



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON NUCLEAR WASTE
WASHINGTON, DC 20555 - 0001

ACNWS-0165

August 28, 2006

The Honorable Dale E. Klein
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Chairman Klein:

SUBJECT: SUMMARY REPORT—172ND MEETING OF THE ADVISORY COMMITTEE ON NUCLEAR WASTE, JULY 17–20, 2006, AND RELATED ACTIVITIES OF THE COMMITTEE

During its 172nd meeting, July 17–20, 2006, the Advisory Committee on Nuclear Waste (ACNW), discussed several matters and completed the following reports.

REPORTS

Reports to Dale E. Klein, Chairman, NRC, from Michael T. Ryan, Chairman, ACNW:

- The Draft 2006 ICRP Revised Recommendations of the International Commission on Radiological Protection, dated July 18, 2006
- Expanded Potential Nuclear Regulatory Commission Use of the Center for Nuclear Waste Regulatory Analyses Expertise, dated July 28, 2006 **[Official Use Only]**

HIGHLIGHTS OF KEY ISSUES

1. U.S. Department of Energy (DOE) Briefing on Exploratory Drilling of Aeromagnetic Anomalies in the Yucca Mountain Region

Dr. Frank Perry (Los Alamos National Laboratories) briefed the Committee about a drilling program that supports an ongoing expert elicitation update on Probabilistic Volcanic Hazard Assessment (PVHA-U) for Yucca Mountain. The drilling program is designed to drill exploratory boreholes at locations of seven aeromagnetic anomalies and determine whether buried volcanoes are present, and if so, to ascertain their ages. The results will be used by the PVHA-U expert panel to update current estimates of the probability of future volcanism disrupting a repository. Four of the seven boreholes penetrated basalts, and preliminary ages have been obtained using radiometric dating. DOE is integrating the new results with the existing volcanic framework of Yucca Mountain.

Committee Action

This briefing will assist ACNW in preparing a white paper that will provide an analysis of the current state of knowledge of igneous activity which the Commission can use as a technical basis for decisionmaking.

2. U.S. Nuclear Regulatory Commission (NRC) Staff Review of Revised International Commission on Radiological Protection (ICRP) Draft Recommendations

The Committee was briefed by Drs. Donald Cool and Vincent Holahan, both with NRC's Office of Nuclear Materials Safety and Safeguards. Their talk was titled "Preliminary Observations on ICRP's 2006 Draft Recommendations." The speakers outlined the history of ICRP's recommendations, presented an overview of the revised recommendations, and gave examples of the staff's preliminary observations. The NRC staff review reportedly will be provided to the NRC Commissioners by the end of July, 2006. Comments are due to ICRP by September 15, 2006. One of the preliminary conclusions reached by the NRC staff is that the draft 2006 recommendations improve on the 2004 version, but do not yet achieve the stated ICRP objectives which are to incorporate new biological and physical information in the setting of radiation protection standards, and to improve, simplify, and consolidate the presentation of the recommendations.

Committee Action

During this meeting the Committee prepared and finalized a letter to Chairman Klein on this topic, dated July 18, 2006. This letter states that the revised 2006 Draft ICRP Recommendations make an important point regarding risk estimates:

"In summary, the Commission [ICRP] considers that while the nominal risk estimates are now slightly smaller than in 1990, for practical purposes the risk is in the same order of magnitude as before. Thus, the approximate overall risk coefficient of about 0.00005 per mSv on which the current international radiation safety standards are based continues to be appropriate for purposes of radiological protection."

The Committee concurs with this ICRP statement and concludes that a fundamental change to NRC radiation protection standards is not needed at this time. The Committee agrees with NRC staff concerns regarding references to unpublished work, and the need to ensure that the recommendations reflect the current state of knowledge. The Committee also concurs with the NRC staff view that ICRP should not adopt a new set of tissue weighting factors and nominal risk coefficients until the latest assessment of the A-bomb data is completed and published.

3. Exchange of Information Between the Office of Nuclear Material Safety and Safeguards Management and Advisory Committee on Nuclear Waste Members

Mr. Aby Mohseni, from NRC's Office of Nuclear Material Safety and Safeguards (NMSS), addressed the Committee on the upcoming organizational changes within NMSS, as approved in the June 16th Staff Requirement Memorandum (SRM). Effective October 1, 2006, the current NMSS will be divided into two offices: the Office of National Material Program and the "new" NMSS. The Office of National Material Program (this title may still change, pending input from interested parties) will encompass part of current NMSS activities as well as those of the existing Office of State and Tribal Programs, currently not part of NMSS, and with responsibilities in the areas of Agreement States Programs and Federal, State, and Tribal Liaison Program. The new Office of Nuclear Material Safety and Safeguards (title not to be changed since it is statutorily required) will have a smaller regulatory focus: uranium

conversion, enrichment, and fabrication, spent fuel, high-level waste storage, transportation and disposal. In short, it will cover all aspects of the fuel life cycle, from “cradle to grave.” Added to the challenge of the reorganization is the geographical move of the “new” NMSS to a new location on Executive Boulevard, about 0.5 miles from the current NRC complex on Rockville Pike, also expected to happen in October 2006.

Dr. John Larkins, Executive Director of ACRS/ACNW, addressed NMSS Senior management about how recent SRMs, dated February 7, 2006, and February 9, 2006, were incorporated into the fiscal years 2006 and 2007 ACNW Action Plan. This exchange of information will facilitate the upcoming September ACNW meeting, when NMSS Directors and Division Directors are scheduled to brief the Committee on recent activities within their respective programs. Some of the topics now being investigated by the Committee are: igneous activity at Yucca Mountain, monitoring for compliance and prediction of performance using analytical methods, decommissioning, lessons learned that may be applied to reprocessing, waste determination, low-level waste, risk of low-dose radiation, *in-situ* uranium mining, and existing and advanced nuclear fuel recycling technologies. The Committee also plans on writing white papers as a way of collecting the existing expertise and knowledge about many of these topics.

Committee Action:

This was simply an exchange of information between the two offices. The Committee will take no specific action on the subject. The Committee looks forward to future NMSS presentations.

4. ACNW Working Group Meeting on Predicting the Performance of Cementitious Barriers for Near-Surface Disposal

This Working Group meeting was held to obtain information and the views of invited cement experts on using cementitious materials in performance assessment evaluations of near-surface radioactive waste disposal facilities. Specifically, the Working Group meeting was designed to address the following topics: (a) applications and uses of cementitious materials in near-surface disposal of radioactive wastes and their importance to performance assessment, (b) failure modes of such materials and causes of failure, and c) current state of technology in predicting cementitious materials performance over long time periods. The information obtained from this meeting will be used to develop technical advice to the Commission with regard to staff reviews of performance assessments in near-surface waste disposal facilities involving the use of cementitious waste forms and barriers.

Committee Action

The Committee will write a letter report to the Commission that summarizes the committee’s conclusions and recommendations.

5. NRC Draft Rule/Guidance on Preventing Legacy Sites

Andrew Persinko, Tom Fredrichs, and James Shepherd of the Decommissioning Directorate of the Division of Waste Management and Environmental Protection discussed the staff's preliminary plans for the proposed rulemaking to prevent legacy decommissioning sites. Mr. Persinko provided some introductory remarks, including the planned schedule for the rule-making. Staff plans on providing a proposed rulemaking package to the Commission by the end of March 2007. Mr. Fredrichs introduced the staff's preliminary plans for improving the financial assurance mechanisms included in current guidance to address some issues that have contributed to the current legacy sites. Mr. Shepherd provided the staff's preliminary plans for revisions to 10 CFR Part 20.1406. He also discussed improvements to the associated technical guidance in the areas of performance and ground water monitoring to provide early warning of conditions at new and currently operating facilities that could indicate when issues that have led to the current legacy sites are beginning to surface.

Committee Action

The Committee agree to write a letter to the Commission on the preliminary plans for the proposed rulemaking.

6. Expanded Potential NRC Use of the Center for Nuclear Waste Regulatory Analyses (CNWRA) Expertise (Closed)

The ACNW has been tasked by the Commission with providing advice as to how the CNWRA could broaden the scope of its support of NRC staff activities. The ACNW met with representatives of NMSS, RES, and NRR to discuss these offices' identification of large-scope and long-term activities that could be supported by the use of CNWRA expertise. An ACRS member participated in these discussions. The ACNW was generally in agreement with the NRC staff's approach and supports the technical areas identified by the NRC staff for consideration as areas where CNWRA expertise might be used.

Committee Action

The Committee issued a report to the Commission stating its observations on use of the CNWRA's expertise.

7. DOE Briefing on Advanced Fuel Cycle Initiative (AFCI)

Buzz Savage, Director, Advanced Fuel Cycle R&D Office of Nuclear Energy, DOE, James Laidler, National Technical Director, Separations, Argonne National Laboratory, and Kemal Pasamehmetoglu, AFCI Fuels Development Technical Director, INL, briefed the ACNW on the Global Nuclear Energy Partnership (GNEP) and associated technological developmental activities. Dr. Laidler presented key GNEP program elements specifically focusing on advanced separations technological development and their impact on Yucca Mountain reference case. Near-term and long-term objectives were presented noting that both aqueous and non-aqueous spent fuel treatment processes were under development. Dr. Laidler discussed radionuclide content of LWR spent fuel important to process design, the suite of uranium extraction processes and products, and process performance targets. Process

selection led to the UREX+1a process that separates out radionuclides into three groups: 1) pure uranium for future use, 2) cesium and strontium to alleviate the short-term decay heat load on the repository, and 3) transuranic (TRU) waste as fuel for fast reactors. Relative increase in repository capacity by recycling was significant, up to 225 fold depending on the fraction of Cs, Sr, and transuranic elements in the waste. Following a description of the UREX+1a process, Dr. Laidler provided the status of technology development, noting that the UREX+1a process has been demonstrated at the laboratory scale, and that further optimization of the process will continue through 2009. A facility projected to process 2500 metric tons of LWR spent fuel per year, is projected to come on-line in 2025-2030. Dr. Laidler closed his presentation by describing the advanced pyroprocess development and advanced aqueous process technologies for long-term applications.

Dr. Pasamehmetoglu presentation focused on fuel development and advanced fuel cycle facility, noting that development of a transmutation fuel is a critical element for the implementation of GNEP. The required fuel will need remote fabrication, maintenance, and QA. Two types of fuel will be tested in a fast reactor: driver fuel and transmuted fuel with TRU. Both metal and oxide TRU fuels are candidates for the first generation transmutation fuel.

Dr. Pasamehmetoglu indicated that metal fuel development was progressing successfully, but that nitride fuels will require more work to demonstrate feasibility. A multi-scale modeling approach is being used to develop a fuel performance suite of codes.

Dr. Pasamehmetoglu also provided a brief presentation on enhanced safeguards technology development and demonstration. Safeguard measures included nuclear material accounting, containment and surveillance, and process monitoring. By implementing advanced monitoring and safeguards technologies, Dr. Pasamehmetoglu indicated that separation and fuel fabrication plants can be shown to have minimum proliferation risk.

Committee Action

This briefing was for information only and was intended to keep the Committee informed of DOE's technical activities on reprocessing. The Committee will continue to remain informed and ready to provide advice to the Commission should the need arise. A white paper is being prepared by an ACNW consultant on reprocessing that will be used to support Committee advice and recommendations to the Commission in the area of reprocessing.

8. Standard Review Plan for Activities Related to DOE Waste Determinations

Representatives of the NRC Staff from the Division of Waste Management and Environmental Protection briefed the Committee on a draft Standard Review Plan (SRP) for activities related to U.S. Department of Energy Waste Determinations (WD), dated May 2006. The NRC staff had also briefed the Committee on this subject during the ACNW 170th meeting, May 23-26, 2006, prior to the release of the draft SRP on May 31, 2006. During the 172nd meeting, staff indicated that the draft SRP is open for public comment until July 31, 2006, outlined the purpose and uses of the SRP, and addressed ACNW questions on specific topics.

The NRC staff indicated that the draft SRP is for interim use by the NRC staff, and that it provides guidance for WD reviews and the types of information that may be evaluated. It was noted that the draft SRP is based on existing NRC guidance and NRC staff experience

pertaining to WD and low-level radioactive waste review activities, and that it will provide a basis for consistent WD reviews. The NRC staff also pointed out that the SRP is meant to be flexible and applicable to a wide variety of situations, rather than prescriptive.

The NRC staff addressed Committee specific comments and questions pertaining in the areas of performance assessment, radionuclide removal, and SRP guidance development.

Committee Action

The Committee has agreed to prepare a letter report based on its review of the draft SRP and the two briefings by the NRC staff.

9. Office of Nuclear Regulatory Research/Office of Nuclear Material Safety and Safeguards Dry Cask Storage Probabilistic Risk Assessment

Representatives of the NRC staff gave a presentation titled "Information Briefing: A Pilot Probabilistic Risk Assessment (PRA) of a Dry Cask Storage System at a Nuclear Power Plant." This PRA study was initiated to help the Spent Fuel Project Office (SFPO) develop an initial look at risk-informing its regulator approach for spent fuel storage. The whole process of loading, transferring and storing a specific dry cask system (HI-STORM 100, with a welded lid design) at a specific boiling water reactor (BWR) site was carefully studied so that all the stages of operations could be accounted for in the PRA analysis. The overall risk of dry cask storage was, not surprisingly, found to be very low and mainly dominated by possible accidents during handling operations. The estimated yearly probability of latent cancer for an individual was found to be 2.0×10^{-12} per year per cask for the first year of storage (which includes loading and transfer operations) and 1.9×10^{-13} per year per cask during the subsequent years of storage. No prompt fatalities are expected.

Committee Action

The Committee plans to write a letter report on the subject of dry cask storage and its associated low risk to the public, addressing this presentation as well as the presentation on Electric Power Research Institute dry cask storage PRA study.

10. Electric Power Research Institute (EPRI) Dry Cask Storage PRA Study

The Committee was briefed by Ken Canavan, Senior Project Manager for the Electric Power Research Institute. His presentation was titled "Probabilistic Risk Assessment of Bolted Dry Spent Fuel Storage Casks: Revisited," this being a revised/revisited version to the original PRA study completed in 2003. In order to complement the ongoing PRA study at the NRC (combined SFPO and RES effort), the EPRI approach was to use a different dry cask storage system (TN-32, with a bolted lid design) intended to store pressurized water reactor (PWR) fuel at a hypothetical (generic) reactor site. All the detailed aspects of putting spent reactor fuel into dry storage (loading, transferring and storage) were carefully identified and accounted for in their probability of initiating or participating in failure events. The risk to the public is found to be extremely low, with no calculated early fatalities and a first year latent cancer fatality of 5.6×10^{-13} per year per cask. Subsequent year risk to the public is even lower, again, with no early fatalities and a cancer risk of 1.7×10^{-13} per year per cask.

Committee Action

The Committee plans to write a letter report on the subject of dry cask storage and its associated low risk to the public, addressing this presentation as well as the one the presentation on RES/NMSS dry cask storage PRA study.

RECONCILIATION OF ACNW COMMENTS AND RECOMMENDATIONS/EDO COMMITMENTS

The Committee considered the following reports from the NRC's Executive /Director for Operations (EDO) during its Planning and Procedures meeting on July 17, 2006.

- EDO response dated May 23, 2006, to ACNW letter dated April 14, 2006 on the NRC waste safety research and technical assistance programs. The Committee decided that it was satisfied with the EDO's response.
- EDO response dated June 20, 2006, to ACNW letter dated May 9, 2006 on the DOE's Office of Science, Technology, and International Programs. The Committee decided that it was satisfied with the EDO's response.
- EDO response dated June 21, 2006, to ACNW letter dated May 2, 2006 on risk-informed decision-making for nuclear material and waste. The Committee decided that it was satisfied with the EDO's response.

PROPOSED SCHEDULE FOR THE ACNW AD HOC SUBCOMMITTEE MEETING

The Committee agreed to consider the following topics during its Ad Hoc Subcommittee meeting, to be held August 15–17, 2006:

- Discussion of draft and possible letters and reports on the following:
 - Draft Standard Review Plan for Waste Determinations
 - Predicting the Performance of Cementitious Barriers
 - Draft Rule/Guidance on Preventing Legacy Sites
 - Dry Cask Storage PRA

Sincerely,

/RA/

Michael T. Ryan
Chairman