 17-19, 2007

## MONDAY, DECEMBER 17, 2007, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH, ROCKVILLE, MARYLAND

1)	8:30 – 8:35 A.M.	Opening Remarks by the ACNW&M Chairman (Open)(MTR/AFD) The Chairman will make opening remarks regarding the conduct of today's sessions.	
2)	8:35 – <del>10:00</del> A.M. 10:15	Electric Power Research Institute's Report on Drift degradation at Yucca Mountain (Open) (MTR/NMC) A representative from the Electric Power Research Institute will summarize the approach, methods, and conclusions of their 2007 report on drift degradation.	
		(break: 10:15 – 12:00)	
	12:00 – 1:00 P.M.	***LUNCH***	
3)	1:00 – <del>2:30</del> P.M. 2:05	Update on NRC Rulemaking on Groundwater Protection at In-Situ Leach Uranium Mining Facilities (Open) (RFW/LSH) NRC staff from the Office of Federal and State Materials and Environmental Management Programs (FSME) will brief the Committee on the status of the rulemaking on groundwater protection at in-situ leach uranium recovery sites.	
	<del>2:30</del> – 2:45 P.M. 2:05	***BREAK***	
4)	2:45 – <del>3:30</del> P.M. <b>3:15</b>	<u>Vendor's View on the Transportation-Aging-Disposal</u> <u>Performance Specifications</u> (Open) (RFW/CLB) A representative from NAC International, a commercial cask vendor, will brief the Committee on their views on the Transportation-Aging-Disposal (TAD) performance specifications, possible challenges the vendor may be facing, and suggestions for expediting NRC approval of any TAD license application.	
5)	3:30 – 5:00 P.M.	<ul> <li>Discussion of ACNW&amp;M Letter Reports (Open) (All)</li> <li>Discussion of proposed and potential ACNW&amp;M letter reports on:</li> <li>5.1) Preclosure Seismic Analysis Evaluation at the Proposed Yucca Mountain, Nevada, Repository (WJH/MPL)</li> <li>5.2) Potential Impacts of Drift Degradation on Engineer Barrier Systems (MTR/NMC)</li> </ul>	

- 5.3) Current Developments on Waste Package Corrosion and Spent Fuel Dissolution in Support of the Total-System Performance Assessment Code (RFW/JHC/CLB)
- 5.4) Update on Rulemaking on Groundwater Protection at In-Situ Leach Uranium Mining Facilities (RFW/LSH)
- 5:00 P.M. Adjourn

## TUESDAY, DECEMBER 18, 2007, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH, ROCKVILLE, MARYLAND

6)	8:30 – 8:35 A.M.	<b>Opening Remarks by the ACNW&amp;M Chairman</b> (Open) (MTR/AFD) The Chairman will make opening remarks regarding the conduct of today's sessions.	
7)	8:35 – <del>9:30</del> A.M. 9:45	Status of Operations at the Barnwell Low-Level Radioactive Waste Disposal Facility (Open) (MTR/MPL) The Barnwell low-level radioactive waste (LLW) disposal facility is scheduled to close to non-compact states in July 2008. A representative of the site's operator, Energy Solutions, will update the Committee on activities at this commercial disposal facility in anticipation of scaled-back operations.	
	<b>9<del>:30 – 9:45</del> A.M.</b> 9:45 – 10:00	***BREAK***	
8)	<del>9:45 – 11:30</del> A.M. 10:00 – 11:37	NRC 2006 Commercial LLW Strategic Planning Initiative (Open) (MTR/MPL) Representatives from the Office of FSME will brief the Committee on their recently-issued Commission Paper (SECY-07-0180) containing specific recommendations on the scope of work to be considered in any future NRC commercial LLW program. This briefing is also expected to include a summary of the public comments received in 2005.	
	<del>11:30 –</del> 1:00 P.M. 11:37	***LUNCH***	
9)	1:00 – 2:00 P.M.	Review of Planned Waste Management Activities at U.S. Department of Energy Mixed-Oxide Fuel Fabrication Facility (Open) (AGC/LSH) NRC staff from the Office of Nuclear Material Safety and Safeguards will brief the Committee on planned waste management activities at U.S. Department of Energy's (DOE) Mixed-Oxide (MOX) Fuel Fabrication Facility in Aiken, South Carolina.	

10)	<del>2:00 – 3:00</del> P.M. 1:55 – 3:10	Briefing on Tritium Task Force Actions to Revise the		
		Significance Determination Process to Address Spills and Leaks (Open) (JHC/DAW) A representative from the Office of Nuclear Reactor Regulation will report on the revisions to its Significance Determination Process (SDP) to address radioactive liquid spills and leaks in response to an action recommended in the Tritium Task Force Report.		
	<b>3:00 – 3:15 P.M</b> 3:10	***BREAK***		
11)	3:15 – 5:00 P.M.	Discussion of ACNW&M Letter Reports (Open) (All)		

- 3:15 5:00 P.M. **Discussion of ACNW&M Letter Reports** (Open) (All) Continued discussion of proposed and potential ACNW&M letter reports listed under Item 5 and:
  - 11.1) Status of Operations at the Barnwell LLW Disposal Facility (MTR/MPL)
  - 11.2) NRC 2006 Commercial LLW Strategic Planning Initiative (MTR/MPL)
  - 11.3) Review of Planned Waste Management Activities at DOE's MOX Fuel Fabrication Facility (AGC/LSH)
  - 11.4) Briefing on Tritium Task Force Actions to Revise the SDP to Address Spills and Leaks (JHC/DAW)

5:00 P.M. Adjourn

## WEDNESDAY, DECEMBER 19, 2007, CONFERENCE ROOM T-2B1, TWO WHITE FLINT NORTH, ROCKVILLE, MARYLAND

- 12) 8:30 8:35 A.M. <u>Opening Remarks by the ACNW&M Chairman</u> (Open) (MTR/AFD) The Chairman will make opening remarks regarding the conduct of today's sessions.
- 13)
   8:35 11:30 A.M.
   Discussion of ACNW&M Letter Reports (Open) (All)

   Continued discussion of proposed and potential ACNW&M letter reports listed under Items 5 and 11.

### 11:30 – 1:00 P.M. \*\*\*LUNCH\*\*\*

14) 1:00 – 3:00 P.M. <u>Discussion of ACNW&M Letter Reports</u> (Open) (All) Continued discussion of proposed and potential ACNW&M letter reports listed under Items 5 and 11. 15) 3:00 – 5:00 P.M. <u>Miscellaneous</u> (Open) (All) – The Committee will discuss matters related to the conduct of ACNW&M activities and specific issues that were not completed during previous meetings, as time and availability permit. Discussions may include content of future letters and scope of future Committee Meetings.

## 5:00 P.M. Adjourn

## NOTES:

- Presentation time should not exceed 50 percent of the total time allocated for a given item. The remaining 50 percent of the time is reserved for discussion.
- Thirty five (35) hard copies and one (1) electronic copy of the presentation materials should be provided to the ACNW&M in advance of the briefing.
- During the days of the meeting, phone number 301-415-7360 should be used in order to access anyone in the ACNW&M Office.

December 17 - 19, 2007

## PLEASE PRINT

**NRC ORGANIZATION** 

## **NRC Attendees**

Today's Date: 12/17/07

## <u>NAME</u>

1	Matthew Panicker	NMSS
2	Meraj Rahimi	NMSS/SFST
3	Mysore Nataraja	NMSS/HLWRS
4	Mahendra Shah	NMSS/HLWRS
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December 17 - 19, 2007

## PLEASE PRINT

## **NRC** Attendees

TODAY'S DATE: 12/18/07

## <u>NAME</u>

1	James Kennedy
2	Mark Fuhrman
3	Dave McIntyre
4	Jim Shaffner
5	Scott Flanders
6	David Brown
7	Don Helton
8	Samantha Crane
9	Rob Tregoning
10	Nishka Devaser
11	David Tiktinksky
12	Jody Martin
13	Michael Norato
14	Kelli Markham
15	Marge Kotzales
16	Aleem Boatright
17	Alex Murray
18	Jonathan DeJesus
19	John Thompson
20	Suart Richards
21	

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NRC ORGANIZATION
FSME/DWMEP
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OPA
FSME/DWMEP
FSME/DWMEP
FSME/DWMEP
RES/DSA
RES/DE
RES/DE
FSME/DWMEP
NMSS/FLSS
OGC
NMSS/FCSS
FSME
NMSS/FCSS
NMSS/FCSS
NMSS/FCSS
NMSS/FCSS
NRR/DIRS
NRR/DIRS

December 17 - 19, 2007

## PLEASE PRINT

## NRC Attendees

TODAY'S DATE: 12/19/07

	NAME	NRC ORGANIZATION
1	JC Shepherd	FSME/DWMEP
2	Roger Pederson	NRR
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December 17 - 19, 2007

## PLEASE PRINT

## Visitors

Today's Date: 12/17/07

## <u>NAME</u>

1	E. Von Tiesenhausen
2	W. Patrick
3	B. Safer
4	Sitakanta Mohanty
5	John Kemeny
6	Rod McCullen
7	John Kessler
8	Andrew Sowder
9	Stephen Schmid
10	John Stamatakos
11	John Smegal
12	George Oliver
13	Charles W. Pennington
14	Everett Redmond II
15	Ralph Best
16	Maureen Conly
17	Bill House
18	Peter Lien
19	Matthew Gordon
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## **ORGANIZATION**

Clark County	
CNWRA-SWRI	
CNWRA-SWRI	
CNWRA-SWRI	
University of Arizona/EPRI	
NEI	
EPRI	
EPRI	
BSC	
CNWRA-SWRI	
Legin Group	
NEI	
NAC International	
NEI	
BSC	
Platts	
Energy Solutions	
NMSS/DSFST	
NMSS/SFST	

December 17 - 19, 2007

## PLEASE PRINT

## **NRC** Attendees

TODAY'S DATE: 12/18/07

## NAME

	NAME		NRC ORGANIZATION
1	Bill House		Energy Solutions
2	E. Von Tiesenhausen		Clark County
3	Ralph Andersen		NEI
4	Mark Kirsh		M4 Services, LLC
5	Rich Janati		PA DEP/Appalachian Comp
6	Todd Lovings		LLW Forum, Inc.
7	John Smegal	· _	Legin Group
8	Dealis Gwyn	· _	Mox Services
9	Bill Dornsiff		WSC
10	Anjna Mehta	· _	GE Hitachi Nuclear Energy
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#### UNITED STATES NUCLEAR REGULATORY COMMISSION ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS WASHINGTON, D.C. 20555-0001

January 31, 2008

## AGENDA 186<sup>th</sup> ACNW&M MEETING FEBRUARY 12-14, 2008

## TUESDAY, FEBRUARY 12, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH, ROCKVILLE, MARYLAND

<ol> <li>10:05 – 12:00 P.M. <u>Discussion of ACNW&amp;M Letter Reports</u> (Open) (All) Discussion of proposed and potential ACNW&amp;M letter reports on: 2.1) Post-Closure Degradation of Emplacement Drifts and Its Impact on Engineered Barrier System Performance at the Proposed Yucca Mountain High-Level Radioactive Waste Repository (WJH/NMC)</li> <li>12:00 – 1:00 P.M. ****LUNCH***</li> <li>1:00 – 1:30 P.M. International Commission on Radiological Protection (ICRP) Recommendations – Final Report 103 (Open) (MTR/NMC) Representatives of the NRC staff will discuss with the Committee their views regarding this ICRP Report.</li> <li>1:30 – 1:45 P.M. ****BREAK***</li> <li>1:45 – 3:00 P.M. Corrosion of Waste Package and Spent Fuel Dissolution in a Repository Environment (Open) (RFW/CLB) A representative from the NRC Office of Nuclear Material Safety and Safeguards, Division of High-Level Waste and Repository Safety (DHLWRS), will brief the Committee on waste package corrosion and spent fuel dissolution under potential repository conditions.</li> <li>3:00 – 5:30 P.M. Discussion of ACNW&amp;M Letter Reports (Open) (All) Continued discussion of proposed and potential ACNW&amp;M letter report listed under Item 2 and: 5.1) NRC 2006 Commercial Low Level Waste Strategic Planning Initiative (MTR/MPL)</li> </ol>	1)	10:00 – 10:05 A.M.	<u>Opening Remarks by the ACNW&amp;M Chairman</u> (Open) (MTR/AFD) The Chairman will make opening remarks regarding the conduct of today's sessions.			
12:00 - 1:00 P.M.***LUNCH***3)1:00 - 1:30 P.M.International Commission on Radiological Protection (ICRP) Recommendations - Final Report 103 (Open) (MTR/NMC) Representatives of the NRC staff will discuss with the Committee their views regarding this ICRP Report.4)1:45 - 3:00 P.M.Corrosion of Waste Package and Spent Fuel Dissolution in a Repository Environment (Open) (RFW/CLB) A representative from the NRC Office of Nuclear Material Safety and Safeguards, Division of High-Level Waste and Repository Safety (DHLWRS), will brief the Committee on waste package corrosion and spent fuel dissolution under potential repository conditions.5)3:00 - 5:30 P.M.Discussion of ACNW&M Letter Reports (Open) (All) Continued discussion of proposed and potential ACNW&M letter report listed under Item 2 and: 5.1)NRC 2006 Commercial Low Level Waste Strategic Planning Initiative (MTR/MPL)	2)	10:05 – 12:00 P.M.	<ul> <li><u>Discussion of ACNW&amp;M Letter Reports</u> (Open) (All)</li> <li>Discussion of proposed and potential ACNW&amp;M letter reports on:</li> <li>2.1) Post-Closure Degradation of Emplacement Drifts and Its Impact on Engineered Barrier System Performance at the Proposed Yucca Mountain High-Level Radioactive Waste Repository (WJH/NMC)</li> </ul>			
<ul> <li>3) 1:00 – 1:30 P.M. International Commission on Radiological Protection (ICRP) <u>Recommendations – Final Report 103</u> (Open) (MTR/NMC) Representatives of the NRC staff will discuss with the Committee their views regarding this ICRP Report.</li> <li>4) 1:45 – 3:00 P.M. Corrosion of Waste Package and Spent Fuel Dissolution in a <u>Repository Environment</u> (Open) (RFW/CLB) A representative from the NRC Office of Nuclear Material Safety and Safeguards, Division of High-Level Waste and Repository Safety (DHLWRS), will brief the Committee on waste package corrosion and spent fuel dissolution under potential repository conditions.</li> <li>5) 3:00 – 5:30 P.M. Discussion of ACNW&amp;M Letter Reports (Open) (All) Continued discussion of proposed and potential ACNW&amp;M letter report listed under Item 2 and: 5.1) NRC 2006 Commercial Low Level Waste Strategic Planning Initiative (MTR/MPL)</li> </ul>		12:00 – 1:00 P.M.	***LUNCH***			
<ul> <li>1:30 - 1:45 P.M. ***BREAK***</li> <li>4) 1:45 - 3:00 P.M. <u>Corrosion of Waste Package and Spent Fuel Dissolution in a Repository Environment</u> (Open) (RFW/CLB) A representative from the NRC Office of Nuclear Material Safety and Safeguards, Division of High-Level Waste and Repository Safety (DHLWRS), will brief the Committee on waste package corrosion and spent fuel dissolution under potential repository conditions.</li> <li>5) 3:00 - 5:30 P.M. <u>Discussion of ACNW&amp;M Letter Reports</u> (Open) (All) Continued discussion of proposed and potential ACNW&amp;M letter report listed under Item 2 and: 5.1) NRC 2006 Commercial Low Level Waste Strategic Planning Initiative (MTR/MPL)</li> </ul>	3)	1:00 – 1:30 P.M.	International Commission on Radiological Protection (ICRP) Recommendations – Final Report 103 (Open) (MTR/NMC) Representatives of the NRC staff will discuss with the Committee their views regarding this ICRP Report.			
<ul> <li>4) 1:45 – 3:00 P.M. Corrosion of Waste Package and Spent Fuel Dissolution in a <u>Repository Environment</u> (Open) (RFW/CLB) A representative from the NRC Office of Nuclear Material Safety and Safeguards, Division of High-Level Waste and Repository Safety (DHLWRS), will brief the Committee on waste package corrosion and spent fuel dissolution under potential repository conditions.</li> <li>5) 3:00 – 5:30 P.M. <u>Discussion of ACNW&amp;M Letter Reports</u> (Open) (All) Continued discussion of proposed and potential ACNW&amp;M letter report listed under Item 2 and: 5.1) NRC 2006 Commercial Low Level Waste Strategic Planning Initiative (MTR/MPL)</li> </ul>		1:30 – 1:45 P.M.	***BREAK***			
5) 3:00 – 5:30 P.M. <u>Discussion of ACNW&amp;M Letter Reports</u> (Open) (All) Continued discussion of proposed and potential ACNW&M letter report listed under Item 2 and: 5.1) NRC 2006 Commercial Low Level Waste Strategic Planning Initiative (MTR/MPL)	4)	1:45 – 3:00 P.M.	Corrosion of Waste Package and Spent Fuel Dissolution in a <u>Repository Environment</u> (Open) (RFW/CLB) A representative from the NRC Office of Nuclear Material Safety and Safeguards, Division of High-Level Waste and Repository Safety (DHLWRS), will brief the Committee on waste package corrosion and spent fuel dissolution under potential repository conditions.			
5.2) Corrosion of Waste Package and Spent Fuel Dissolution in a Repository Environment (RFW/CLB)	5)	3:00 – 5:30 P.M.	<ul> <li><u>Discussion of ACNW&amp;M Letter Reports</u> (Open) (All)</li> <li>Continued discussion of proposed and potential ACNW&amp;M letter report listed under Item 2 and:</li> <li>5.1) NRC 2006 Commercial Low Level Waste Strategic Planning Initiative (MTR/MPL)</li> <li>5.2) Corrosion of Waste Package and Spent Fuel Dissolution in a Repository Environment (RFW/CLB)</li> </ul>			

5:30 P.M. Adjourn

## WEDNESDAY, FEBRUARY 13, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH, ROCKVILLE, MARYLAND

	12:00 – 1:00 P.M.	***LUNCH***
8)	9:30 – 12:00 P.M.	Discussion of ACNW&M Letter Reports (Open) (All) Continued discussion of proposed and potential ACNW&M letter reports listed under Item 5.
7)	8:35 – 9:30 A.M.	ACNW&M Meeting with NRC Commissioner Peter B. Lyons (Open) (MTR/NMC) Commissioner Lyons will address the Committee on current topics and issues of common interest.
6)	8:30 – 8:35 A.M.	Opening Remarks by the ACNW&M Chairman (Open) (MTR/NMC) The Chairman will make opening remarks regarding the conduct of today's sessions.

# ACNW&M WORKING GROUP MEETING ON MANAGING LOW ACTIVITY RADIOACTIVE WASTE (LAW) (Open)

### Purpose

The purpose of this Working Group Meeting is to understand how LAW is being managed in the United States, and determine if there are ways to improve its management. Also to be addressed is the extent to which Resource Conservation and Recovery Act (RCRA) disposal sites can/could factor into the management of LAW.

9) 1:00 – 1:15 P.M. <u>Greetings and Introductions</u> (WJH/MPL) Dr. Michael Ryan, the cognizant ACNW&M Member for this meeting topic, will provide an overview of the expected goals for the Working Group Meeting, the planned technical sessions, and introduce the invited speakers.

## **SESSION I: What is LAW?**

10) LAW/TENORM Overview 1:15 – 1:30 P.M. Dr. Ryan, ACNW&M Chair Alternative Disposal Options for Low Activity Waste: An NRC 11) 1:30 – 2:00 P.M. **Regulatory Perspective** James Kennedy, NRC Office of Federal and State Materials and Environmental Management Programs (FSME) 12) 2:00 - 2:30 P.M. LAW Regulation: A National Perspective Ruth McBurney, Conference of Radiation Control Program Directors \*\*\*BREAK\*\*\* 2:30 – 2:45 P.M.

SESSION II: Risk-Based Approaches to the Regulation of LAW

13)	2:45 – 3:15 P.M.	<u>Risk-Based Classification System for Radioactive and Chemically</u> <u>Hazardous Wastes – Recommendations from the National Council</u> <u>on Radiation Protection (NCRP), Report No. 139</u> Allen Croff, ACNW&M
14)	3:15 – 3:45 P.M.	Risk-Informed Analytical Approaches to Waste Classification: NRC Staff Review of U.S. Department of Energy (DOE) Waste Incidental to Reprocessing (WIR) Determination David Esh, FSME
15)	3:45 – 4:15 P.M.	Enabling Risk-Informed Approaches to Management of LAW: Nuclear Industry Perspective Ralph Anderson, Nuclear Energy Institute
16)	4:15 – 4:45 P.M.	A Risk-Informed Approach to Managing LAW: An International Perspective John Greeves and Jim Lieberman, Talisman International, LLC

## 5:00 P.M. Adjourn

## THURSDAY, FEBRUARY 14, 2008, CONFERENCE ROOM T-2B3, TWO WHITE FLINT NORTH, ROCKVILLE, MARYLAND

ACNW&M WORKING GROUP MEETING ON MANAGING LOW ACTIVITY RADIOACTIVE WASTE (LAW) - Continuation (Open)

## **SESSION III:** Alternative Disposal Methods for LAW – Case Studies

17)	8:30 – 9:00 A.M.	Disposal of Mixed Radioactive Wastes: U.S. Environmental Protection Agency (EPA) 2003 Advanced Notice of Proposed Rulemaking: An Update Dan Schultheisz, EPA
18)	9:00 – 9:30 A.M.	<u>Tennessee Municipal Landfill Exemptions for LAW: A Historical</u> <u>Perspective</u> Mike Mobley, Southeast LLW Compact Commission
19)	9:30 – 10:00 A.M.	<u>Grandview, Idaho, Disposal Facility</u> Steve Romano, American Ecology
20)	10:00 – 10:30 A.M.	<u>Clive, Utah, Disposal Facility</u> Tye Rodgers and Bill House, Energy Solutions

#### 10:30 - 10:45 A.M. \*\*\*BREAK\*\*\*

- 21) 10:45 11:30 A.M. <u>Deer Trail (Colorado) and Buttonwillow (California) Facilities</u> Philip Retallick, Clean Harbors
- 22) 11:30 12:30 P.M. <u>Waste Control Specialists (WCS) Anderson Co. Site, Texas,</u> <u>Disposal Facility</u> Bill Dornsife, WCS

12:30 – 1:30 P.M. \*\*\*LUNCH\*\*\*

### **SESSION IV: Working Group Meeting Impressions and Recommendations**

- 23) 1:30 2:30 P.M. <u>Stakeholder Comments, Views and Perspectives</u> As requested.
- 24) 2:30 3:30 P.M. <u>Roundtable Discussion</u> Dr. Michael Ryan, ACNW&M (moderator)
- 25) 3:30 3:45 P.M. <u>Closing Remarks</u> Dr. Michael Ryan, ACNW&M

### 3:45 – 4:00 P.M. \*\*\*BREAK\*\*\*

- 26) 4:00 4:30 P.M. <u>ICRP's Draft Report on Environmental Protection: The Concept</u> and Use of Reference Animals and Plants (Open) (MTR/NMC) Representatives of the NRC staff will discuss with the Committee preliminary views regarding the new ICRP Draft Report on Environmental Protection.
- 27) 4:30 5:00 P.M. <u>Miscellaneous</u> (Open) (All) The Committee will discuss matters related to the conduct of ACNW&M activities and specific issues that were not completed during previous meetings. Discussions may include content of future letters and scope of future Committee Meetings.

### 5:00 P.M. Adjourn

#### NOTES:

- Presentation time should not exceed 50 percent of the total time allocated for a given item. The remaining 50 percent of the time is reserved for discussion.
- Thirty five (35) hard copies and one (1) electronic copy of the presentation materials should be provided to the ACNW&M in advance of the briefing.
- During the days of the meeting, phone number 301-415-7360 should be used in order to access anyone in the ACNW&M Office.

## LIST OF DOCUMENTS PROVIDED TO THE COMMITTEE 185th ACNW&M MEETING December 17-19, 2007

## **MEETING HANDOUTS**

<u>AGENDA</u>	DOCUMENTS/HANDOUTS LISTED IN ORDER
ITFM #	

- 1. Opening Remarks by the ACRS Chairman
- 2. <u>Electric Power Research Institute's Report on Drift Degradation at Yucca</u> <u>Mountain</u>
  - 1. Analysis of Thermal Rock Spalling of Tuff Host Rock for the Yucca Mountain Repository
- 3. <u>Update on NRC Rulemaking on Groundwater Protection at In-Situ Leach</u> <u>Uranium Mining Facilities</u>
  - 2. Update on NRC ISL Rulemaking (Slides from NRC/FSME, Gary Comfort)
- 4. <u>Vendor's View on the Transportation-Aging Disposal Performance</u> <u>Specifications</u>
  - NAC International's Views on the TAD Performance Specification (PS) and Licensing of TAD Systems (Slides from NAC International, Charles W. Pennington)
- 5. Discussion of ACNW&M Letter Reports
  - 4. Reconciliation of ACNW&M Comments and Recommendations
- 7. <u>Status of Operations at the Barnwell Low-Level Radioactive Waste</u> <u>Disposal Facility</u>
  - 5. Barnwell Site Transition Presentation Summary (Slides from Bill House at Energy Solutions)
- 8. NRC 2006 Commercial LLW Strategic Planning Initiative
  - 6. Strategic Assessment of NRC's Low-Level Radioactive Waste Regulatory Progam (Slides from NRC/FSME)
- 9. <u>Review of Planned Waste Management Activities at U.S.</u> Department of Energy Mixed-Oxide Fuel Fabrication Facility
  - 7. Waste Management at the Mixed Oxide Fuel Fabrication Facility (Slides from NRC/NMSS/FCSS, David Tiktinsky)
- Briefing on Tritium Task Force Actions to Revise the Significance Determination Process to Address Spills and Leaks
   Reactor Oversight Process (Slides from NRC,
  - Kennedy/Thompson)

\*\*Copies of most of the handouts can be obtained through the transcript copy found in the Agency Document Management System (ADAMS) or a complete set can be requested by calling the ACRS office of the NRC.

[Note: Some documents listed herein may have been provided or prepared for the Committee use only. These documents must be reviewed prior to release to the public.]



EPEI ELECTRIC POWER RESEARCH INSTITUTE

# Analysis of Thermal Spalling of Tuff Host Rock for the Yucca Mountain Repository

John Kemeny University of Arizona

Mick Apted Monitor Scientific

John Kessler EPRI

# **Recent EPRI Yucca Mountain Studies Containing Rock Mechanics Analyses**

- EPRI. 2007. Program on Technology Innovation: <u>Analysis of Thermal Spalling of Tuff</u> <u>Host Rock for the Yucca Mountain Repository</u>, Report 1015390, Electric Power Research Institute, Palo Alto, CA.
- EPRI. 2007. Program on Technology Innovation: Room at the Mountain, <u>Analysis of the Maximum Disposal Capacity for Commercial Spent Nuclear Fuel in a Yucca Mountain Repository</u>, Report 1015046, Electric Power Research Institute, Palo Alto, CA.
- EPRI, 2006. Program on Technology Innovation: <u>Effects of Multiple Seismic Events and</u> <u>Rockfall on Long-Term Performance of the Yucca Mountain Repository</u>, Report 1013444, Electric Power Research Institute, Palo Alto, CA.
- EPRI. 2006. Program on Technology Innovation: Room at the Mountain, <u>Analysis of the Maximum Disposal Capacity for Commercial Spent Nuclear Fuel in a Yucca Mountain Repository</u>, Report 1013523, Electric Power Research Institute, Palo Alto, CA.
- EPRI. 2005. Program on Technology Innovation: <u>Effects of Seismicity and Rockfall on</u> <u>Long-Term Performance of the Yucca Mountain Repository</u>, 2005 Progress Report 1011812, Electric Power Research Institute, Palo Alto, CA.

# What is Rock Spalling?

 Rock failure at the boundary of a rock mass, usually forming slabs that bulge from the rock and may eventually detach (rockfall)



From BSC (2004)







From Rajmeny et al. (2002)



ELECTRIC POWER RESEARCH INSTITUTE

# **Causes of Rock Spalling**





Rock sample under uniaxial loading

From Martin et al. (1996)

- High tangential stress, low radial stress near an excavation boundary
- The extent and depth of spalling depend on:
  - Magnitude and orientation of the in-situ stresses,
  - Size, shape and orientation of the excavation,
  - The excavation method and sequence (blasting vs. tunnel boring machine (tbm), single vs. multiple headings),
  - Intact rock strength and deformation properties,
  - Rock discontinuity strength and deformation properties,
  - Underground environment (humidity, temperature, rock saturation, water inflow, etc.),
  - The type and properties of the support, if support is applied,
- Progressive spalling can occur due to changing stress conditions (seismic, thermal, continued mining) and time-dependent rock behavior



# **Progressive Spalling Leading to Total Drift Collapse**

- This only occurs in extreme conditions:
  - Condition 1: Extremely high stresses relative to the strength of the rock (in-situ stresses > 5 times rock mass strength; max tangential stress at boundary > 10 times rock mass strength)
  - Condition 2: Very low stresses (i.e., very shallow) and a very weak rock mass
- These conditions are not expected to occur for the static stresses and thermal loading at Yucca Mountain



From Hoek (2001)



# **Slight to Moderate Overstress Conditions**

- Depth of spalling (d) less than one radius (r) away from boundary
- This is common in many underground excavations (civil and mining)
- Standard rock support such as rock bolts and shotcrete are able to support the loose rock associated with these conditions
- Slight to moderate overstress conditions expected at Yucca Mountain due to static+thermal stresses => max tangential stress due to in-situ stresses varies from 3-18 MPa, max tangential stress due to thermal varies from 1-50 MPa (thermal variation due to variation in rock mass Young's modulus)

Rock Type	UCS (MPa)		Young's	Percent of	Lithophysal
	Mean	Lower Bound	Modulus (GPA)	Repository	Porosity (%)
Lithophysal 1	10	2.0	1.9	2.5	35
Lithophysal 2	15	5.6	6.4	6.0	28
Lithophysal 3	20	9.2	10.8	22.0	21
Lithophysal 4	25	12.8	15.3	29.0	13
Lithophysal 5	30	16.3	19.7	25.5	7
Non-lith	30*	20*	20-30*	15.0	<5





# What Happens If There Is No Rock Support

•Yucca Mountain drifts will remain under thermal loading for thousands of years.

•Rock support will be installed as part of pre-closure, but it will deteriorate over time.



- Without rock support, there are two possible scenarios:
  - 1. If rock that reaches the peak stress fails and is immediately removed from the roof or wall of the excavation, all stress originally in the failed rock will be redistributed to unfailed rock, possibly resulting in additional failure and a much larger failure zone than the initial overstressed region.
  - 2. If the failed rock could retain some residual strength, then the rock could remain in place (i.e., no rockfall) and transfer much less stress, resulting in no additional failure or a failure zone only slightly bigger than the original overstressed zone.
- These two scenarios are reflected in the differing CNWRA (1) and DOE (2) opinions on thermal spalling at Yucca Mountain.
- DOE opinion based on discontinuum modeling (UDEC and PFC), CNWRA opinion based on an elastic analysis with a worst-case assumption about post-peak rock behavior in the failed zones.



# **EPRI Modeling**

- 5.5 meter diameter drifts separated by 81 meter pillars
- Material properties, in-situ stresses and temperature boundary conditions from the Drift Degradation Analysis report (BSC, 2004)
- Continuum modeling using FLAC (Itasca). Strain softening properties varied to simulate the range of possible post-peak behavior.
- Discontinuum modeling using UDEC (Itasca). Block model to simulate the actual failure mechanism in the lithophysal tuff. Time dependent drift degradation due to stress corrosion cracking is simulated for 1000 years of thermal loading.



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# **FLAC Modeling**

- Strain softening parameter  $\gamma_c$  used to simulate the brittleness of the post peak behavior (smaller  $\gamma_c$  = more brittle)
- Strength and elastic moduli known, however in general the post peak properties not reported (so  $\gamma_c$  varied over a range of values)
- FLAC simulation of the uniaxial test can be compared with reported results





# **FLAC Results for Category 5 Lithophysal Tuff**



- Category 5 tuff: strongest (30 MPa), highest modulus (19.7 GPa), lowest lithophysal porosity (7%)
- Large spalling region for  $\gamma_c = 0.002$  (left set of figures)
- Small spalling region for  $\gamma_c = 0.005$  (right set of figures)
- (green: at yield in past; pink: yield in shear; purple: yield in tension)



# **FLAC Results for Category 5 Lithophysal Tuff**

- The reason for the stable behavior in the second case is that the cohesion only drops slightly in the spall region, thus only a small transfer of stress occurs
- Compare FLAC uniaxial results with actual test results to estimate likely  $\gamma_c$  value for Category 5 lithophysal tuff


### **FLAC Results for Category 5 Lithophysal Tuff**

- The reason for the stable behavior in the second case is that the cohesion only drops slightly in the spall region, thus only a small transfer of stress occurs
- Compare FLAC uniaxial results with actual test results to estimate likely  $\gamma_c$  value for Category 5 lithophysal tuff



### **FLAC Results for Category 5 Lithophysal Tuff**

- For  $\gamma_c = 0.002$  (FLAC), peak to residual strain less than 0.0001
- For  $\gamma_c = 0.005$  (FLAC), peak to residual strain about 0.0004
- For nonlithophysal tuff (test), peak to residual strain about 0.001
- For Category 5 lith (test), peak to residual strain about 0.015
- Can conclude that only minor spalling is expected in Category 5 lithophysal tuff under thermal loading
- Similar conclusions can be made for the other categories of lithophysal tuff



Source: BSC 2004j, Section 6.5.6, Figure 6.5-20.



### **FLAC Results for Category 3 Lithophysal Tuff**



Category 3 tuff: strength (20 MPa), modulus (10.8 GPa), lithophysal porosity (21%)

Large spalling region for  $\gamma_c$  = 0.005 (left set of figures)

Small spalling region for  $\gamma_c$  = 0.01 (right set of figures)

(green: at yield in past; pink: yield in shear; purple: yield in tension)



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### FLAC Results for Category 1 Lithophysal Tuff



Category 1 tuff: strength (10 MPa), modulus (1.9 GPa), lithophysal porosity (35%)

Large spalling region for  $\gamma_c$  = 0.01 (left set of figures)

Small spalling region for  $\gamma_c$  = 0.05 (right set of figures)

(green: at yield in past; pink: yield in shear; purple: yield in tension)



### FLAC Results for Category 1 Lithophysal Tuff Without Thermal Loading

- Category 1 tuff: weakest (10 MPa), lowest modulus (1.9 GPa), highest lithophysal porosity (35%)
- Some wall spalling is currently observed in the Category 1 lithophysal tuff. FLAC was used to simulate Category 1 tuff without thermal loading
- The results indicate a zone of spalling, with only a minor loss of cohesion in the spall region (no additional damage due to thermal)
- The results are in good agreement with the observed spalling



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### **Do Rocks With Steep Strain Softening Exist?**

- In general, as heterogeneity concentration and heterogeneity size increase, peak to residual strain increases
- Fine-grained granites can have initial microcrack sizes on the order of 0.1 mm. The nonlithophysal tuff has heterogeneities on the order of cm. The lithophysal tuff has heterogeneities with sizes of 10 cm or more.





### **UDEC Modeling**

- A block model was developed to simulate the crack growth mechanism that occurs in the lithophysal tuff
- Rock failure occurs by cracks that connect the individual lithophysae
- Removable blocks are formed by cracks connecting all sides of a block



Figure B-14. Damage in PFC2D Stenciled-lithophysae Specimens (blue is pre-peak, red is post-peak) at an Axial Strain of 0.5% Generated from Lithophysal Cavities of Panel Map at ECRB Station 20+18 to 20+21 (Left Wall)



### **Time Dependent Rock Bridge Failure**

- The segments of rock separating the lithophysae are referred to as rock bridges
- The initial cohesion values for the boundaries of each block are determined based on the size and properties of the rock bridges
- Average rock bridge sizes of 5, 10 and 20 cm have been assumed for Categories 1, 3 and 5 tuff (based on information in BSC, 2004)
- The rock bridge cohesion is calculated as follows:

$$C_o = \frac{K_{IIC}\sqrt{a}}{2w}$$

- This gives initial cohesion values of 3.8, 6.2 and 11.25 MPa for Categories 1, 3 and 5 tuff, which are surprisingly close to the cohesions used in BSC (2004). These cohesion values will decrease with time due to stress corrosion cracking.
- A power-law formulation for crack growth due to stress corrosion cracking is utilized:

Crack Velocity = 
$$A \left[ \frac{K_{II}}{K_{IIC}} \right]^n$$



### **UDEC Results for Category 5 Tuff**



- [left] Number of rock bridges where the cohesion has reduced to zero with time, showing most damage in the first 150 years.
- [right] Location of these bridges after 1000 years of thermal loading (damage zone)
- In order for rockfall to occur, the cohesion on all sides of the block must be zero. Even then, friction can stabilize the block.



### **UDEC Results for Category 5 Tuff**

#### UDEC 4.00

Cycle 196250 Time 7.212E+00 sec Thermal time 1.261E+09 sec block plot joints with FN or SN = 0.0 foint closure max int closure = 7.162E-04 each line micle = 1.430E-04 sheat displacement on joint open joints not included max shear disp = 2.967E-02 each line thick = 7.973E-04



#### **UDEC 4.00**

Cycle 196250 Time 7.212E+00 sec Thermal time 1.261E+09 sec major principal stress cont contour interval= 5.000E+06 -4.500E+07 to -5.000E+06





- The stress remaining in the damage zone is a measure of its integrity (similar to cohesion in FLAC)
- Low stress (dark blue in lower figure) areas are likely to see rockfall
- Overall, UDEC predicts isolated rockfall within the first meter of the damage zone, stable overall
- Similar results for Category 3



### **UDEC Results for Category 1 Tuff**



- Number of broken rock bridges has increased in Category 1 tuff, and also there is an increase with time, even at 1000 years
- Damage zone is larger in Category 1 tuff, however most of the blocks still remain in place due to 1) not all sides of the blocks fractured, and 2) friction still holding blocks in place



#### **UDEC Results for Category 1 Tuff**

#### **UDEC 4.00**

Cycle 191824 Time 6.272E+00 sec Thermal time 1.261E+09 sec block plot

joint closure max jnt closure = 4 160E-04 each line thick = 8 220E-05 shear displacement on joint open joints not included max shear disp = 7 258E-03

each line thick = 1.452E-03



- Low stress (dark blue in lower figure) areas are likely to see rockfall
- Overall, UDEC predicts isolated rockfall within the first 1.5 meters of the damage zone, stable overall

#### **UDEC 4.00**

Cycle 187250 Time 1.457E+01 sec Thermal time 1.261E+09 sec major principal stress cont contour interval= 2.000E+06 -1.800E+07 to 0.000E+00







# UDEC Results for Non-Lithophysal Tuff (regular)





# UDEC Results for Non-Lithophysal Tuff (regular)

#### **UDEC 4.00**

Cycle 181490 Time 1.286E+01 sec Thermal time 1.261E+09 sec block plot joint closure max int closure = 4.014E-04 each line thick = 8.029E-05 joints with FN or SN = 0,0 shear displacement on joint open joints not included max shear disp = 2.227E-03 each line thick = 4.455E-04



#### UDEC 4.00

Cycle 181490 Time 1.286E+01 sec Thermal time 1.261E+09 sec major principal stress cont contour interval= 5.000E+06 -4.000E+07 to -1.000E+07







# UDEC Results for Non-Lithophysal Tuff (fault zone)







### UDEC Results for Non-Lithophysal Tuff (fault zone)

#### **UDEC 4.00**

Cycle 181490 Time 6.658E+00 sec Thermal time 1.261E+09 sec block plot

max int closure = 2.978E-04 each line thick = 5.966E-05 joints with FN or SN = 0.0 shear displacement on joint open joints not included max shear disp = 8.159E-03 each line thick = 1.632E-03

#### UDEC 4.00

Cycle 181490 Time 6.658E+00 sec Thermal time 1.261E+09 sec major principal stress cont contour interval= 5.000E+06 ~4.000E+07 to -5.000E+06







### Conclusions

- The FLAC results indicated that if the strain softening slope is steep enough ( $\gamma_c$  is small enough), large spalling could occur. However, for all categories of lilthophysal tuff, it was found that actual values of  $\gamma_c$  were significantly greater than the critical value necessary for large spalling. Thus stable drifts were predicted with isolated rockfall within the initial overstressed region.
- The UDEC results indicated that a damage zone with a size on the order of 0.5-2.5 meters is created around the drifts due to thermal loading. However, only isolated blocks within the damage zone are expected to produce rockfall. UDEC results also indicated that most of the damage occurs within the first 50-150 years.
- There is good correlation between the FLAC and UDEC results.
- These results are in agreement with DOE results in BSC (2004) and in partial agreement with CNWRA results.
- Neither the FLAC nor the UDEC results predict large amounts of spalling under thermal loading that would fill the drifts with rock blocks



# **Questions?**



### **FLAC Results for Category 3 Lithophysal Tuff**



Lithophysal Porosity = 17.8% (Category 3+)

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### **FLAC Results for Category 1 Lithophysal Tuff**



Lithophysal Porosity = 23.8% (Category 3-)

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### **UDEC Results for Category 3 Tuff**







#### **UDEC Results for Category 3 Tuff**

#### **UDEC 4.00**

Cvcle 191824 Time 6.272E+00 sec Thermal time 1.261E+09 sec

#### **UDEC 4.00**

Cycle 191824 Time 6.272E+00 sec Thermal time 1.261E+09 sec







### **FLAC and UDEC Properties**

Rock	Elastic Props		Rock Mass Strength Props			Strain Softe	ning Props	Temperature Props		
Type	G	K	Co	φ	То	Min values	γc	k	S	α
	GPa	GPa	MPa	deg	MPa	Co, φ, Το		W/m°K	J/kg°K	/°C
Cat1 lith	0.8	1.07	2.9	29	1.5	1e4, 25, 1e4	.01, .05	2.0	920	**
Cat3 lith	4.51	6.01	5.1	35	1.8	1e4, 29, 1e4	.005, .01	2.0	920	**
Cat 5 lith	8.21	10.95	7.6	36	2.5	1e4, 29, 1e4	.002, .005	2.0	920	**

FLAC Properties (\*\*  $\alpha$ =7.46e-6 for temps < 100 °C,  $\alpha$ =9.1e-6 for 100<temp<125,  $\alpha$ =9.98e-6 for temp>125.)

	Intact Rock			I	Rock Mass				
	K	G	Co	φ	Kn	Ks	То	K	G
	GPa	GPa	MPa	Deg	GPa/m	GPa/m	MPa	GPa	GPa
Cat 1 Lith	9.03	6.8	3.8	35	9.34	4.67	1.53	1.07	0.8
Cat 3 Lith	51.37	38.6	6.2	35	53.08	26.57	3.18	6.01	4.51
Cat 5 Lith	93.6	70.5	11.25	35	97.0	48.4	4.92	10.95	8.21

#### **UDEC** Properties

	Intact Rock				Rock Mass				
	K	G	Co	•	Kn	Ks	То	K	G
	GPa	GPa	MPa	Deg	<u>GPa/m</u>	<u>GPa/m</u>	MPa	GPa	GPa
Non-lith average	18.93	13.61	0.1	41	50.0	50.0	0.05	12.04	8.7
Non-lith frac zone	18.93	13.61	0.1	35	50.0	50.0	0.05	9.2	6.3

#### Non-lith (UDEC) Properties



**Protecting People and the Environment** 

# Update on NRC ISL Rulemaking

ACNW Briefing Gary Comfort Division of Intergovernmental Liaison and Rulemaking, FSME December 17, 2007

# Purpose

#### • Brief ACNW

- Background of Rulemaking
- Status of ISL rulemaking effort
- Respond to past ACNW recommendations

# April 11, 2007 Briefing Discussed Technical Basis of Rulemaking

- Legislative and Regulatory Background
- Efforts to Eliminate Dual Regulation
- Staff's Rulemaking Strategy
- EPA Interactions
- Path Forward
- Meetings with EPA and NMA
- Next Steps

# Initial Commission Direction March 2006

- Commission directed staff to initiate rulemaking for groundwater protection at ISLs
  - Focus on eliminating dual regulation of groundwater protection at ISLs
  - Defer regulation to EPA/States through UIC program
  - Actively engage stakeholders
  - Proposed rule to Commission January 2007

## 2006 Interactions with EPA

- June 20, 2006 letter to EPA requests confirmation - UIC rules appropriate standards to which to conform NRC regulations
- August 3, 2006 EPA letter EPA concerned with NRC proposal - suggests discussions before NRC rulemaking effort proceeds. However, because of expedited schedule, staff continued rulemaking effort, while discussing with EPA

# 2006 Interactions with EPA (cont)

- August 3 and August 15, 2006 meetings with EPA 2 major concerns of EPA staff
  - Groundwater standards in 40 CFR 192 are applicable to ISLs and UIC standards are additional requirements
  - EPA does not have sufficient resources to regulate ISLs under expanded UIC program in non-authorized States - had intended to rely on NRC regulatory program for monitoring
- Meetings and discussions with EPA late 2006
  - EPA does not agree to use of UIC standards as basis for ISL groundwater protection
  - EPA UMTRCA-based standards are appropriate requirements
  - EPA expressed willingness to work closely with NRC in rulemaking process

# **Updated Commission Direction**

- Provided Commission Rule Update to Commission in April, 2007 (COMSECY-07-0015)
  - Updated status of rulemaking and resolution of issues brought up by EPA
  - Requested direction to go forth with rule
- SRM directed staff to continue rulemaking
  - Remain diligent in working with EPA/States
  - Establish standards to protect public and environment
  - Reduce/eliminate dual regulation

# **Rule Development**

- Added working group members from EPA (Office of Air and Radiation, Office of Water) and CRCPD
- Developed draft rule language
  - Pulled language from NUREG-1569 and EPA UIC program
  - Focuses primarily on additional requirements specific to groundwater protection at ISLs

# **Recent Interactions with EPA**

- Provided draft rule language to working group members in September 2007
- EPA staff raised concerns about language at September working group meeting
- EPA/NRC staff met in October to try to resolve issues

## **EPA** Issues

- Concerns with use of UIC language
  - NRC using UIC as standard
  - NRC usurping EPA UIC program
  - Precedence of interpretations
  - Preferred NRC to do direct referral to UIC language
- Believed approach did not represent UMTRCA standard strongly enough

# **December Meeting with EPA**

- Meeting included managers from EPA and NRC
- NRC explained why use of UIC language and problems with direct referral of UIC language
- Resolved most outstanding issues
- Plan to provide working group with new version in early 2008

# **Rulemaking Next Steps**

- Continue drafting rule package
- Currently assessing new schedule
  - EPA interactions will result in proposed rule to Commission likely in Fall 2008
  - Schedule needs to include additional meetings with EPA and stakeholders



**Protecting People and the Environment** 

# Update on NRC ISL Rulemaking

ACNW Briefing Myron Fliegel Uranium Recovery Licensing Branch DWMEP, FSME December 17, 2007
## May 9, 2007 ACNW Letter to Chairman Klein

- Based on April 11, 2007 briefing by NRC staff to ACNW
- Presented five recommendations
- Staff is addressing those recommendations in the rulemaking

The FSME staff should proceed with developing the proposed rule, including codification of the appropriate standards specified by the EPA.

• We agree

The rule should provide specific guidance on the threedimensional location of the point of compliance, groundwater monitoring requirements, methods of demonstrating compliance, and financial surety considerations.

- Point of compliance
  - Standards currently define POC in relation to surface impoundment
  - For ISLs, rule will define where restoration standard applies
- Groundwater monitoring requirements will be in the rule
- Methods of demonstrating compliance will be in the rule
- Financial surety already in Appendix A criterion 9

The rule should establish guidance on measures to reduce the likelihood of contaminant excursions outside the mined zone (the exempted aquifer unit that contains the uranium ore deposit) and the site property (the land that is under control of the licensee), and for remediation outside of the mined zone if excursion occurs.

- Excursions the rule will require a net inflow into mining zone
- Remediation will be in the rule

The rule should be risk-informed and should consider groundwater use, onsite effluent disposal, and decommissioning and license termination.

- Risk informed, consider groundwater use ACLs address this
- Onsite effluent disposal
  - evaporation ponds covered by criterion 5
  - deep well injection permitted by EPA or State
- Decommissioning and license termination
  - Decommissioning of wells will be in the rule
  - Decommissioning of site and license termination beyond the scope of rulemaking but already in Appendix A

The rule should provide requirements for establishing premining background or baseline groundwater quality.

• Will be in the rule

## NAC International's Views on the TAD Performance Specification (PS) and Licensing of TAD Systems



Charles W. Pennington Vice President NAC International Norcross, Georgia, USA

December 17, 2007





NAC International Is a Wholly Owned Subsidiary of USEC Inc., a Leading Supplier of Enriched Uranium Fuel for Commercial Nuclear Power Plants NAC International's Views on the TAD Performance Specification (PS) and Licensing of TAD Systems

## **Topics**

- NAC Background Relevant to TAD Systems
- TAD System Development Overview
- Key TAD PS Issues for Parts 71 and 72
- Other Issues/Limitations of Potential Concern
- Discussion



### **NAC Background: Business Organization**





## **TAD System Development Overview**

- DOE has worked well with industry to get PS contents into reasonable range
- TAD PS for Parts 71 and 72 can be met
- TAD PS for Aging Systems requires more discussion with the DOE
- The Committee has heard from others about their issues: try not to be repetitive here
- The following summarizes Parts 71 and 72 issues that may not previously have been covered



### **TAD System Discussion**





## Key Part 71 and 72 TAD PS Issues

- Borated stainless steel in TAD baskets, NRC approval
- Increase of canister design life to 110 years
- Requirements for PWR disposable control rod assembly (DCRA)
- GROA/Aging System flow-through requirements on canister for Parts 71 and 72



## **Borated Stainless (BoSS) in Basket**

- Neutron absorption (poisoning) function
- Maintenance of physical location and chemistry necessary for long term repository service
- Parts 71 and 72 control BoSS in basket design
- NRC approval of ASME Code Case N-510-1?
  - Does design need welding of BoSS?
  - Acceptable BoSS load bearing properties?
- Large BoSS volume, limited PS canister diameter restrict flux traps



## **Increase in Canister Design Life**

- Current designs for storage/transport canisters use 40 to 50 year design life
- PS calls for canister design life of 60 years at plants, 50 years at aging facility
- Foresee no limitations on design life, but requirements to justify, defend, and demonstrate such a change for Parts 71 and 72 unclear



## **PWR DCRA Requirements**

- DCRA necessary for PWR fuel that falls outside post-closure criticality loading curves
- DCRA design and required extent of use not final
- DCRA must be installed at reactor facilities
- Need more DCRA design information on thick Zirc cladding, extended poison coverage, and spider than is offered in PS for Part 71 and 72 licensing
- Water displacement by DCRAs may make flux traps more important
- Licensing schedule makes finalization critical



## GROA/Aging System Flow-Throughs From PS

- PS requires analysis of system drops at GROA from seismic or handling events
- Acceptance criteria at GROA stated as leakage rates
  - 3 g seismic peak acceleration design requirement suspends need for meeting design code allowables
  - normal 1 foot drop and 10,000 year seismic event require meeting design code allowables
- There may be impacts on canister design for storage and transport as a result



# Other Issues/Limitations of Potential Concern

#### Unresolved transport certification issues

- High Burnup Fuel (HiBuF) cladding properties
- Burnup Credit (BuC)
- Moderator Exclusion (ModEx)
- Resolutions of these issues are still works in progress
- For near-term DOE award of TAD development, time has expired for applying resolutions to TADs
- Industry must proceed with current situation



# Other Issues/Limitations of Potential Concern, continued

Transport cask confirmatory drop testing for certification

- Testing of cask system designs: time consuming and costly
- Testing facilities' concurrent availability for all vendors?
- Testing facility audits required to make them approved suppliers
- NRC has expanded testing requirements over last 7 years
  - dynamic analysis time history: g load vs time predictions must agree with test measurements



Drop testing the NAC-STC cask (with impact limiters) containing UMS™ type fuel basket.



# Other Issues/Limitations of Potential Concern, continued

DOE licensing schedule requirements, DOE delays

- Vendors bear risk of NRC licensing schedule
- New designs are most challenging for vendors and NRC with respect to schedules
- Numerous concurrent TAD licensing submittals may tax system
- DOE award delay now of critical proportion
  planned resource availability a concern



# Other Issues/Limitations of Potential Concern, continued

### Implications of Other Issues/Limitations

- They require careful review for TAD development under DOE's procurement requirements
- Vendor reviews may lead to following considerations:
  - make TAD canister design very similar to current storage/transport canister design
  - restrict fuel coverage with respect to HiBuF and BuC for ease and speed of licensing
  - assure TAD transport system design bounded by recently approved transport system testing
  - amend currently certified designs to include TAD system components

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## **Summary and Conclusions**

- NAC believes PS issues can be solved for Parts 71 and 72
- Other issues/limitations (resources, unresolved issues, schedule, DOE delays) are more troubling
- Time is now of the essence of TAD System development



# QUESTIONS and DISCUSSION





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# **ENERGY**SOLUTIONS



Barnwell Low-Level Radioactive Waste Disposal Facility Transition

Presented to: ACNW&M December 18, 2007 By: Bill House



## **Barnwell Site Transition Presentation Summary**

- Barnwell LLRW Disposal Site Status
- In-Region Operations Transition
- Operational Scenarios Considered
- Post 2008 Cost Estimates
- Phase I Closure Transition



## Barnwell Disposal Site Key Event Dates

- 1971 Disposal license issued and Extended Care Maintenance Fund established
- 1976 Lease amended to 235 acres
- 1980 US LLRW Policy Act passed
- 1981 Decommissioning Trust Fund established
- 1982 SC joined Southeast Compact
- **1985** US LLRW Policy Act Amendment passed
- **1995** SC withdrew from Southeast Compact
- 2000 SC joined Atlantic Compact
- 2004 License Renewal Appealed



## **Barnwell Site Summary Facts**

- **36 Years of uninterrupted operations**
- 28 Million cubic feet of waste disposed
- 12 Million Curies buried
- **3** Million Curies remaining inventory
- 119 Acres of disposal trenches
  - 96 Acres of trenches capped



## **Volumes under Atlantic Compact**

	Volume Allowed	Actual Volume
FY 2000-2001	160,000 cu ft	125,989 cu ft
FY 2001-2002	80,000 cu ft	57,763 cu ft
FY 2002-2003	70,000 cu ft	65,656 cu ft
FY 2003-2004	60,000 cu ft	59,516 cu ft
FY 2004-2005	50,000 cu ft	43,260 cu ft
FY 2005-2006	45,000 cu ft	44,988 cu ft
FY 2006-2007	40,000 cu ft	37,607 cu ft
FY 2007-2008	35,000 cu ft	(7/1/07 – 11/30/07) <b>11,674 cu ft</b>

•Members: SC, CT, NJ. No out of compact waste after FY 07/08.



## **Barnwell Site Class B/C Volumes**

	FY 2002/2003	FY 2003/2004	FY 2004/2005	FY 2005/2006	FY 2006/2007
	(cu. ft.)	(cu. ft.)	(cu. ft.)	(cu. ft.)	(cu. ft.)
Atlantic Compact	4,495	11,942 <sup>2</sup>	2,894	4,791	4,552
Texas Compact (2 states)	1,081	909	1,127	549	927
34 States w/o Access after 6/30/08	24,694 <sup>1</sup>	20,524 <sup>3</sup>	16,923	14,761	19,580 <sup>4</sup>
Totals	30,270	33,375	20,944	20,101	25,059
Totals w/o RPVs	20,734	23,038	20,944	20,101	21,929

<sup>1</sup> Includes 9,536 cu.ft. for the ME Yankee RPV

- <sup>2</sup> Includes 7,507 cu.ft. for the CY RPV
- <sup>3</sup> Includes 2,830 cu.ft. for the Big Rock RPV

<sup>4</sup> Includes 3,130 cu.ft. for the LaCrosse RPV



## **Current Disposal Operations**

### Three Trench Designs

- Large (Class A) Waste Trench
- Class B/C Trench
- Slit Trench

### Concrete Disposal Vaults or equivalent

- Liners, drums, boxes in standard vaults (cylindrical, rectangular, and slit trench)
- Large components encapsulated in specifically designed vaults
- Large components assessed as the vault



# **In-Region Transition Planning**

- Projecting waste volumes
- Evaluating operating approaches
- Evaluating trench design options
- Determining cost assumptions
- Developing various cost estimates
- Identifying funding sources
- Building consensus of the parties



## **Atlantic Compact Waste Volumes**

Waste Class	FY 2003/2004 (cu. ft.)	FY 2004/2005 (cu. ft.)	FY 2005/2006 (cu. ft.)	FY 2006/2007 (cu. ft.)
Class A	8,577	6,080	10,146	3,529
Class B	1,742	1,245	1,998	2,268
Class C	10,144	1,648	2,792	2,284
Total	20,463	8,973	14,936	8,081

FY 03/04 includes 7,508 cu. ft. Class C Large Component



## **Atlantic Compact Generators**

- Dominion, Millstone (2), CT
- Duke, Catawba (2), Oconee (3), SC
- Excelon, Oyster Creek (1), NJ
- Progress, Robinson (1), SC
- PSEG, Hope Creek (1), Salem (2), NJ
- SCE&G, VC Summers (1), SC
- US Navy, New London, CT, Charleston, SC
- Others (non-fuel cycle)



## Atlantic Compact Volume Projections (July 2007)

#### High-end waste volume

- 11,344 cubic feet A/B/C 2008/2009
- 7,500 cubic feet held waste 2008/2009
- Large components
- Hardware
- Low-end waste volume
  - Less than 4,000 cubic feet B/C only



## **In-Region Base Case Scenarios**

### 4,000 cubic feet Class B,C waste

- Waste acceptance and active disposal operations two to three months per year
- One trench design
- 11,000 cubic feet Class A,B,C waste
  - Waste acceptance throughout the year
  - Disposal of waste when it is received
  - One trench design

Disposal of irradiated hardware and large components not included



## Trench Design / Construction Options Considered for In-Region Operations

- Pre-staged Vault Array (single layer)
- Class A, B, C Progressive Trench
- Existing Class B/C Trench


### **Pre-Staged Vault Array**





#### Class A/B/C Trench Phased Trench Construction





### **Class B/C Trench**





### **Trench Option Comparisons**

Parameter	<b>Pre-Staged</b>	Class A,B,C	Class B/C
Licensing Effort	High	Medium	Complete
Constructability	Potentially Difficult	Moderately Difficult	Already Established
Personnel Exposures	Potentially Low	Moderate	Low
Stormwater Management	Potentially Difficult	Potentially Low	Low
Enhanced Cap Costs	High	Low	Medium



## **General Cost Estimating Assumptions**

- Existing regulatory and license requirements
- Cost structure for scenarios except institutional costs based on PSC application structure
- Labor and material costs based on FY 06-07 rates
- License fees and other reimbursable costs beyond control of site operator based on FY 06-07 rates
- Waste volume scenarios include costs of trench construction, disposal vaults, and license maintenance



## **Cost Scenarios Estimated**

#### Institutional Costs for Completed Site Areas

- Site maintenance and monitoring
- Operating Costs with No Waste Acceptance
  - Disposal operating license maintenance
- 4,000 Cubic Feet Class B, C Only
  - One trench, no hardware or components
- 11,000 Cubic Feet Class A, B, C

- One trench, no hardware or components



# Institutional Costs (Completed Portion of Site)

Category of Costs	Annual Estimate
Environmental Monitoring	\$577,804
Site Maintenance	\$192,917
Site Security	\$176,936
Insurance	\$477,443
Utilities, Accounting, etc.	\$446,691
Site Operator Costs Total	\$1,871,791
G&A and Margin (14%)	\$530,137
License Fees	\$215,362
Total Institutional Costs	\$2,617,290



## **Operating License Costs** (No Waste Accepted)

Category of Costs	Annual Estimate
Fixed Costs	\$2,548,427
Variable Costs	\$0
Irregular Costs	\$49,000
Site Operator Costs Total	\$2,597,427
Statutory Margin	\$753,254
Reimbursable Costs	\$353,466
<b>Total Operating Costs</b>	\$3,704,147



### 4,000 Cubic Feet Costs

Category of Costs	Annual Estimate
Fixed Costs	\$3,862,618
Variable Costs	\$215,858
Irregular Costs	\$77,000
Site Operator Costs Total	\$4,155,476
Statutory Margin	\$1,205,088
Reimbursable Costs	\$595,466
Total Operating Costs	\$5,956,030



## 11,000 Cubic Feet Costs

Category of Costs	Annual Estimate
Fixed Costs	\$4,376,967
Variable Costs	\$592,456
Irregular Costs	\$126,000
Site Operator Costs Total	\$5,095,423
Statutory Margin	\$1,477,673
Reimbursable Costs	\$1,018,966
Total Operating Costs	\$7,592,062



## **Summary Costs Table (in \$000s)**

Cost Category	Institutional Costs	No waste	4,000 cu. ft.	11,000 cu. ft.
Fixed	\$2,081	\$2,548	\$3,863	\$4,377
Variable	0	0	\$216	\$592
Irregular	0	\$49	\$77	\$126
Site Operator Costs Total	\$2,081	\$2,597	\$4,156	\$5,095
Margin	\$321	\$753	\$1,205	\$1,478
Reimbursable	\$215	\$353	\$595	\$1,019
Total Op Costs	\$2,617	\$3,704	\$5,956	\$7,592



## **Total Operating Cost Comparison**

**Total Operating Cost Comparison** 





### **Approximate Labor Resources** (Full Time Equivalents – not staffing levels)

Labor Categories	Institutional	No Waste	4,000 cu. ft.	11,000 cu. ft.
Management/Accounting/ Support Staff	2	2	3	5
Security	4	4	5	5
Environmental	6	7	7	7
Compliance & HP	1	3	4	5
Operations	1	3	5	7
Total	14	19	24	29



## **In-Region Transition Status**

#### Cost estimates presented to primary parties

- Budget and Control Board
- Atlantic Compact Commission
- Compact Generators (utilities)
- Department of Health and Env. Control
- Continue working toward an economically viable In-Region operations scenario
  - Waste volume commitments
  - Stabilize costs beyond site operator's control
  - Institutional cost reimbursement mechanism



## **Barnwell Site Transition Planning**

- Updated 2005 Closure Plan cost estimates
- Preparing financial authorization request to Budget and Control Board
- Capping project (7 acres) in spring 2008
- Preparing Performance Objectives Verification Plan for DHEC review
- Phase I Closure is 15-month project starting July, 2008



## **Barnwell Site Configuration**





## **Engineered Cap Components**

- 2 feet soil cover and vegetation layer
- I foot sand drain layer
- 60 mil HDPE liner
- Geosynthetic clay layer
- I foot recompacted clay layer
- Compacted backfill / waste zone



#### Site Closure Cost Estimate (November, 2007)

Category of Costs	Project Estimate
Structures & Equipment D&D	\$1,280,185
Enhanced Capping	\$7,015,577
Site Maintenance and Monitoring	\$1,735,383
Performance Objective Verification	\$853,002
Grading, Stormwater, Land, Fences	\$1,137,434
Security, Wells, Records, Other	\$2,620,123
Project Management	\$3,197,869
Total Phase I Closure Costs	\$17,839,573



## **Environmental Radiological Performance Verification**

- ERPV completed in 2003 and accepted by DHEC and Peer Review Panel
- Site-specific groundwater model using long term environmental data (25 yrs)
- Tritium is 20% of limit at compliance point
- Maximum tritium projection is 50% of limit
- Hypothetical dose at compliance point
- Site performance projected for 2000 years



## **Tritium Migration Status**

**Barnwell Site Tritium Concentrations** 



For information, the approximate Energy Solutions/Chem-Nuclear Systems (CNS) property boundaries are shown.



## **State Budget and Control Board**

- Accepts break-even operating scenario, but must implement suspended operations if the condition arises
- Issued letter to Compact generators asking for commitment to support the Site
- Supports paying institutional costs from Extended Care and Maintenance Fund
- Hired contractor to evaluate adequacy of the Extended Care and Maintenance Fund



## **Transition Period 2008 - 2010**

- Accept 35,000 cu. ft. waste through June, 2008
- Complete Phase I Closure / gain DHEC acceptance
- Accept In-Region operating wastes and held waste
- Continue using existing trenches
- Finalize baseline In-Region volumes
- Establish actual institutional costs and reimbursement mechanism
- Reduce staff for institutional activities and In-Region disposal operations



#### Strategic Assessment of NRC's Low-Level Radioactive Waste Regulatory Program

**Environmental and Performance Assessment Directorate** 

**Division of Waste Management and Environmental Protection** 

Office of Federal and State Materials and Environmental Management Programs

December 18, 2007

#### Scope

National LLW program

NRC LLW regulatory program

NRC strategic assessment

#### **Low-Level Waste Authorities and Responsibilities**

- Governing legislation
  - Atomic Energy Act of 1954
  - Low-Level Radioactive Waste Policy Amendments Act of 1985
- LLRWPA assignment of responsibilities
  - States responsible
  - Regional compacts
  - Incentives and penalties
  - Exclusion of out-of-region waste
- NRC responsibilities
  - Regulatory framework for LLW disposal
  - Assistance to NRC Agreement States
  - LLW licensing, as necessary, esp. for GTCC facility
- Agreement States
  - Currently regulate all LLW disposal sites in U.S. and majority of LLW generators
- Others
  - Generators, brokers, processors, disposal facility operators

#### **Commercial LLW Sites in U.S.**

**US Ecology** 

Hanford



#### Class B/C Disposal Access in U.S. (as of June 30, 2008)





Atlantic Compact

#### Future Need vs. Existing Capacity for LLW Disposal

LLW Generators	Future Need <sup>1</sup>	Existing Capacity
Northwest and Rocky Mountain Compacts (11 States)	20,000 – 86,000 ft³/yr, all waste classes	Assured access to Hanford LLW facility for next 50 years for all waste classes
Atlantic Compact (3 States)	Class A: 300,000 – 800,000 ft³/yr Class B/C: 4000 – 12,000 ft³/yr	Access to Barnwell through approximately 2050, and EnergySolutions for 19 more years
Rest of U.S. (36 States)	Class A: 2.5 – 3.3 million ft³/yr Class B/C: 10,000 – 35,000 ft³/yr	Class A – 19 years capacity at EnergySolutions in Clive, Utah Class B/C – after June 30, 2008, no options for disposal. Texas facility possible for TX and VT generators in 2009.

1. Based on current LLW generation rates. Rates approximate per year over last 5 years.

#### **Current Issues in National Low-Level Waste Program**

- Consideration of major changes in national program
  - GAO, NAS, HPS views
  - Establish risk-based rather than origin-based system
  - Revise/rescind LLRWPAA
  - Allow use of DOE sites by commercial generators
- Lack of disposal option for B/C waste
  - Barnwell closure to out-of-compact generators in mid-2008. 36 States affected. Need for possible long-term storage of B/C waste
  - Texas license application, but only for TX and VT
  - Sealed sources
- GTCC disposal

#### **Direction of Industry**

- Efforts to mitigate limited disposal availability and high costs
  - Increased use of RCRA facilities for low-activity LLW
  - Waste minimization and process changes
  - Extended storage
- Research on risk-informing waste classification
- Longer term interest in rulemakings

#### National Developments Affecting LLW Generation

- License renewal
  - Fewer reactors entering decommissioning
  - Declining volumes of low-activity waste for disposal
- New reactors
  - 19 COL applications through 2009 for 28 new units
  - Operational LLW volumes small, activity large, capabilities to store
- New fuel cycle facilities
  - Depleted uranium
- Global Nuclear Energy Partnership
  - Potential for new waste streams
  - Technical basis for 10 CFR Part 61
  - Need for additional analysis for disposal
- Materials users
  - Impacted by loss of access for B/C disposal
  - Sealed source focus

#### **NRC Regulatory Program**

#### **Background/Recent History**

- September 1996 Strategic Assessment Issue Paper
- March 1997 Commission Direction to Staff: Maintain LLW Program at Current Level (5-10 FTE)
- Current (FY 2008) Program: ~ 5 FTE, primarily focused on maintenance tasks

#### **Core Responsibilities**

- Regulatory framework for LLW disposal
- Assistance to NRC Agreement States and other stakeholders
- LLW licensing, as necessary, esp. for GTCC facility and import/export

#### Some Internal LLW Activities (Baseline Work)

- Import/export licensing
- Support to NRC Regions, other Offices
- Reviews of Agreement State disposal programs
- Technical assistance to Agreement States
- International work (standards review, e.g.)
- Greater-than-Class C disposal
- Case-by-case approvals of low-activity waste disposals

#### **NRC LLW Program**

#### <u>External</u>

#### **Internal**


## LLW Program Strategic Assessment

### **Objectives**

- Position the LLW program to meet current and future challenges
- Ensure limited resources are used effectively

## Approach

- Define objectives
- Scope the issues, including gathering of stakeholder views
- Identify potential NRC actions
- Prioritize
- Develop implementation plan

### **Process**



#### **Stakeholder Input**

- ACNW Workshop May 23-24, 2006
- Federal Register Notice, July 7, 2006
- Broad Categories of Stakeholders
  - States
  - U.S. Military
  - Compact Commissions
  - Industry Groups/Trade Associations
  - Professional Societies
  - Environmental/Public Interest Groups
- Specific Input
  - NAS Report on LAW
  - GAO Report on International Practices
  - ACNW&M White Paper and Letter Reports
  - Supplemental Interactions with States
  - Various Position Papers

#### **Issues Raised by Stakeholders**

- Risk-informing
- Closure of Barnwell to out-of-compact waste
- Low-activity waste disposal
- Use of DOE disposal sites
- Waste classification
- Unintended consequences

## **Methods for Addressing Issues**

- Legislative changes
- Rulemakings
- Guidance
  - Alternate waste classification
  - LLW storage
  - Concentration averaging
  - Waste minimization
  - Low-activity waste disposals in RCRA facilities

### **Decisionmaking Criteria**

- Agency strategic goals safety, security, effectiveness, and openness
- Need (time frame)
- Level of effort
- Benefit
- Additional considerations
- Scenario applicability

## Summary of Tasks Evaluated by Staff

- Evaluate potential changes in LLW regulatory program to address curtailment of disposal capacity
- Promulgate rule for disposal of LAW
- Publish Standard Review Plan (SRP) for import/export license reviews
- Examine alternatives for DU disposal
- Update LLW extended storage guidance
- Develop licensing criteria for GTCC disposal facility
- Develop guidance for 10 CFR 20.2002 LAW disposals
- Identify and evaluate potential legislative changes
- Consolidate LLW guidance
- Implement major revisions to 10 CFR Part 61

- Coordinate with other agencies on consistency in regulating LAW disposal
- Develop guidance that summarizes disposition options for low-end materials and waste
- Identify new waste streams (GNEP, e.g.)
- Develop SRP for 10 CFR 61.58
- Develop criteria for LLW disposal in mill tailings impoundments
- Update Concentration Averaging
  BTP
- Develop Information Notice on Waste Minimization
- Examine need for guidance on defining when RAM becomes LLW
- Perform scoping study on financial assurance
- Develop and implement National Waste Tracking System

# **High-Priority Tasks**

Task No.	Description	Schedule		
1	Update storage guidance Review industry guidance for	2 <sup>nd</sup> quarter '08 4 <sup>th</sup> quarter '08		
	reactors			
2	Develop guidance on 20.2002	4 <sup>th</sup> quarter '08		
3	Investigate DU from enrichment plants	4 <sup>th</sup> quarter '08		
4	Update BTP on concentration averaging	Begin 2 <sup>nd</sup> quarter '08		
5	Develop import/export procedure	Begin '09		
6	Develop guidance on 61.58	Revisit '09		
7	Perform scoping study of financial assurance	Revisit '09		

### LLW Storage Guidance -- Example

- Information Notice 90-09 for materials and fuel cycle licensees
  - Review and evaluation of existing guidance
  - Contacts with selected State programs
  - Contacts with Regional licensing and inspection personnel
  - Updated guidance to be published early 2008
- NEI/EPRI guidance for nuclear power reactors
- Consolidated guidance in NUREG
- Inspection procedures

### **Future**

- Implementation of high priority tasks
- Commission direction
- Coordination with States and other stakeholders
- Coordination with ACNW&M
  - All major products
  - As early as practicable
  - Near-term
    - DU disposal
    - 20.2002 guidance
    - LLW storage issues
    - Other

#### References

- LLW Strategic Assessment Commission Paper SECY-07-0180, October 17, 2007 (http://www.nrc.gov/reading-rm/doccollections/commission/secys/2007/)
- GAO reports on LLW
  - Disposal Availability Adequate in the Short-Term, but Oversight Needed to Identify Any Future Shortfalls (GAO-04-604), 2004
  - DOE Needs Better Information to Guide Its Expanded Recovery of Sealed Radiological Sources (GAO-05-967), 2005
  - Approaches Used by Foreign Countries May Provide Useful Lessons for Managing U.S. Radioactive Waste (GAO-07-221), 2007
- NAS report on LAW
  - Improving the Regulation and Management of Low-Activity Radioactive Wastes (2006)



# Presentation to ACNW&M on Waste Management at the Mixed Oxide Fuel Fabrication Facility David Tiktinsky, NMSS/FCSS December 18, 2007



# Background

- Construction Authorization issued by NRC for Mixed Oxide Fuel Fabrication Facility (MFFF) in March 2005
- License Application (LA) to possess and use radioactive material submitted in September 2006 and accepted for docketing by NRC in December 2006
- NRC is currently reviewing LA
- Nuclear construction began August 1, 2007
- Current schedule estimates for completion of Final Safety Evaluation Report by:
  - December 2010 without hearing
  - December 2011 with hearing



### **MFFF & Support Buildings**



### Construction Statistics

#### **Buildings:**

#### 600,000 square feet

Concrete: Reinforcing steel: Excavation: Engineered fill: 170,000 cubic yards 35,000 tons 980,000 cubic yards 54,000 tons Conduit:500,000 linear feetCable tray:47,000 linear feetPower/control cable:3,000,000 linear feetProcess piping:>80 miles



## **MFFF Process Overview**

#### **Aqueous Polishing (AP)**

- Primarily used to remove Ga & Am contaminants
- PuO<sub>2</sub> Also removes other impurities



Liquid waste generated



# Liquid Waste Generation in Aqueous Polishing Process

- High alpha activity waste stream
  - Liquid americium
  - Excess acid
  - Alkaline
- Stripped uranium stream
  - Less than 0.96 % uranium-235
- Low level liquid waste stream
  - Very low radioactive contamination or the potential for radioactive contamination
    - Lab rinsing water
    - Sanitaries rinsing water
    - HVAC condensate
    - Distillate waste
    - Chlorinated effluents
- Solvent waste stream
  - Generated from solvent recovery process
  - Slightly contaminated



# Liquid Waste Generation at the MFFF





# **Liquid Waste Generation Basis**

- High alpha activity waste stream
  - Maximum expected volume
    - 39,000 L (10,300 gal) per year
    - Up to 25 batch transfers per year
- Stripped uranium stream
  - Maximum expected volume
    - 166,600 L (44,000 gal) per year
    - Up to 42 batch transfer per year
- Low level liquid waste stream
  - Maximum expected volume
    - 1,078,000 L (285,000 gal) per year
    - Up to 80 batch transfers per year



# **Liquid Waste Holdup Capabilities**

- High Alpha Waste Collection Tanks
  - 2 tanks
  - 10,500 liters each
  - More than 6 months holdup capacity
  - Agitated or recirculated to mix tanks
- Stripped Uranium Collection Tanks
  - 4 tanks
  - 11,000 liters each
  - More than 3 months holdup capacity
  - Agitated or recirculated to mix tanks
- Low Level Liquid Collection Tanks
  - 2 tanks
  - 11,500 liters each
  - 7 day holdup capacity



# **Solvent Waste Stream**

- Excess solvent waste
  - Generated from solvent recovery process
  - Less than 17.2 mg Pu/yr
  - Approximately 10,600 L (2,800 gal) per year
    - Collected in 1500 L (400 gal) holding tank
  - Sampled to determine compliance with Waste Acceptance Criteria (WAC)
  - Batch transferred to 1000 L (300 gal) carboy or suitable container
  - Containers transferred to Savannah River Site (SRS)
  - Approximately 11 transfers per year



# Liquid Waste Transfer Protocol

- Waste transferred in dedicated lines to Waste Solidification Building (WSB) (operated by DOE not MOX Services)
  - Buried underground
  - Double walled stainless steel pipe
  - High alpha transfer line is Item Relied on for Safety (IROFS)
  - Approximately 2000 feet
  - Leak detection system
  - Designed to withstand seismic events and other applicable events



# Solid Waste

- Loaded into drums
- TRU Waste
  - Approximately 1100 drums/year
  - 550 drum storage capacity (180 days)
  - Final disposition at WIPP
- LLW
  - Approximately 1500 drums/year
  - 150 drum storage capacity (30 days)
  - Transferred to SRS or vendor for disposition



# MOX Services – SRS Interface Control Documents

- Waste acceptance criteria
  - Consistent with MOX waste streams
  - Consistent with Integrated Safety Analysis
- Provides for notifications between MFFF and WSB management
- Waste sampled and analyzed prior to transfer



# What would happen if operations at the WSB have to be suspended?

- MOX Services response
  - Follow operating procedures that will be developed with respect to this contingency
  - Resolve the event
- Potential impacts
  - Stop transfer of waste from MFFF to WSB
  - Store waste in holding tanks at MFFF
  - Suspend waste generating operations
  - Maintain facility in safe condition until issue resolved
    - Potential events involving inability to transfer waste have been evaluated in the Integrated Safety Analysis (under review by the staff)
    - Agitators and/or recirculation capability provided in storage tanks to ensure mixing of tank contents
- MOX Services and WSB procedures will provide for contingencies for any facility disruptions



# Waste Solidification Building Status (regulated by DOE)

- DOE Critical Decision (CD) 2 (approved baseline) and 3 (construction) in 2008
- Plan to start construction in 2010, operations in 2013
- Construction schedule consistent with MFFF construction and startup schedules



# Conclusions

- Low level liquid waste stream storage capacity is the limiting factor, related to curtailing operations at MFFF, in the event of unavailability of the WSB
- MFFF has contingency plans to shutdown in a safe state if WSB is unavailable



# Reactor Oversight Process Overview

# **ROP** Overview - Key Attributes

- Baseline and Supplemental Inspections
- Significance Determination Process
- Performance Indicators
- Assessment Program
  - Safety Culture
  - Industry Trends Program
  - Agency Action Review Meeting
  - Enforcement
  - Self-Assessment Process

#### **REGULATORY FRAMEWORK**



# **Reactor Oversight Process**



# Action Matrix Concept

Licensee	Regulatory	Degraded	Multiple/Rep.	Unacceptable	
Response	Response	Cornerstone	Degraded Cornerstone	Performance	



**Increasing Safety Significance** 

**Increasing NRC Inspection Efforts** 

Increasing NRC/Licensee Management Involvement

**Increasing Regulatory Actions** 

# **Action Matrix**

#### Exhibit 5 - ACTION MATRIX

		Licensee Response Column	Regulatory Response Column	Degraded Cornerstone Column	Multiple/ Repetitive Degraded Cornerstone Column	Unacceptable Performance Column	IMC 0350 Process
RESULTS		All Assessment Inputs (Performance Indicators (PIs) and Inspection Findings) Green; Cornerstone Objectives Fully Met	One or Two White Inputs (in different cornerstones) in a Strategic Performance Area; Cornerstone Objectives Fully Met	One Degraded Cornerstone (2 White Inputs or 1 Yellow Input) or any 3 White Inputs in a Strategic Performance Area; Cornerstone Objectives Met with Moderate Degradation in Safety Performance	Repetitive Degraded Cornerstone, Multiple Degraded Cornerstones, Multiple Yellow Inputs, or 1 Red Input; Cornerstone Objectives Met with Longstanding Issues or Significant Degradation in Safety Performance	Overall Unacceptable Performance; Plants Not Permitted to Operate Within this Band, Unacceptable Margin to Safety	Plants in a shutdown condition with performance problems placed under the IMC 0350 process
RESPONSE	Regulatory Performance Meeting	None	Branch Chief (BC) or Division Director (DD) Meet with Licensee	DD or Regional Administrator (RA) Meet with Licensee	RA (or EDO) Meet with Senior Licensee Management	Commission meeting with Senior Licensee Management	RA (or EDO) Meet with Senior Licensee Management
	Licensee Action	Licensee Corrective Action	Licensee root cause evaluation and corrective action with NRC Oversight	Licensee cumulative root cause evaluation with NRC Oversight	Licensee Performance Improvement Plan with NRC Oversight		Licensee Performance Improvement Plan / Restart Plan with NRC Oversight
	NRC Inspection	Risk-Informed Baseline Inspection Program	Baseline and supplemental inspection procedure 95001	Baseline and supplemental inspection procedure 95002	Baseline and supplemental inspection procedure 95003		Baseline and supplemental as practicable, plus special inspections per restart checklist.
	Regulatory Actions <sup>1</sup>	None	Supplemental inspection only	Supplemental inspection only	-10 CFR 2.204 DFI -10 CFR 50.54(f) Letter - CAL/Order	Order to Modify, Suspend, or Revoke Licensed Activities	CAL/order requiring NRC approval for restart.
COMMUNICATION	Assessment Letters	BC or DD review/sign assessment report (w/ inspection plan)	DD review/sign assessment report (w/ inspection plan)	RA review/sign assessment report (w/ inspection plan)	RA review/sign assessment report (w/ inspection plan)		N/A. RA (or 0350 Panel Chairman) review/ sign 0350-related correspondence
	Annual Public Meeting	SRI or BC Meet with Licensee	BC or DD Meet with Licensee	RA (or designee) Discuss Performance with Licensee	RA or EDO Discuss Performance with Senior Licensee Management		N/A. 0350 Panel Chairman conduct public status meetings periodically
	Commission Involvement	None	None	None	Plant discussed at AARM	Commission Meeting with Senior Licensee Management	Commission meetings as requested, restart approval in some cases.
	INCREASING SAFETY SIGNIFICANCE>						

Note 1: Other than the CAL, the regulatory actions for plants in the Multiple/Repetitive Degraded Cornerstone column and IMC 0350 column are not mandatory agency actions. However, the regional office should consider each of these regulatory actions when significant new information regarding licensee performance becomes available. Note 2: The IMC 0350 Process column is included for illustrative purposes only and is not necessarily representative of the worst level of licensee performance. Plants under the IMC 0350 oversight process are considered outside the auspices of the ROP Action Matrix. See IMC 0350, "Oversight of Operating Reactor Facilities in a Shutdown Condition with Performance Problems," for more detail.



#### Performance Results in all 7 Cornerstones of Safety

# PI/SDP Significance Threshold

#### **Performance Indicators**

Green:	Acceptable performance
White:	Performance outside normal range
Yellow:	Significant reduction in safety margin
Red:	Performance significantly outside of design basis

#### **Inspection Findings**

Green:	Very low safety issue	
White:	Low to moderate safety issue	
Yellow:	Substantial safety issue	
Red:	High safety issue	
#### Significance Determination Process

#### There are 9 SDPs currently developed for the ROP.

- At-Power Situations SDP
- Emergency Preparedness SDP
- Occupational Radiation Safety SDP
- Public Radiation Safety SDP (proposed draft revision)
- Physical Protection SDP
- Fire Protection and Post-Fire Safe Shutdown SDP
- Shutdown Safety SDP
- Containment Integrity SDP
- Operator Requalification, Human Performance
- Steam Generator Tube Integrity SDP |
- Maintenance Risk Assessment and Risk Management SDP

# **Baseline Inspection Program**

- Minimum Level of Inspection Conducted at All Plants Regardless of Performance
  - Three Basic Parts:
    - Inspection in Areas Where Performance Indicators Are Not Identified or Do Not Fully Cover A Cornerstone
    - Performance Indicator Verification
    - Licensee Problem Identification and Resolution Program (PI&R)

#### **Performance Indicators in the Seven Cornerstones**



#### **Typical Performance Indicator**



Thresholds: White > 3.0 Yellow > 6.0 Red > 25.0

## Assessment Program

- Performance Indicators and Inspection Findings Are Equally Weighted to Arrive at an Overall Assessment of Plant Performance.
- Action Matrix Is Used to Assess Performance and Determine Regulatory Actions.
- Quarterly, Mid-Cycle and End of Cycle Assessments Are Performed for Each Licensee.
- Assessment Letters sent to all licensees after the Mid-Cycle and End-of- Cycle Assessments.

## Action Matrix Summary

#### Status at End of CY 2005

Licensee Response	84
Regulatory Response Degraded Cornerstone	12 4
Unacceptable	0
Total	103

#### SECY-07-0112

Staff Evaluation and Proposed Revision to the Public Radiation Safety SDP to Address Radioactive Liquid Spills and Leaks, July 6, 2007

#### SRM for SECY-07-0112, September 12, 2007

- Approved the staff's proposed changes to the Public Radiation Safety SDP
- ROP Basis Document (IMC 0308) should capture basis
- Staff should update NRC's public web page on groundwater tritium issues with a summary of actions taken or planned to close out LLTF recommendations.

# Public Radiation Safety SDP Revision

- Address Radioactive Spills and Leaks
- Remove Green finding in Rad Material Control Branch for >5 Occurrences
- Remove denial of access to Low Level Burial Grounds

## Public Radiation Safety SDP Flow Chart



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# Proposed Public Radiation Safety SDP Flow Chart

#### PUBLIC RADIATION SAFETY



#### **Transportation Flow Chart**



## Proposed Transportation Flow Chart

