

# **ACNW MEETING WITH THE COMMISSION**

**MICHAEL T. RYAN**

# **Today's Agenda**

- **Introduction**
  - **M.T. Ryan**
- **Working Group Meeting on ICRP Draft Recommendations**
  - **M. T. Ryan**
- **Waste Research Activities**
  - **R. F. Weiner**

# **Today's Agenda (Cont'd)**

- **Future Activities/Working Groups**  
– **A. G. Croff**
  
- **Igneous Activity**  
– **W. J. Hinze**
  
- **Action Plan/Closing Comments**  
– **M. T. Ryan**

# **Introduction**

- **Two New Members**
  - **W. J. Hinze and J. H. Clarke**
- **Interactions with NMSS**
- **Evolving Role of ACNW in Delayed YMLA**
- **HLW Risk Insights Baseline Report**

**WORKING GROUP ON  
ICRP'S 2005 DRAFT  
RECOMMENDATIONS**

**MICHAEL T. RYAN**

# Goals

- **Review substance and technical bases for draft ICRP recommendations**
- **Assess value of ICRP's recommendations to U.S. radiation protection practice**

# Observations

- **ICRP characterizes current update as a “simplification and elaboration” of its previous recommendations**
- **Foundation documents that contain the scientific bases are not yet available, preventing a complete review**

# **Observations (Cont'd)**

- **ICRP goal of simplifying its terminology has not been achieved; ambiguities still exist**
- **Schedule has been delayed**
- **Revised draft consultation paper anticipated in late 2005**



# **Observations (Cont'd)**

- **Questionable whether ICRP's recommendations for optimization are really improvements**
- **Draft recommendations confound use of existing ALARA principles**

# Recommendations

- **Commission should continue to defer action on ICRP's recommendations until BEIR VII is published and evaluated**
- **NRC staff should stay cognizant of ICRP's activities until more details are forthcoming about technical bases for recommendations**

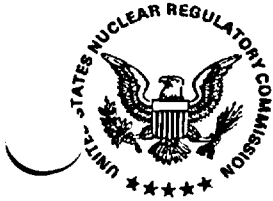
# **Recommendations (Cont'd)**

- **Commission should consider adopting the following technical improvements:**
  - **New radiation weighting factors for neutrons and protons**
  - **New tissue-weighting factors**
  - **Recent methods and models to assess internal radiation exposures**

# **ACNW Expert Panel Conclusion**

**There would be no significant improvement in protecting worker and public health and safety by adopting ICRP's 2005 draft recommendations.**

ACNW LETTERS



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

November 3, 2004

The Honorable Nils J. Diaz  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

**SUBJECT: THE 2005 RECOMMENDATIONS OF THE INTERNATIONAL COMMISSION  
ON RADIOLOGICAL PROTECTION**

Dear Chairman Diaz:

During its 154<sup>th</sup> meeting on October 19-21, 2004, the Advisory Committee on Nuclear Waste (ACNW) held a working group meeting (WGM). The meeting included presentations from staff and experts regarding the most recent draft recommendations of the International Commission on Radiological Protection (ICRP). These draft recommendations were also presented to staff and the public at NRC headquarters on September 15, 2004, by the Chairman of ICRP, Dr. Roger Clarke, and the Vice Chairman (and Chairman-Elect) Dr. Lars-Erik Holm. The Committee was represented at the September 15 presentations.

The ACNW WGM was held (1) to develop the information necessary to provide a letter report to the Commission, (2) to understand the technical bases for the draft 2005 ICRP recommendations, (3) to review these recommendations against current NRC regulations and practice; and (4) to identify aspects of the draft ICRP recommendations that may need further study. The Committee heard presentations and discussions by:

Donald Cool, NRC staff and ICRP Committee 4 (practical applications); Vince Holahan, NRC staff; Keith Eckerman, ORNL & ICRP Committee 2 (dosimetry); Michael Boyd, EPA; Edgar Bailey, State of California and Conference of Radiation Control Program Directors; Richard Vetter, Mayo Clinic and Advisory Committee on Medical Uses of Isotopes (ACMUI) member; Dana Powers, member of the Advisory Committee on Reactor Safeguards (ACRS).

The draft ICRP recommendations cover eight areas:

- Radiation quantities
- Biological aspects
- ICRP's general system of protection
- ICRP's quantitative recommendations
- Concepts of optimization
- Exclusions from the recommendations
- Medical exposures of patients as a separate issue
- A proposal for protection of the environment

There are various incremental changes in the first seven areas, including radiation- and tissue-weighting factors, new definitions for dosimetric quantities, and further discussion of the ICRP's concepts of justification of practices, source constraints, and dose limits. An important point about these draft recommendations is that ICRP's quantitative recommendations for workers

and members of the public have not changed since their 1990 recommendations, as published in ICRP Publication 60.<sup>1</sup> ICRP characterizes this update as a "simplification and elaboration" of its previous recommendations.

The eighth item is a proposal on radiological protection of non-human species. ICRP will form (mid-2005) a new committee to develop this proposal. The ACNW recommends that no action be taken at this time and that the NRC staff remain cognizant of the ICRP activities in this area until more details about ICRP's proposals are forthcoming. The Committee believes this is consistent with the Commission's documented direction to the staff.<sup>2</sup>

The Committee and the NRC staff cannot completely review the draft ICRP recommendations since the five comprehensive "foundation documents" (which give the scientific basis for the recommendations) are not yet available. Some of these foundation documents are expected soon. Others were reported by expert panel members to be still in progress.

The remainder of this letter concerns the draft ICRP recommendations in the first seven areas.

The unanimous view from expert panel members at the WGM was that there would likely be no significant improvement in the protection of worker and public health and safety by adopting these draft recommendations. Expert panel members identified potential difficulties, including confusion in the ICRP's use of terminology, confusion regarding ICRP's use of concepts such as safety culture without clear definition, and the application of the ICRP quantitative recommendations to U.S. licensees. Expert panel members did note that several elements of the recommendations would be improvements to the scientific basis. Some other elements need further consideration:

1. Without sufficient time to study and understand the foundation documents, it does not seem reasonable that the Draft ICRP recommendations should become final in June 2005. The Committee believes that the ICRP should allow more time for comment.
2. In its discussion of optimization, ICRP introduced the concept of "safety culture." It would be better if the ICRP specified the attributes of safety culture it finds important, rather than simply saying safety culture is part of optimization.
3. The Committee finds the current ICRP recommendations to be sufficient regarding "optimization." The Committee questions whether the draft ICRP recommendations are really improvements. ALARA as practiced in the U.S. provides a framework for accomplishing much of what the ICRP says about "optimization." ALARA is well understood and ALARA programs identify both dose reduction opportunities and other safety issues. The draft ICRP recommendations would unnecessarily complicate existing ALARA principles and applications with new terminology or dimensions.

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<sup>1</sup>ICRP (1991) 1990 Recommendations of the International Commission on Radiological Protection. ICRP Publication 60. Ann. ICRP 21 (1-3), Pergamon Press, Oxford.

<sup>2</sup>Memorandum from A. Vietti-Cook, to W. Travers, EDO, "Staff Requirements - SECY-04-0055 - Plan for Evaluating Scientific Information and Radiation Protection Recommendations," ML041340304, May 13, 2004.

4. In the U.S. the term "best available technology" is a legal term and has ramifications that may not be consistent with ICRP objectives. ICRP should explain the application of "best available technology" within an optimization process for control of emissions to the environment.

5. In the U.S. there is a well-defined system of protection that is based on the relationship between radiation dose and risk. This relationship is not evident in the draft ICRP recommendations. The Committee believes that the draft ICRP recommendations would be improved by a detailed discussion of this relationship and its use in protecting the public.

6. The Committee believes that the ICRP goal of simplifying its terminology has not been achieved. For example, the term "constraint" in the draft ICRP recommendations has multiple meanings, some of which overlap with the meaning of the U.S. term "limit." The draft ICRP recommendations use the term "failure" to indicate not meeting a constraint. This may or may not mean that a legal or regulatory limit has been exceeded. These are examples of the confusion that can arise in trying to interpret and translate the terminology from the draft ICRP recommendations into practice.

## **RECOMMENDATIONS**

The Committee believes that the Commission should consider deferring action on any of the draft ICRP recommendations until BEIR VII is published and available for review. Further, the expert panel members identified several items in the draft ICRP recommendations that could enhance the current regulations or radiation protection guidance. The Commission should consider three of these items as it deliberates on its response to the draft ICRP recommendations:

1. The radiation weighting factors for neutrons and protons (quality factors in 10 CFR Part 20)
2. The tissue-weighting factors that reflect the ICRP's current thinking about cancer risk
3. The ICRP's more recent methods and models for assessment of internal radiation exposures

Sincerely,

**/RA/**

Michael T. Ryan  
Chairman



EDO RESPONSE



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

January 13, 2005

Dr. Michael T. Ryan, Chairman  
Advisory Committee on Nuclear Waste  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

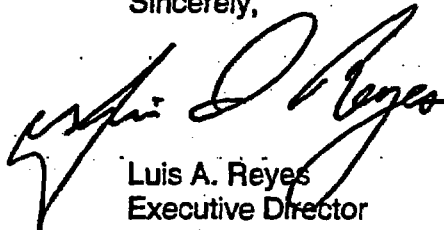
**SUBJECT: RESPONSE TO THE ADVISORY COMMITTEE ON NUCLEAR WASTE  
LETTER, DATED NOVEMBER 3, 2004, ON "THE 2005 RECOMMENDATIONS  
OF THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION"**

Dear Dr. Ryan:

Thank you for your letter summarizing the findings of the Working Group of the Advisory Committee on Nuclear Waste (ACNW). The Working Group reviewed the most recent draft recommendations of the International Commission on Radiological Protection (ICRP), and provided a number of comments and several recommendations to the Commission. The U.S. Nuclear Regulatory Commission (NRC) staff holds similar views on the draft recommendations, and we have provided the Commission with a set of general and specific comments in SECY-04-0233. The staff's comments to ICRP include each of the points raised in your November 3, 2004 letter to the commission. In SRM-04-0223, the Commission approved the staff's comments which have been subsequently provided to the ICRP. The SRM also expressed the Commission's thanks for the detailed review and the clear and well-written letter and noted that the ACNW working group's efforts were beneficial to both staff and the Commission.

We appreciate the ACNW's examination of this issue, and look forward to continuing to interact with you as the ICRP revises its draft recommendations and provides a series of foundation documents for public consultation in 2005. Since the time of the ACNW Working Group meeting, the ICRP has announced that all foundation documents will be made available in the spring, and that additional public consultation on the recommendations is possible in the fall of 2005. When the ICRP has completed its public consultation process, and published its updated recommendations, the NRC staff will then prepare an analysis, with recommendations for NRC's regulatory framework. This analysis will include the topics recommended in your letter.

Sincerely,



Luis A. Reyes  
Executive Director  
for Operations

cc: Chairman Diaz  
Commissioner McGaffigan  
Commissioner Merrifield  
SECY

**WASTE RESEARCH  
ACTIVITIES**

**RUTH F. WEINER**

# **NRC Research**

- **Annual reviews of RES research programs and NMSS technical assistance programs**
- **Annual review of CNWRA work**
- **Cutting-edge example**

# **Model Uncertainty**

- **Statistical techniques have been developed to assess uncertainty among competing conceptual models**
- **Method is rigorous and far-reaching cutting-edge research**
- **Work provides benefits now and may become more useful in future activities**

# **2005 CNWRA Visit Topics**

- **Igneous Activity**
- **Container Life & Source Term**
- **Near Field Environment**
- **Models for Complex  
Decommissioning Sites**
- **Total System Performance  
Assessment**
- **Radionuclide Retardation**

ACNW LETTERS



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

August 4, 2004

The Honorable Nils J. Diaz  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

**SUBJECT: RESEARCH ON MODEL UNCERTAINTY**

Dear Chairman Diaz:

The Advisory Committee on Nuclear Waste (ACNW) has been briefed periodically on work supported by NRC's Office of Nuclear Regulatory Research (RES) on the treatment of uncertainties in hydrogeological models. At its 150th meeting in May 2004, the ACNW was briefed on recent results from this research program.

Performance assessments typically evaluate the uncertainty associated with the parameters of one or more conceptual models. Parameter uncertainties are evaluated by probabilistic methods, sensitivity studies, and bounding analyses. The main question addressed in the May briefing was how the NRC might include conceptual model uncertainty in their analyses, i.e., how competing conceptual models for a hydrogeological system may be included in an analysis.

The research team sponsored by RES developed a method referred to as "Maximum Likelihood Bayesian Model Averaging" (MLBMA) to deal with the problem of incorporating model uncertainty into assessments. Part of the briefing package was a very recent paper published in *Water Resources Research*. The methodology is rigorous, elegant, and (necessarily) not simple to apply. The ACNW judges the research to be of very high quality.

A question that arises is how NRC staff in its regulatory role may actually apply such cutting edge research. Following the ACNW briefing, the research team held a training course for the NRC staff to outline the MLBMA and its application. The staff reported to the Committee that this training went well. Although the rigorous details of the MLBMA may prevent its use by NRC staff in all but very selected instances, the staff believes that the insights derived from such work are important in themselves for dealing with the difficult problem of treating model uncertainty.

The ACNW agrees with the staff assessment that the research on the MLBMA is important and has been of great value. It is essential that NRC staff have discussions with researchers who are at the frontiers of the field so they can formulate their approach to vexed problems important to regulatory assessment using the best information available. RES is to be commended for maintaining a part of their research portfolio to recognize excellent research that may not be applied until sometime in the future when it becomes more "routine" and yet has definite indirect benefits in the present.

Sincerely,

/RA/

B. John Garrick  
Chairman



# **FUTURE ACTIVITIES/ WORKING GROUPS**

**ALLEN G. CROFF**

# **Planned Working Groups**

- **Health Physics (Radiation Protection)**
- **Decommissioning Guidance**
- **Waste Incidental to Reprocessing**
- **Disposition of Solid Materials**
- **West Valley Demonstration Project**

# **IGNEOUS ACTIVITY**

**WILLIAM J. HINZE**

# **Background**

- **Small volcanoes have occurred over past several million years**
- **Evaluation of volcanism required**
- **Performance assessments show igneous activity major contributor to dose**

# **Recurring Themes**

- **Important uncertainties remain in spite of improved understanding of igneous processes and effects**
- **Need for integrated approach to probability and consequences**
- **Rely more on evidence-based models and data**

# **ACNW Working Group Conclusions**

- **Increased emphasis needed on risk-informed studies using PRA techniques**
- **Degree of conservatism in some assumptions unwarranted**
- **Improved risk insights will result from increased emphasis on consequences**

# Probability

- **Challenges**
  - **No clear definitive predictors**
  - **No established methodology**
  - **Limitations in process knowledge**
  - **Extrapolation of past igneous event history**

# Probability (Cont'd)

- **Results**
  - **Published frequency of dike intersection range  $10^{-10}$  to  $10^{-6}/\text{yr}$**
  - **Most scientifically acceptable predictions range  $10^{-8}$  to  $10^{-7}/\text{yr}$**
  - **Significant changes unlikely in this acceptable frequency range**
  - **Increase emphasis on consequences**



# **Probability (Cont'd)**

- **Results (cont'd)**
  - **Monitor and evaluate DOE's Probabilistic Volcanic Hazard Analysis Update**

# **Magma/Repository Interaction**

- **Improved realism in models needed for evaluating potential interaction of magma and waste packages**
  - **Behavior of magma in drifts**
  - **High-temperature and mechanical effects on waste packages**
  - **Waste/magma interactions**
- **Uncertainties remain**

# **Consequence Scenario**

- **Realism needed to assess the following:**
  - **Dispersal and redistribution of ejected contaminated ash**
  - **Contaminated ash particle size**
  - **Dust loading and resuspension period**
  - **Wind direction and velocity**
  - **Dosimetry**
- **Fixed value assumptions appear overly conservative**

# **Next Steps**

- **Committee plans to review and evaluate current activities**
  - **Visit the CNWRA regarding consequence research activities**
  - **Review staff progress in risk informing consequence assessments**
  - **Monitor progress of the PVHA expert elicitation**
  - **Consider an additional working group**

ACNW LETTERS



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

November 3, 2004

The Honorable Nils J. Diaz  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

**SUBJECT: WORKING GROUP ON THE EVALUATION OF IGNEOUS ACTIVITY AND ITS CONSEQUENCES FOR A GEOLOGIC REPOSITORY AT YUCCA MOUNTAIN, NEVADA**

Dear Chairman Diaz:

During its 153rd meeting on September 22-23, 2003, the Advisory Committee on Nuclear Waste (ACNW) had a working group meeting (WGM) on the evaluation of igneous activity and its consequences for the potential Yucca Mountain high-level waste repository. The WGM included panel discussions by eight renowned scientists from academia, research institutions, and private enterprise in the fields of volcanism, risk assessment, and health physics<sup>1</sup>. Presentations to the Committee were made by the Nuclear Regulatory Commission (NRC) staff, staff from the Center for Nuclear Waste Regulatory Analyses (CNWRA), the Electric Power Research Institute (EPRI), ACNW staff, LANL, SNL, ORNL, the University of Utah, and ABS Consulting, Inc. Stakeholders and members of the public were given opportunities to comment on the discussions. Representatives from DOE's Yucca Mountain Project Office and the State of Nevada were invited to give presentations but declined.

The purposes of the WGM were to (1) increase the ACNW's technical knowledge of staff plans to evaluate the likelihood and consequences of disruptive igneous events at the proposed Yucca Mountain repository; (2) better understand NRC staff expectations regarding the DOE's consequence analyses; (3) identify aspects of those analyses that may need further study; and (4) complement previous working group meetings on performance assessments of Yucca Mountain. In addition, there were discussions regarding (1) the technical bases (measurements, analyses, and interpretations) necessary to conduct dose assessments, (2) the role of risk insights in the development of technical bases, and (3) the impact of outstanding technical issues on the resolution of agreements. The expert panel offered a number of suggestions and observations regarding the assessments and evaluations that will support the

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<sup>1</sup>Drs. Bruce Crowe (the Los Alamos National Laboratory – LANL), William Hinze (Purdue University), Bruce Marsh (Johns Hopkins University), William Melson (Smithsonian Institution), Robert Budnitz [Lawrence Livermore National Laboratory, on detail to the U.S. Department of Energy (DOE)], Fred Harper (the Sandia National Laboratories – SNL), Lynn Anspaugh (University of Utah), Keith Eckerman (the Oak Ridge National Laboratory – ORNL), and ABS Consulting, Inc. (Irvine, California).

volcanism-related dose calculations. The calculations must be included in a DOE license application to meet the requirements of 10 CFR Part 63.

The WGM covered three areas of interest: (1) probability that future basaltic dikes will intersect a potential repository; (2) the manner in which a volcanic event intersects a waste disposal drift and mobilizes radioactive material from waste packages; and (3) the dosimetric consequences of subsequent dispersal of radioactive material.

To prepare for the WGM, ACNW staff and consultants attended an Appendix 7 meeting on September 21, 2004, between the NRC and DOE, where there was a presentation on the preliminary results of a recent aeromagnetic survey in the region, designed to detect possible additional buried basaltic features. Additionally, staff learned that DOE is reconvening an expert panel on volcanic hazards to examine new data that have become available since the previous 1996 expert elicitation.

Based on the information presented at the WGM, the Committee has concluded that it was not clear or transparent how the staff's work on igneous activity is risk informed. The Committee makes the following recommendations as a result of this WGM:

1. Instead of using a fixed value of  $10^{-7}$  per year in performance assessments to represent the dike intersection frequency, it would be better to use an appropriate range, such as  $10^{-8}$  to  $10^{-7}$  per year, as suggested by Dr. Crowe, one of the WGM panelists. A similar range was derived in a recent ACNW staff paper (Coleman et al., 2004). This range is consistent with the Committee's previous conclusion in 2002. "The range of estimated probabilities,  $\sim 10^{-9}$  to  $\sim 10^{-7}$  per year, of an igneous intrusion into the repository used by DOE in its performance assessment is reasonable." Such a range is consistent with the volcanic history of the Yucca Mountain region.
2. The staff should give high priority to examining the realism in models for evaluating the potential interaction of magma with repository drifts and waste packages. The staff assumes that all of the radioactive material in a waste package becomes available after interaction with intrusive magma. The Committee heard an alternative view from EPRI. EPRI scientists presented an analysis of a postulated magma intrusion scenario, and contended that there is a "reasonable expectation" that no waste packages will fail during a postulated intrusive igneous event. The Committee believes that additional evaluation of waste package/magma interactions would improve the risk insights regarding the quantities of radioactive materials that could be mobilized. Recommendations provided by both EPRI (2004) and the DOE-sponsored Igneous Consequences Peer Review (ICPR) Group can offer insights on how to improve this modeling.
3. Based on the presentations, the Committee believes the staff should reassess the apparent conservatisms in the consequence and dose estimates from airborne transport of contaminated volcanic ash. Examples include wind direction, mass loading, and other parameters used in calculating dose to the reasonably maximally exposed individual (RMEI). A more transparent calculation would show how these assessments are risk informed.

### Probability that future volcanism will intersect a potential repository

The most recent system-level performance assessment by the NRC staff (Mohanty et al., 2004) used a constant value of  $10^{-7}$  per year for igneous intrusion rather than a range of probabilities. A new analysis of probability has been performed by the ACNW staff and its consultant and NRC's Office of Nuclear Research staff. This work (Coleman et al., 2004), which has been accepted for publication in the journal *Geophysical Research Letters*, suggests that an appropriate range for the likelihood of igneous intrusion into the repository is  $10^{-8}$  to  $10^{-7}$  per year. This range is identical to that reported in a paper by the NRC and CNWRA staff (Connor et al., 2000). These are two examples of a number of published evaluations of the likelihood of igneous events in the Yucca Mountain region. The Committee believes that a thorough, documented review of these and related evaluations will be useful in making staff analyses more transparent.

### Volcanic event intersects a waste disposal drift and mobilizes radionuclides from waste packages

The NRC staff currently assumes in its modeling that the entire radioactive content of a waste package intercepted by intruding magma is available for airborne transport during a volcanic eruption. Representatives from EPRI discussed the impacts of potential igneous activity on waste packages. Their simulations suggested that under assumed conditions the waste packages would not be breached. Erosive effects of flowing magma were reported to be unlikely and waste packages did not fail from simulated overpressure effects or creep failure. EPRI representatives concluded there is "reasonable expectation" that no waste packages will fail during a postulated igneous event. EPRI only considered a scenario where the waste package had not been breached prior to magma intrusion into the repository. This may be reasonable, based on NRC staff analyses that show mean dose arising from extrusive igneous activity is much greater if the intrusion occurs in the first 500 years after postulated waste emplacement (Mohanty et al., 2004). In addition, the Committee heard presentations regarding the water content of magma which is important to its physical properties such as viscosity and explosivity (Nicholis and Rutherford, 2004). In November 2003, at its 147<sup>th</sup> meeting, the Committee was briefed on the DOE-sponsored ICPR Group recommendations (Detournay et al., 2003a and b). The ICPR was tasked to critically review the technical bases used by DOE to analyze the consequences of igneous events that might impact a repository, and to make recommendations on additional tasks that would significantly strengthen that program. Both EPRI's (2004) and the ICPR Group's recommendations offer insights on how to improve the consequence modeling. The Committee believes that it would be beneficial for the staff to consider these works in further evaluations of igneous intrusion scenarios.

### Estimation of potential doses from igneous activity

The Committee heard presentations from NRC staff, the CNWRA, and other experts on the behavior of aerosols generated during explosive events involving metals and ceramics, resuspension modeling, internal dosimetry modeling and an independent comprehensive assessment of the consequence scenario. The Committee concluded from these presentations that the staff's assumptions and consequence modeling of an igneous event could be overly conservative in several ways:



1. It is unclear what fraction of the radioactive material could be involved in an eruption to which the RMEI is ultimately exposed. Further, an analysis of the range of values associated with release, transport, and exposure of radioactive material would improve the risk insights. For example, particle sizes up to 100 microns are included in the dose assessment, although 10 microns is typically considered the upper limit of the respirable range. The Committee heard during an expert presentation that in explosions designed to disperse metals and ceramics, typically less than 10 percent of the mass of particulate matter is smaller than 10 microns in diameter. The remainder of the particulate matter is larger and settles out quickly.
2. The current staff analysis assumes the wind blows towards the RMEI at all times. Always placing the receptor directly downwind artificially and incorrectly increases the estimated dose. The staff reported that this conservatism in transport and exposure modeling was being addressed, though results were not available. The re-analysis will consider a distribution of wind directions based on weather data from the Yucca Mountain region.
3. Assumed dust loadings are quite high and resuspension is modeled to continue for years. An expert panel member reported that resuspension is a phenomenon that is generally important for days after a release, rather than years. This conclusion was based on data from work at the Nevada Test Site during above-ground nuclear weapons testing.

These are examples of apparent conservatisms that result from fixed value assumptions. It is difficult for the Committee to see this as a realistic assessment. A systematic evaluation of ranges of parameters may provide more transparent risk insights in the ultimate calculation of dose to the RMEI.

Sincerely,

*/RA/*

Michael T. Ryan  
Chairman

## **Cited References**

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EDO RESPONSE



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

December 16, 2004

Dr. Michael T. Ryan, Chairman  
Advisory Committee on Nuclear Waste  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

**SUBJECT: WORKING GROUP ON THE EVALUATION OF IGNEOUS ACTIVITY AND ITS CONSEQUENCES FOR A GEOLOGIC REPOSITORY AT YUCCA MOUNTAIN, NEVADA**

Dear Dr. Ryan:

I am responding to your letter of November 3, 2004, regarding the "Working Group on the Evaluation of Igneous Activity and Its Consequences for a Geologic Repository at Yucca Mountain, Nevada," held in September 2004, as part of the Advisory Committee on Nuclear Waste's (ACNW) 153<sup>rd</sup> meeting.

You indicated in your letter that, based on information presented during the Working Group meeting, the risk informed nature of the staff's work on igneous activity, and incorporation of realism in aspects of such work, were not transparent. Staff recognizes the value of presenting this complex information in a transparent way. We believe that we have used a risk-informed approach in this work, and we are striving to make this approach as transparent as possible. We would be willing to facilitate a more detailed understanding of our efforts in this area with you.

The staff feels that its conceptual model for igneous activity best represents the data and our understanding of the site. Although we have developed parameter values and distributions for the igneous activity model abstraction used in the NRC Total-system Performance Assessment (TPA) code, we have used single values in some cases where it is more efficient and does not significantly influence the results. We believe the TPA model is realistic and risk informed, and is sufficiently flexible to incorporate greater realism, such as the inclusion of a more complete representation of the local wind field now being implemented.

Staff research and analysis has sharpened our focus on those aspects of igneous activity identified as having the most significant impact on repository performance. As outlined in the *Risk Insights Baseline Report*, which has been previously presented to the ACNW, these include the following High- and Medium-ranked aspects:

- Probability of Igneous Activity
- Number of Waste Packages Affected by an Eruption
- Number of Waste Packages Damaged by an Intrusion
- Volume of Ash Produced by an Eruption

- Remobilization of Ash Deposits
- Inhalation of Resuspended Volcanic Ash
- Wind Vectors During an Eruption

We feel that the significant aspects of risk have been appropriately identified and that we have the models and information necessary to perform realistic evaluations. This work contributes to our confidence that we are prepared to review a license application for the proposed repository at Yucca Mountain.

Sincerely,



Luis A. Reyes  
Executive Director  
for Operations

cc: Chairman Diaz  
Commissioner McGaffigan  
Commissioner Merrifield  
SECY

**ACTION PLAN  
(NON-YUCCA  
MOUNTAIN ACTIVITIES)**

**MICHAEL T. RYAN**

# **ACNW Action Plan**

- **Aligns with Commission's Strategic Plan**
- **Identifies Priority Topics:**
  - **Tier I**
  - **Tier II**

# **ACNW Action Plan Tier I Activities**

- **Decommissioning**
- **Waste Incidental to Reprocessing**
- **Disposition of Solid Materials**
- **Health Physics**
- **Risk-Informing Regulatory Activities**



# **Decommissioning**

- **Key issues**
  - **Institutional controls**
  - **Realistic scenarios**
  - **Intentional mixing**
  - **Onsite disposal**
- **Applications**
  - **West Valley Demonstration Project LTR**
  - **Other complex sites**

# **Waste Incidental to Reprocessing**

- **Focus on reclassification criteria**
- **Use risk-informed approaches to performance assessments**
- **Support development of risk-informed Standard Review Plan for WIR determinations**

# **Disposition of Solid Materials**

- **Focus on rulemaking concerning disposition of materials that have very small amounts of radioactivity**
- **Draft rule to Commission March 2005**
- **Committee will advise on technical and risk-informing issues**

# Health Physics

- **ICRP foundation documents and next draft of recommendations**
- **BEIR VII**
- **Emerging radiobiological research**

# **Risk-Informing Regulatory Activities**

- **Focus on instilling**
  - **Realism**
  - **Transparency**
  - **Consistency**
  - **Identification of uncertainties**
- **Assess strengths and weaknesses of risk assessments for decisionmaking**

# **ACNW Action Plan Tier II Activities**

- **Radioactive Material Transportation**
  - **Review approach to Package Performance Study**
- **Waste Management Research Program Review**
  - **NRC Office of Research**
  - **Center for Nuclear Waste Regulatory Analyses**

# **ACNW Action Plan**

## **Tier II Activities (Cont'd)**

- **Proposed Private Fuel Storage Facility**
  - **Remain informed of technical issues**
- **Fuel Cycle Facilities: Review technical and safety licensing issues**
  - **Uranium enrichment plants**
  - **Mixed-oxide fuel fabrication facility**

# **ACNW Action Plan**

## **Tier II Activities (Cont'd)**

- **Low-Level Radioactive Waste**
  - **Risk-inform 10 CFR Part 61**
  - **Low-level waste processing, storage, and disposal issues**



ACNW LETTERS



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

November 2, 2004

MEMORANDUM TO: Luis A. Reyes  
Executive Director for Operations  
*/RA/*

FROM: John T. Larkins, Executive Director  
Advisory Committee on Nuclear Waste

SUBJECT: DRAFT FINAL REGULATORY GUIDE DG-1085, "STANDARD FORMAT AND CONTENT OF DECOMMISSIONING COST ESTIMATES FOR NUCLEAR POWER REACTORS," AND NUREG-1713, "STANDARD REVIEW PLAN FOR DECOMMISSIONING COST ESTIMATES FOR NUCLEAR POWER REACTORS"

During the 154<sup>th</sup> meeting of the Advisory Committee on Nuclear Waste (ACNW), October 19-21, 2004, the Committee considered for review draft final Regulatory Guide DG-1085, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," and draft final NUREG-1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors." As noted in my October 12, 2004, memorandum to you, the Advisory Committee on Reactor Safeguards (ACRS) declined to review these documents and forwarded them to the ACNW.

At its 154<sup>th</sup> meeting, the ACNW similarly decided not to review these documents.

Reference:

Memorandum dated September 24, 2004, from Catherine Haney, Program Director, NRR, to John T. Larkins, Executive Director, ACRS, Subject: Publication of Regulatory Guide DG-1085, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," and NUREG-1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors."

cc: A. Vietti-Cook, SECY  
W. Dean, OEDO  
R. Tadesse, OEDO  
J. Dyer, NRR  
C. Haney, NRR  
M. G. Crutchley, NRR  
C. Pittiglio, NRR  
M. R. Snodderly, ACRS

ACNW LETTERS



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

July 30, 2004

The Honorable Nils J. Diaz  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

**SUBJECT: REVIEW THE LTR ANALYSIS - INTENTIONAL MIXING OF CONTAMINATED SOIL**

Dear Chairman Diaz:

At its 152<sup>nd</sup> Meeting of July 20 to 22, the Advisory Committee on Nuclear Waste (ACNW) was briefed by staff on the License Termination Rule (LTR) implementation issue related to intentional mixing of contaminated soil. The Committee heard information related to the development of a set of options and the rationale for selecting the option that allows for the continuation of current practices and allows limited (case-by-case) intentional mixing of soil to meet LTR release criteria. The Committee believes that this is an appropriate selection and an improvement toward making the LTR more risk informed.

The detailed guidance that is being developed by staff is the key to success for intentional mixing as part of the LTR. Two licensees have expressed interest in the application of intentional mixing to their licensed activities. These two cases are likely to provide relevant information for the development of detailed guidance. The Committee recommends that staff plan ahead to include information that is likely to develop from these two cases in the guidance under development for wider application of intentional mixing as an option under the LTR.

The Committee recommends that stakeholder meetings be held to gather additional information. These meetings should include licensees planning decommissioning or decontamination projects, entities that provide decommissioning and decontamination services, Agreement State representatives and other stakeholders. Stakeholders should also be invited to provide information, challenges, and experiences that will enhance the development of guidance on intentional mixing.

The Committee believes that the LTR, intentional mixing, and control of disposition of solid materials are interrelated. The Committee recommends that efforts continue to evaluate the relationship among these existing and emerging initiatives so that they are well coordinated and avoid conflicts in guidance to licensees.

Sincerely,

**/RA/**

B. John Garrick  
Chairman

EDO RESPONSE



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

September 9, 2004

Dr. B. John Garrick, Chairman  
Advisory Committee on Nuclear Waste  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT: REVIEW OF THE LICENSE TERMINATION RULE ANALYSIS - INTENTIONAL MIXING OF CONTAMINATED SOIL**

Dear Dr. Garrick:

I am responding to your letter to Chairman Diaz, dated July 30, 2004, on the Advisory Committee on Nuclear Waste's (ACNW's or Committee's) review of the License Termination Rule (LTR) analysis on the use of intentional mixing of contaminated soil. On July 20, 2004, staff provided a briefing on this part of the LTR analysis to the Committee at its 152<sup>nd</sup> meeting. In your letter, the ACNW makes three recommendations.

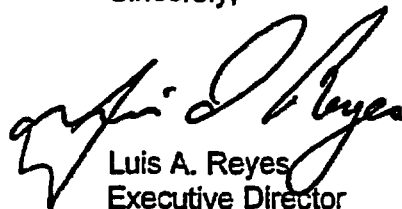
In your first recommendation, you suggest that the staff plan ahead to include, in its draft guidance development, the information that is likely to result from current cases of licensee interest in the use of intentional mixing. Staff has already provided site-specific interim guidance to a licensee for one of the options included in the evaluation of the restricted release and institutional control issue of the LTR analysis in SECY-03-0069. The staff plans on incorporating this interim guidance into a revision of NUREG-1757 planned for fiscal year (FY) 2005 for LTR implementation issues. Staff will take a similar approach with the two cases involving intentional mixing by incorporating relevant information into a revision of NUREG-1757.

Your second recommendation suggests that meetings involving stakeholders would enhance the development of guidance on intentional mixing. The Committee suggests that stakeholders should include licensees planning decommissioning or decontamination projects, companies that provide decontamination and decommissioning services, and Agreement State representatives. The staff plans on holding at least one workshop, during FY 2005 that will include gathering information from stakeholders to assist in development of the draft implementation guidance on intentional mixing. Stakeholders invited to this workshop will include other Federal and State agencies involved in decommissioning projects; licensees planning or performing decommissioning activities, as well as their vendors; disposal site personnel; and others with an interest in the use of intentional mixing of soil to complete decommissioning projects. At this workshop, certain participants will be asked to provide information, challenges, and experiences that will assist in the detailed development of guidance on the subject of intentional mixing of soil. Also, once the draft implementation guidance on intentional mixing is prepared, staff has committed to the Commission, in SECY-04-0035, that it will request public comment, which will provide another opportunity for stakeholders to provide information on the draft guidance.

The staff agrees with the ACNW that the LTR, intentional mixing, and the control of disposition of solid material are interrelated. The results of the LTR Analysis in SECY-03-0069 and the Regulatory Issue Summary 2004-08, "Result of License Termination Rule Analysis," both evaluate the relationship of the LTR and the control of disposition of solid materials, particularly for instances where contaminated materials might be removed from an unrestricted-use site after license termination. Consistent with the ACNW's recommendation, as the staff develops guidance in FY 2005, the staff will continue to evaluate the relationship among these initiatives so that they are coordinated.

We appreciate the ACNW's interest in the LTR analysis and the staff's plans for developing implementation guidance to clarify the issues evaluated. We look forward to continuing interactions with the Committee, as the guidance is developed.

Sincerely,



Luis A. Reyes  
Executive Director  
for Operations

cc: Chairman Diaz  
Commissioner McGaffigan  
Commissioner Merrifield  
SECY

ACNW LETTERS



December 22, 2004

The Honorable Nils J. Diaz  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT: FISCAL YEAR 2005 AND 2006 ACTION PLAN FOR THE ADVISORY  
COMMITTEE ON NUCLEAR WASTE**

Dear Chairman Diaz:

The Advisory Committee on Nuclear Waste (ACNW) has updated its Action Plan (hereafter the Plan) to reflect new and continuing priorities for fiscal years (FY) 2005 and 2006 (see enclosure). The primary purpose of the Plan is to guide the Committee in carrying out its mission. The Committee will continue to update the Plan at least every 2 years. The Plan describes our mission, vision, desired outcomes, commitments, goals, objectives, and priority topics. The Plan supports the Nuclear Regulatory Commission's (NRC's) new Strategic Plan for FY 2004-FY 2009 (NUREG-1614, Vol. 3), dated August 2004. The Plan is also consistent with the ACNW's charter and the Memorandum of Understanding between the ACNW and NRC's Executive Director for Operations, dated March 23, 2001.

In addition to identifying and prioritizing topics in the Plan, the ACNW had performed a self-assessment (SECY-03-0091) to identify process improvements that will enhance the Committee's operation. The ACNW will continue to monitor the effectiveness and efficiency of its processes, perform self-assessments, and make improvements as warranted. Progress and outcomes of process improvements are being tracked in a separate internal planning document.

The Committee has identified six first-tier priority topics and six second-tier priority topics for FY 2005 and FY 2006

First-Tier Topics:

1. Proposed Yucca Mountain Repository
2. 10 CFR Part 63 Rulemaking Activity
3. Risk-Informing Regulatory Activities

4. Decommissioning, License Termination Rule (LTR) (institutional controls, realistic scenarios, and intentional mixing)
5. Clearance (control and disposition of solid material)
6. Health Physics (fundamental radiation biology that affects standards)

Second-Tier Topics:

1. Waste Management Research Program Review
2. Low-Level Radioactive Waste
3. Proposed Private Fuel Storage Facility
4. Fuel Cycle Facilities
5. Waste Incidental to Reprocessing
6. Transportation of Radioactive Materials

The Committee plans to address the first-tier priority topics over the next year, and the second-tier priority topics as time and resources permit, unless otherwise directed by the Commission. The Department of Energy's (DOE) proposed Yucca Mountain repository continues to be a Tier I priority for the ACNW in 2005. Since the Yucca Mountain License Application (YMLA) may not be submitted before the end of FY2005, the ACNW will continue with its pre-licensing activities until the application is received. Pre-licensing activities would include meeting sessions and working groups that focus on risk-significant topics. Areas of interest include external event (e.g., igneous activity, seismic events), performance assessment models, above ground surface facilities, and outstanding high-risk agreements between NRC and DOE including the Integrated Issue Resolution Status Report. The Committee will also review the project work plan and other guidance documents that will be used by the staff in the YMLA review. Additionally, the Plan includes an activity to familiarize the Committee with the YMLA. Under this activity, the Committee will examine selected technical topics and topical areas in the license application including repository performance evaluations to become familiar with the application, and be prepared to review issues referred to the Committee by the Commission.

The Committee is prepared to support the Commission if changes to 10 CFR Part 63 become necessary. The Committee will continue to advise the Commission on the effectiveness and efficiency of other proposed rules, including the new rulemaking initiative on disposition of solid materials. The Committee will also continue to be proactive in their consideration of working group activities that would help the NRC staff develop standard review plans or guidance in challenging areas such as waste incidental to reprocessing, and risk-informing 10 CFR Part 61.

In addition to the 12 priority topics listed in above, the ACNW will continue to participate in activities of the Joint ACNW and Advisory Committee on Reactor Safeguards Subcommittee. The priority topics are described in more detail in the enclosed Plan.

Sincerely,

*/RA/*

Michael T. Ryan  
Chairman

Enclosure:  
FY 2005 and 2006 Action Plan  
for ACNW

## **FISCAL YEAR 2005 AND 2006 ACTION PLAN ADVISORY COMMITTEE ON NUCLEAR WASTE**

### **PURPOSE OF PLAN**

The purpose of this Action Plan (Plan) is to guide the Advisory Committee on Nuclear Waste (ACNW) in carrying out its mission. The Plan describes the ACNW's mission, vision, desired outcomes, commitments, goals, objectives, and priority topics. The Plan also links the ACNW goals to the Commission's strategic goals identified in NRC's Strategic Plan (NUREG-1614, Vol. 3) for fiscal years (FYs) 2004–FY 2009.

This Plan also provides the Commission, NRC staff, and other interested stakeholders with information about the priority topics that will be the focus of ACNW reviews over the next 2 years. The Committee selected the first- and second-tier priority topics in a top-down manner designed to support its mission, vision, goals, and objectives. The priority topics consist of self-initiated topics, and those requested by the Commission, as well as those requested by the NRC staff and other stakeholders.

### **SCOPE OF ACNW ACTIVITIES**

The Committee reports to and advises the Commission on technical matters related to nuclear materials and waste management. The bases for ACNW reviews include Title 10, Parts 20, 40, 50, 60, 61, 63, 70, 71, and 72 of the *Code of Federal Regulations* (CFR), and other applicable regulations and legislative mandates. The ACNW will undertake studies and activities related to, for example, interim storage of spent nuclear fuel, materials safety, decommissioning, application of risk-informed and performance-based (RIPB) regulations, and evaluation of licensing documents, rules, regulatory guidance, and other issues, as requested by the Commission. To fulfill its responsibilities, the Committee will interact with representatives of the public, the NRC, the Advisory Committee on Reactor Safeguards (ACRS), other Federal agencies, State and local agencies, Indian Nations, and private, international, and other affected organizations, as appropriate.

### **RISK-INFORMED, PERFORMANCE-BASED (RIPB) APPROACH**

The Committee believes that it best serves the Commission by taking an RIPB approach to ACNW activities. The Committee will accomplish this goal, in part, by supporting the Commission in applying the principles in the NRC's probabilistic risk assessment (PRA) policy statement, dated August 10, 1995 (60 FR 42622), to waste and materials regulations. The ACNW will continue to encourage the use of PRA principles and associated analyses (sensitivity studies, uncertainty analyses, and importance measures) to enhance the effectiveness and efficiency of the regulatory process. The ACNW will also encourage realism, transparency, and consistency in risk and performance assessments, and will continue to identify uncertainties and sources of uncertainty in these assessments.

In addition to supporting the PRA policy statement, the Committee will encourage implementation of a flexible overall RIPB regulatory framework for the NRC's materials and waste regulations. A RIPB approach will increase flexibility and reduce inefficiencies that stem from rigid interpretation and prescriptive approaches in the application of regulations. A RIPB framework will facilitate the use of defensible and transparent regulations and will improve confidence in regulatory decisions.

### **ACNW MISSION**

The ACNW's mission is to provide the Commission with independent and timely technical advice on nuclear materials and waste management issues to support the NRC in conducting an efficient and effective regulatory program that enables the Nation to use nuclear materials in a safe manner for civilian purposes.

### **ACNW VISION, DESIRED OUTCOMES, AND COMMITMENTS**

#### **Vision**

The ACNW's advice and recommended solutions are forward-looking, are based upon the best available science and technology, can be implemented, and reflect the need to balance risk, benefit, and cost to society to enable the safe use of nuclear materials.

#### **Desired Outcomes**

1. ACNW advice reflects the need for safety and the need to balance risk, cost, and benefit in all of the NRC's decisions.
2. ACNW advice is clear, concise, and easily understood.
3. ACNW provides an effective forum for the public to participate in the regulatory process, increases public confidence in the regulatory process, and ensures that communication paths with the public remain open and effective.
4. ACNW advice is provided in ample time for consideration by the Commission in making regulatory decisions.
5. ACNW advice reflects sound technical judgment and influences the NRC's regulations and guidance.
6. ACNW advice alerts the Commission to emerging and potentially challenging issues.
7. ACNW advice reflects consideration and awareness of relevant waste and materials issues that cut across other Federal agencies, institutions, and industry.
8. ACNW advice provides value to the Commission, the NRC staff, the public, and other stakeholders.

## **Commitments**

To achieve its desired outcomes, goals, and objectives, the Committee makes the following commitments:

1. **Make safety its highest priority.**
2. **Be responsive to the Commission's needs and requests.**
3. **Maintain technical excellence, independence, and credibility.**
4. **Adopt the NRC's plain language initiative.**
5. **Regard the public as its ultimate stakeholder and seek better ways to obtain meaningful public involvement.**
6. **Implement a risk-informed philosophy by asking: What is the risk? What are the important contributors to risk? What are the uncertainties associated with the risk?**
7. **Strive to examine issues and offer advice while regulatory solutions are still being formulated.**
8. **Foster an atmosphere of mutual problem solving with the NRC staff.**
9. **Remain flexible, anticipate change, and evaluate options and contingencies.**
10. **Keep informed of external trends and events that may adversely impact the NRC.**
11. **Keep abreast of international trends and developments that could affect the NRC's regulatory practices or approaches and apply the experience when practicable.**
12. **Identify relevant waste and materials issues that cut across the NRC and other Federal agencies, institutions, and industry.**
13. **Abide by the Committee's Action Plan to foster the efficiency and effectiveness of Committee activities and products.**

## GOALS AND OBJECTIVES

The ACNW has developed goals and objectives consistent with its mission and vision. The following five goals provide strategic direction for the ACNW over the next 2 years and align well with the new strategic goals identified in the NRC's Strategic Plan for FY2004-2009. Each goal has several objectives that will be used to focus the Committee's attention.

**Goal 1: Assist the NRC in positioning itself to respond to external change in its regulation of the management of nuclear waste and materials.** (This goal supports the NRC's Management Goal to ensure excellence in agency management.)

*Objective 1: Advise the Commission in a timely fashion on technical developments that may require changes in the NRC's regulations, policies, and practices.*

*Objective 2: Inform the Commission of issues that the NRC needs to address and recommend solutions.*

**Goal 2: Support the NRC in employing sound science in resolving key safety issues.** (This goal supports the NRC's Safety Goal to ensure protection of public health and safety and the environment.)

*Objective 1: Keep informed of methods and technologies being developed and used worldwide that are applicable for assessing and managing risks associated with the cleanup, disposal, and storage of nuclear waste.*

*Objective 2: Advise the Commission on enhancements to the NRC staff's technical capabilities that are needed to address current and expected Commission needs.*

*Objective 3: Advise the Commission and the NRC staff on ways to use risk-informed and performance-based approaches to develop an efficient and effective regulatory framework.*

**Goal 3: Advise the NRC on how to increase its reliance on risk as a basis for decisionmaking, including methods that (1) implement a risk-informed approach, (2) quantify and reveal uncertainties, and (3) are consistent across programs.** (This goal supports two NRC Strategic Goals, the Safety Goal to ensure protection of public health and safety and the Effectiveness Goal to ensure that NRC actions are effective, efficient, realistic, and timely.)

*Objective 1: Encourage the NRC staff in seeking and proposing approaches to gain a better understanding of the inherent risks of activities within NRC's regulatory responsibilities, as well as the relationship between regulations, cost, and safety.*

*Objective 2: Propose approaches that provide a better understanding of the inherent risks associated with nuclear power and the relationship between safety, regulations, and cost, and advise the Commission on the proposals.*

**Objective 3:** *Provide technically sound and realistic approaches for resolving new and emerging issues, and identify ways to utilize risk-informed and performance-based approaches related to the safe use of nuclear materials for civilian purposes.*

**Goal 4:** **Support the NRC's openness goal by evaluating current issues before the Commission and staff in a public forum.** (This goal supports NRC's Openness Goal to ensure openness in our regulatory process.)

**Objective 1:** *Provide opportunities through the Federal Advisory Committee Act process for more meaningful public involvement in the regulatory process.*

**Objective 2:** *Recommend ways for the NRC to achieve more meaningful public involvement in the regulatory process, taking into consideration lessons learned from international experience.*

**Objective 3:** *Assist the NRC in making the agency's decisionmaking process more transparent and ensuring that agency documentation is readily understandable and addresses the relevant issues.*

**Goal 5:** **Support the effectiveness and efficiency of NRC operations.** (This goal supports the NRC's Effectiveness Goal, to ensure that NRC actions are effective, efficient, realistic, and timely.)

**Objective 1:** *Select and evaluate feedback from stakeholders on ACNW operations.*

**Objective 2:** *Evaluate and modify existing ACNW operational procedures as appropriate to accomplish "more with less."*

## **PRIORITY TOPICS AND PROCESS IMPROVEMENTS**

In support of the above goals, the ACNW has identified its highest priority topics through FY 2006, and other important topics that it plans to address as time and resources permit. The highest priority topics are identified as first-tier priorities, while other important topics are identified as second-tier priorities. Unless otherwise directed by the Commission, the Committee plans to place most of its emphasis on reviewing issues under the first-tier topics. The ACNW will stay informed of issues associated with the second-tier topics, but with less emphasis on these topics, unless priorities change.

The Committee has also defined the criteria it uses to select its priority topics. In support of its fifth goal to support the effectiveness and efficiency of NRC operations, the ACNW has identified the improvements in operational processes it will carry out this year and next. The Committee will track its progress toward these process improvements in a separate internal planning document, and will periodically evaluate their impact.

For each priority topic addressed, the Committee will prepare a task action plan to identify the nature and scope of the issue, and a strategy for proposed action. The task action plans will include a schedule, purpose, scope, planned products, and performance measures to evaluate



the Committee's effectiveness.

Identified below are the criteria for selecting priority topics, followed by a brief background discussion of the selected topics.

### **Criteria for Selecting Priority Topics**

The Committee selects priority topics during its annual planning retreat by discussing potential NRC activities during the next year, reducing this discussion to a list of potential topics, and then identifying the highest-priority topics by jointly judging how many of the following criteria are met:

- the likelihood that a topic, if not properly addressed, will result in significant adverse impact on the environment, significant risk to the health and safety of the public, or unnecessary economic costs
- topics for which the Commission or the Executive Director for Operations requests ACNW review
- topics for which the ACNW can provide a unique input that will add significant value to the resolution of the issue
- the relevance of the topic in the NRC's near-term regulatory agenda and the need for timely ACNW review
- the level of interest shown by NRC's external stakeholders in a topic and the degree to which ACNW engagement of the topic will enhance openness.

The total number of topics is limited based on the judgments concerning the amount of time required by each topic and the projected resources available to the Committee with first-tier topics being accorded more resources.

### **First-Tier Priority Topics**

#### **1. Proposed Yucca Mountain Repository**

DOE plans to submit a Yucca Mountain License Application (YMLA) for construction of the Nation's first proposed geologic repository for disposal of HLW at Yucca Mountain. The submittal date is uncertain, but as this is being written the date is likely to be in the early part of early FY2006. The YMLA is expected to consist of three main parts: general information, a Safety Analysis Report (SAR), and a Final Environmental Impact Statement (FEIS). Once the YMLA's submitted, ACNW members will become familiar with the YMLA in order to be prepared to provide technical advice on the Yucca Mountain project as requested by the Commission.

Until the YMLA is submitted, the Committee will continue to perform pre-licensing technical reviews. These reviews would include working group meetings that focus on risk-significant areas. Areas of interest include external events (e.g., igneous activity, seismic events),

performance assessment models, above ground surface facilities, outstanding high-risk agreements between NRC and DOE including the Integrated Issue Resolution Status Report. The Committee will also review the project work plan and other guidance documents that will be used by the staff in the YMLA review.

In addition, EPA's 10,000-year regulatory compliance period specified in the EPA standards was vacated by the U.S. Court of Appeals. The Court found that EPA's 10,000-year compliance period was not consistent with the National Academy of Science (NAS) 1995 findings and recommendations. NRC will need to amend its rule in 10 CFR Part 63 to conform to any amendment of the EPA standards. Previously, the ACNW assisted the Commission in developing 10 CFR Part 63, including the period of compliance. The Committee will assist the Commission with any proposed revisions to 10 CFR Part 63 to conform to a revised EPA standard that complies with the court decision on the length of the compliance period.

## **2. Risk-Informing Regulatory Activities**

The ACNW will continue to support the Commission's Policy Statement on the use of Probabilistic Risk Assessment (PRA) Methods. Committee activities will include evaluating the strengths and weaknesses of adapting PRA techniques to the nuclear material and waste areas, and communicating risk insights to the Commission for use in decision-making. The Committee will continue to promote the use of PRA principles and associated analyses (sensitivity studies, uncertainty analyses, and importance measures), and will encourage (a) realism, transparency, and consistency in risk and performance assessments, including the identification of uncertainty in these assessments, and (b) implementation of a flexible overall RIPB regulatory framework for regulatory decisions.

For FY 2005 and FY2006, the ACNW plans to focus its activities on NRC's efforts to risk-inform the materials and waste regulations, including the use and application of risk metrics, goals, and criteria. Other areas of interest include the application of the RIPB methodology to the regulation of low-activity waste, license termination, decommissioning, and fuel cycle.

## **3. Decommissioning, License Termination Rule (LTR) (institutional controls, realistic scenarios, and intentional mixing)**

The Committee will focus on decommissioning and LTR rule issues through the coming year. The Committee will develop review plans through consultation with NMSS staff and will conduct specific reviews supporting current regulatory initiatives. Many decommissioning sites are being considered for license termination. These facilities include reactors, fuel cycle facilities, and uranium and thorium contaminated sites. The Committee plans specifically to review the application of the LTR to complex decommissioning sites like the West Valley Demonstration Project and other sites such as Sequoyah Fuels.

## **4. Clearance (control and disposition of solid materials)**

The ACNW has closely tracked the agency's reexamination of its approach for control of materials at licensed facilities. Considerable effort and numerous public workshops have been conducted on this topic over a period of several years. The clearance issue is directed toward

defining an acceptable approach for the release of slightly contaminated solid materials. Stakeholder interest in this issue is very high. In its guidance to the staff, the Commission directed consideration of all alternatives in the development of the proposed rule, including exploring the feasibility of conditional or restricted clearance. The ACNW will use a risk-informed approach to provide timely advice to the Commission (i.e., provide advice in time to support rulemaking schedules).

**5. Health Physics (fundamental radiation biology that affects standards)**

The Commission has approved Option 2 of SECY-04-0030, to initiate a more proactive radiation protection research program. Key health physics areas to focus on recognizing advances in fundamental radiation biology, radiation dosimetry, radiation effects on humans, and the fate and transport of radioactive material to the environment. The ACNW will stay informed of the activities of the Committee on Health Risks from Exposure to Low Levels of Ionizing Radiation (BEIR VII) which is updating its analysis of risks to humans from exposure to low-level, low-LET ionizing radiation.

**6. Waste Incidental to Reprocessing (WIR)**

NRC's role in reclassification of HLW has expanded. DOE must now consult with NRC on case-by-case determinations of whether the waste meets reclassification criteria specified in various laws, regulations, and orders. The ACNW will provide independent advice to the Commission concerning these WIR assessments by the staff. The issues include reclassification criteria, risk-informed approaches to performance assessments, and development of a standard review plan. The Committee's advice will be directed at ensuring that the Commission's WIR decisions are risk-informed and performance-based, technically sound, consistent across sites, and fully integrated with other NRC regulations and guidance.

**Second-Tier Priority Topics**

**1. Waste Management Research Program Review**

The ACNW will continue to report periodically to the Commission on NRC's waste-related research and technical assistance programs. Specifically, the Committee will continue to examine the research performed by the NRC's Office of Nuclear Regulatory Research on nuclear waste safety and the technical assistance work performed by the Center for Nuclear Waste Regulatory Analyses as appropriate.

**2. Transportation of Radioactive Materials**

The ACNW has provided advice and comment on the Package Performance Study (PPS) the testing program for Type B spent fuel casks. The ACNW will monitor U.S. and international developments in Type B cask testing and regulatory activities.

**3. Low-Level Radioactive Waste (LLW)**

The ACNW plans to review 10 CFR Part 61, the regulations governing the disposal of LLW. The Committee plans to evaluate how these regulations and their implementation could be risk-informed and performance based. A number of issues have been identified during the last 20 years of unsuccessful LLW disposal facility licensing activities. Using this information to risk-inform 10 CFR Part 61 guidance could make the LLW licensing process more effective. Additionally, the Committee plans to keep informed of new developments related to the management of LLW, including new disposal siting initiatives in States, other industry trends in LLW processing, and disposal and studies by the National Academy of Sciences on LLW and low-activity waste management.

#### **4. Proposed Private Fuel Storage (PFS) Facility**

The ACNW will continue to stay informed of the technical issues associated with the licensing of this facility and with its proposed operation and will provide such reviews as appropriate. In 2003, the ASLB issued three decisions on the PFS license application. Their decisions concerned an acceptable seismic design basis, the likelihood of an aircraft crash hazard, and the treatment of spent nuclear fuel transportation in an Environmental Impact Statement.

#### **5. Fuel Cycle Facilities**

The Committee will examine the licensing review process, including predecisional material (as approved by the Commission in COMSECY-04-0012), and associated technical findings for technical, safety, or process issues. The ACNW will focus on waste-management-related technical issues. Specifically, the Committee will focus on technical and safety issues associated with increasing uranium enrichment, and the ultimate disposition of depleted uranium that is expected to be generated by the uranium enrichment processes.

ACNW in conjunction with ACRS is also reviewing the construction authorization request for a fuel fabrication facility to convert U.S. Department of Energy's surplus plutonium to mixed oxide fuel for use in commercial nuclear reactors. Duke COGEMA Stone & Webster (DCS) has submitted the application and NRC has already issued a draft SER on the proposed facility.

### **Working Groups**

Approximately four ACNW working group meetings are held each year. Working group meetings focus on specific technical subjects related to the nuclear waste or materials area. Presentations generally include NRC staff, experts, and other interested stakeholders. The ACNW plans to hold the following working group meetings in FY2005.

#### **I. Health Physics**

A panel of experts will review three main health physics topics: (1) summary results and findings of the BEIR VII investigations, (2) followup on technical bases for the draft ICRP recommendations, and (3) emerging issues in radiation biology (biodosimeters, bystander effects, etc.). This is a follow on to the Committee's working group meeting of October 2004. The Committee believes that this working group will help the Commission reformulate

fundamental radiation protection guidance.

## II. Decommissioning

This working group will focus on guidance documents that will help implement the license termination rule. This guidance will focus on institutional controls, onsite disposal, realistic dose scenarios, restricted access options, and intentional mixing of contaminated soil. The working group will also focus on inspection and oversight procedures to prevent future legacy sites. The Committee through consultation with NMSS management believes that this working group will support near-term Commission decisionmaking regarding decommissioning.

## III. Waste Incidental to Reprocessing (WIR)

This working group will focus on risk-informing the NRC's technical approach to meeting its responsibilities concerning whether DOE various waste streams are WIR. Congressional action expanded NRC's role in this area to require that DOE consult with NRC on all WIR determinations and the disposal of WIR wastes. The Committee believes this working group will support the development of an effective and consistent NRC approach to reviewing DOE WIR determinations for soundness of technical assumptions, analysis, and conclusions, and implementation approach for the NRC's monitoring responsibilities.

## IV. Clearance (controlling the disposition of solid materials)

This working group will review the current status of efforts to and issues regarding a risk-informed approach to support proposed rulemaking on control and disposition of solid materials that contain little or no radioactive material. The Committee believes this working group will support the development of the proposed rule.

## V. West Valley Demonstration Project (WVDP)

The NMSS staff sought the Committee's advice regarding the WVDP. The Committee anticipates that the decommissioning of this complex site will use all of the options available in the LTR. This working group (the first of several on WVDP) will focus on the Decommissioning Plan and Draft Environmental Impact Statement for the West Valley Demonstration Project. The group will review both the NRC staff and DOE performance assessments and preliminary results that stem from the Project. NYSERDA and representatives from local stakeholder groups are expected to participate. The Committee believes this working group will provide risk insights into complex decommissioning activities that will support Commission decisionmaking.

As time and resources permit, the Committee will also consider working group meetings in two other areas:

1. Risk-significant pre-licensing issues for Yucca Mountain, consistent with its previous working group activities regarding Yucca Mountain and Commission direction.
2. Low Level Waste: A working group on 10 CFR Part 61 may be held to investigate issues associated with risk-informing regulations and guidance for disposing LLW. A number of issues have been identified during the last 20 years of unsuccessful LLW disposal facility licensing activities. The Committee believes that using this experience to risk-inform 10 CFR Part 61 guidance could make the LLW licensing process more effective. {AGC: Do

we dare leave this in? The Commissioner's letter seems to imply according it such a low priority that nothing happens.}

### **JOINT ACRS/ACNW SUBCOMMITTEE ACTIVITIES**

The Commission authorized the establishment of the joint subcommittee in response to a request for ACRS/ACNW assistance on activities associated with risk-informing regulations developed by the NRC's Office of Nuclear Materials Safety and Safeguards (NMSS). The scope of the joint subcommittee's work includes activities that are within the purview of both Committees. Utilizing the expertise of both committees in a joint subcommittee will be more effective and efficient. The joint subcommittee could review topics on how to risk-inform NMSS activities, proposed PRA for spent fuel dry cask storage, proposed safety goals for NMSS activities, and decommissioning issues on which both ACNW and ACRS are expected to give advice. The joint subcommittee could also review the Integrated Safety Assessment for the Mixed Oxide Fuel Fabrication Facility.

### **MEASURES OF SUCCESS**

The Committee will assess the extent to which the goals and objectives in this Plan have been met and report the results in the annual ACNW operating plan. The Committee has established performance metrics to measure its overall effectiveness. The performance metrics include the ACNW's effectiveness, efficiency, quality, timeliness, and success in contributing to the RIPB regulatory process. As part of its annual self-assessment, the Committee will solicit stakeholder feedback as one of the sources of information for evaluating the ACNW's effectiveness.

### **UPDATING THE PLAN**

The ACNW will continue to conduct top-down planning on an annual basis to identify goals and priority issues for the coming year. Revisions to the Plan will result from input from the Commission, changes in legislation, changes to the NRC Strategic Plan, the results of customer surveys and self-assessments, external events, and available resources. As part of the Committee's efficiency and effectiveness goal, the ACNW will track, in a separate planning document, outcomes of its operational process improvements, special projects, ideas for working group meetings, possible follow-up action to past ACNW letters, and items that the Committee considers important but cannot pursue this year due to time or resource limitations.

## Commission Response

January 19, 2005

**MEMORANDUM TO:** Michael T. Ryan, Chairman  
Advisory Committee on Nuclear Waste

**FROM:** Annette L. Vietti-Cook, Secretary **/RA/**

**SUBJECT:** STAFF REQUIREMENTS - COMSECY-04-0077 - FISCAL YEAR  
2005 AND 2006 ACTION PLAN FOR THE ADVISORY  
COMMITTEE ON NUCLEAR WASTE

The Commission has approved the 2005-2006 Action Plan for the Advisory Committee on Nuclear Waste (ACNW) as modified by the comments provided below, under the assumption that they will be accomplished with currently budgeted resources.

In the future, the Committee should improve clarity in how the screening criteria are applied and consistency with the agency's strategic plan. Specifically, "openness" should be used as a screening criterion rather than "stakeholder confidence."

Given the current status of the Yucca Mountain license application, the ACNW should continue its current activities in this area. But once the license application is received, any Committee activities related to the proposed high level waste repository should focus on information gathering and familiarization with the staff work plan and other documents to best position the Committee to assist the Commission in its license activities upon specific Commission request. Part 63 rulemaking activities should be removed as a stand-alone topic. It is already being addressed in the proposed Yucca Mountain repository topic.

Waste Incidental to Reprocessing (WIR) should be a tier-one topic due to recent Congressional action expanding NRC's role in this program. In addition, the Low Level Waste working group should be replaced with the WIR working group, currently listed as tentative.

The Committee lists low-level radioactive waste as a second tier function with a stated intent to hold discussions with the staff on risk informing the existing low level waste regulations. Given the current lack of NRC activity in licensing new disposal facilities, this effort should be given a low priority. The Committee should not divert staff resources from other higher priority issues to address this issue unless a specific need arises in this time frame requiring Agency action.

Transportation of Radioactive Materials is listed as a second tier topic. It should either be considered a first tier topic or be given a high priority among the second tier projects. For example, the Committee should address this topic before addressing the potential for risk informing the low level waste regulations.



cc: Chairman Diaz  
Commissioner McGaffigan  
Commissioner Merrifield  
EDO  
DOC  
OGC  
CFO  
OCA  
OPA  
Office Directors, Regions, ACRS, ACNW, ASLBP (via E-Mail)  
PDR

**ACTION PLAN  
(YUCCA MOUNTAIN  
ACTIVITIES)**

**MICHAEL T. RYAN**

# **Proposed YM Repository**

- **Continue pre-licensing activities**
- **Apply risk insights to focus on most important areas**
  - **High Significance Issues, e.g., Igneous Activity**
  - **Above Ground Surface Facility**
  - **Performance Assessment Modeling**
  - **Time of Compliance as it develops**

# **Proposed YM Repository (Cont'd)**

- **Develop Yucca Mountain Familiarization Plan**
- **Support Commission consistent with previous guidance**

ACNW LETTERS



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

August 3, 2004

The Honorable Nils J. Diaz  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

**SUBJECT: WORKING GROUP MEETING ON GEOSPHERE TRANSPORT AT YUCCA MOUNTAIN**

Dear Chairman Diaz:

During the 151st meeting of the Advisory Committee on Nuclear Waste on June 22-24, 2004, the Committee held a Working Group Meeting (WGM) on Geosphere Transport. The Committee organized this meeting to review the expected behavior of radionuclides in the tuffs and valley-fill alluvium proximal to and south of Yucca Mountain. The WGM included a panel of four distinguished scientists from academia, research institutions, and the private sector renowned in the fields of the fate and transport of radioactive materials in geological media.<sup>1</sup> The Department of Energy (DOE), the Nuclear Regulatory Commission (NRC) staff, and representatives of Nye County, Nevada, and the Electric Power Research Institute made presentations.

The purpose of the meeting was to examine whether the results of experiments, conceptual models, mathematical implementations, and site data provide confidence that the geosphere is an effective barrier for retarding the movement of radionuclides from a potential repository at Yucca Mountain. In particular, the goals of the meeting were to review what is known about saturated zone pathways from Yucca Mountain to the compliance boundary in Amargosa Valley, and review the state of knowledge of radionuclide sorption in tuffs and alluvium down-gradient from Yucca Mountain.

Presentations made at the WGM confirmed the ACNW's view that NRC staff has done an excellent job of developing an approach to parsing and analyzing performance assessments for Yucca Mountain. This exposes how various flow and transport processes and behavior of specific radionuclides sharpened the staff's risk insights. The staff developed its approach using geosphere transport as the illustrative case. The ACNW believes that the general approach will help staff to focus their reviews and will also be invaluable in communicating results to all stakeholders.

The Committee recommends that the staff continue working to make performance assessment results transparent. We further recommend that the staff expand its approach to include the engineered barrier systems.

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<sup>1</sup>James Davis, US Geological Survey, Richard Parizek, Pennsylvania State University, Don Shettel, Geosciences Management Institute, and Ines Triay, US Department of Energy.

## Observations From the WGM

The risk insights from analyses by NRC staff provide a framework for understanding the context of the discussions at the WGM.

1. The radionuclides  $^{241}\text{Am}$  and  $^{240}\text{Pu}$  constitute approximately 80% of the radioactivity (curies) in the proposed repository 1000 years postclosure, but their immobility keeps them in or near a repository for more than 10,000 years. They would therefore contribute little to estimated receptor dose.
2. The radionuclides  $^{99}\text{Tc}$  and  $^{129}\text{I}$  are mobile and make up a very small fraction of the waste inventory. Current analyses suggest that these radionuclides would move with water once a waste package is breached, reaching the compliance boundary after hundreds to thousands of years. The relatively small inventory and dilution in the aquifer make the estimated doses small.
3. There are significant uncertainties in the behavior of  $^{237}\text{Np}$ . The uncertainty in the retardation factor for  $^{237}\text{Np}$  in alluvium ranges over three orders of magnitude. The degree to which  $^{237}\text{Np}$  is retarded by alluvium can have a major effect on calculated doses.

Flow path length, dilution, and sorption all contribute to the ability of the geosphere to serve as a barrier to radionuclide transport. Presentations and discussions at the WGM highlighted uncertainties in current understanding of those processes.

DOE, NRC, and EPRI all have modeled ground water flow and radionuclide transport to support their performance assessments. Different conceptualizations of the geologic environment, including major faults and fractures, the block sizes that influence matrix diffusion, and recharge fluxes result in similar projected flow paths and travel times. The overall conclusion is that ground water flow is to the east-southeast toward Fortymile Wash and then to the south.

Although the performance assessments for Yucca Mountain all indicate that the geosphere is an effective barrier to the transport of radionuclides, additional information on the geosphere as an effective barrier would enhance confidence in those analyses. A recent letter dated May 3, 2004, from R. Parizek (US NWTRB) to M. Chu (US DOE) regarding comments from the Nuclear Waste Technical Review Board Panel on the Natural System, Las Vegas, Nevada, March 9-10, 2004, makes a similar point.

A DOE representative identified ground water flow rates, matrix diffusion in fractured tuff, and sorption coefficients for the key radionuclides as areas where additional information might reduce uncertainties. NRC risk insights analysis suggests that additional information on flow path length in the alluvium would be helpful.

The portion of the groundwater flow path, from Yucca Mountain to the compliance boundary, that traverses the alluvium is a critical element in performance assessment models. Field information to constrain possibilities could be very useful in reducing modeling uncertainties. The work being done by Nye County to study ground water in the alluvium is producing the best available hydrogeological information in Amargosa Valley. Several comments were made at the WGM that large-scale field tests to determine how major faults may act as either conduits or barriers to flow would be beneficial. Work to reduce uncertainties in regional groundwater flux and matrix diffusion was also viewed as potentially useful in strengthening the evidence base.

The keynote presentation raised interesting questions relative to sorption of  $^{237}\text{Np}$  at Yucca Mountain. Studies of uranium migration at a mill tailings site indicated that sorption depended much more on water chemistry than on geologic materials properties. Because factors that control sorption of neptunium are similar to those that control sorption of uranium, better characterization of the water chemistry in the alluvium at Yucca Mountain may help build confidence about sorption coefficients used in performance assessments.

Based on our past reviews and the results of the WGM, the ACNW concludes that there is strong evidence that the geosphere will provide significant barriers to the migration of radionuclides from a proposed repository at Yucca Mountain.

Sincerely,

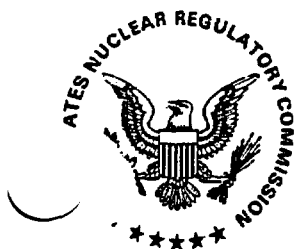
*/RA/*

B. John Garrick  
Chairman



EDO RESPONSE

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001



September 9, 2004

Dr. B. John Garrick, Chairman  
Advisory Committee on Nuclear Waste  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

**SUBJECT: RESPONSE TO THE ADVISORY COMMITTEE ON NUCLEAR WASTE LETTER  
DATED AUGUST 3, 2004, ON THE WORKING GROUP MEETING ON  
GEOSPHERE TRANSPORT AT YUCCA MOUNTAIN**

Dear Dr. Garrick:

Your letter to Chairman Diaz, dated August 3, 2004, provided the Advisory Committee on Nuclear Waste's (ACNW) report on the results of the working group meeting on geosphere transport at Yucca Mountain. The ACNW recommended that the U.S. Nuclear Regulatory Commission (NRC) staff continue working to make performance assessment results transparent, and that the NRC staff expand its approach for parsing and analyzing performance assessments for risk insights to include the engineered barrier systems. The NRC staff recognizes the importance of transparency and will continue to develop and apply methods for effective communication of performance assessment results.

The ACNW's letter identified a number of observations from the discussions at the working group meeting. The NRC staff will remain cognizant of these observations, in any continued interactions, with the U.S. Department of Energy, that include geosphere transport issues.

The NRC staff appreciates the ACNW's continued interest in, and input on, the technical analysis associated with geosphere transport.

Sincerely,

A handwritten signature in black ink, appearing to read "Luis A. Reyes".

Luis A. Reyes  
Executive Director  
for Operations

cc: Chairman Diaz  
Commissioner McGaffigan  
Commissioner Merrifield  
SECY

# **SUMMARY**

**MICHAEL T. RYAN**

# Acronyms

- **ACNW – Advisory Committee on Nuclear Waste**
- **ALARA – as low as reasonably achievable**
- **BEIR VII – Committee of the National Academies on the Biological Effects of Ionizing Radiation**

# **Acronyms (Cont'd)**

- **CNWRA - Center for Nuclear Waste Regulatory Analyses**
- **HLW – high-level waste**
- **ICRP – International Commission on Radiological Protection**
- **LTR – License Termination Rule**
- **MOX FFF- Mixed-Oxide Fuel Fabrication Facility**
- **NMSS – Office of Nuclear Materials Safety and Safeguards**

# **Acronyms (Cont'd)**

- **PRA – probabilistic risk assessment**
- **PVHA – probabilistic volcanic hazard assessment**
- **RES – Office of Nuclear Regulatory Research**
- **WIR – waste to incidental to reprocessing**
- **YM – Yucca Mountain**
- **YMLA – Yucca Mountain License Application**