

**CERTIFIED**

MINUTES OF THE 51ST ACNW MEETING  
FEBRUARY 24-26, 1993

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A. Report	
<u>Possible Impacts of the Energy Policy Act of 1992 on NRC</u> <u>Activities to Address Ongoing NRC Initiatives in the High-</u> <u>Level Radioactive Waste Program (Report to Chairman Ivan</u> <u>Selin from Dade W. Moeller, Chairman, ACNW, dated March 3,</u> <u>1993)</u>	
B. Performance Indicators for LLW Handling and Disposal (Open)	
C. Clarification of a Previous Report (Open)	
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*D. E. T. (ACNW)*

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- APPENDICES -

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Issued: April 23, 1993

MINUTES OF THE 51ST MEETING OF THE  
ADVISORY COMMITTEE ON NUCLEAR WASTE  
FEBRUARY 24-26, 1993  
BETHESDA, MARYLAND

The 51st meeting of the Advisory Committee on Nuclear Waste was held Wednesday, Thursday, and Friday, February 24-26, 1993, in the Conference Room, 7920 Norfolk Avenue, Bethesda, Maryland. The purpose of this meeting was to discuss and take appropriate actions on the items listed in the attached agenda.

A transcript of selected portions of the meeting was kept and is available in the NRC Public Document Room at the Gelman Building, 2120 L Street, N.W., Washington, D.C. [Copies of the transcript taken at this meeting may be purchased from Ann Riley & Associates, Ltd., 1612 K Street, N.W., Washington, D.C. 20006.]

Dr. Dade W. Moeller, Committee Chairman, convened the meeting at 8:30 a.m. and briefly reviewed the schedule for the meeting. He stated that the meeting was being conducted in conformance with the Federal Advisory Committee Act. He stated that the Committee had received neither written comments nor requests from members of the public for time to make oral statements. However, he invited members of the public, who were present and had something to contribute, to let the ACNW staff know so that time could be allocated for them to make oral statements.

ACNW members, Drs. William J. Hinze, Paul W. Pomeroy, and Martin J. Steindler, were present. [For a list of attendees, see Appendix III.]

I. CHAIRMAN'S REPORT (Open)

[Note: Mr. Richard K. Major was the Designated Federal Official for this part of the meeting.]

Dr. Moeller identified a number of items that he believed to be of interest to the Committee, including:

- The Executive Director for Operations has issued SECY-92-404, Proposed Amendments to 10 CFR Part 60 on Disposal of High-Level Radioactive Wastes in Geologic Repositories -- Design Basis Events for the Geologic Repository Operations Area. The proposed rule would clarify Commission requirements on the protection of public health and safety from activities conducted at a geologic repository operations area prior to its permanent closure.

- The U.S. Department of Energy (DOE) has issued Site Characterization Progress Reports, Numbers 6 and 7 for the Yucca Mountain site.
- Sandia National Laboratories issued a report on Quality Assessment Procedures for Parameter Selection and Use of Expert Judgment Panels Supporting Performance Assessments of the Waste Isolation Pilot Plant (SAND91-0429, November 1992)
- The NRC staff issued the latest revision to the "Proposed Amendments to 10 CFR Part 72 to Establish the Emergency Preparedness Licensing Regulations for ISFSI and MRS Facilities," SECY-93-006.
- The new U.S. Environmental Protection Agency (EPA) administrator, Ms. Carol M. Browner, attended a recent meeting of the Science Advisory Board. She expressed the need for environmentally related decisions to be based on sound science as well as local community views. Also, she called on the EPA to examine whole ecosystems when making decisions.
- The Office of Nuclear Materials Safety and Safeguards (NMSS) has been reorganized. The Division of Safeguards and Transportation is now the Division of Fuel Cycle Safety and Safeguards.
- The NRC Commissioners have found that Pennsylvania's low-level waste regulatory regime is "compatible" with NRC requirements. This case is important because it goes to the question of whether agreement states under federal low-level waste law can set more stringent radiation-related standards than exist under NRC rules.
- Chairman Selin has announced that Mr. Harold Denton, Director of the Office of International Programs (OIP), intends to retire at the end of April 1993.

II. ASSESSMENT OF THE FLAMMABILITY AND EXPLOSION POTENTIAL OF TRANSURANIC WASTE (Open)

[Note: Ms. Lynn Deering was the Designated Federal Official for this portion of the meeting.]

Dr. Matthew Silva, New Mexico Environmental Evaluation Group, stated that accidents, such as fires and explosions, have occurred in waste containers at DOE sites because the guidelines and procedures in place at the time of the accidents have been inade-

quate, improperly used, or not used at all. He recommended that, for the Waste Isolation Pilot Project (WIPP) site, accidents should be anticipated, workers should be made aware of potential hazards, and procedures put in place and enforced to ensure safety.

Dr. Silva provided a history of the issue, beginning with an EPA hearing for the no migration petition in May 1990, when a member of the National Resources Defense Council (NRDC) cited an EPA report that indicated that there was an explosion potential with transuranic (TRU) waste. The New Mexico Environmental Evaluation Group (EEG) was asked to investigate this issue. Although the EEG initially concluded that explosions due to volatile organic compounds (VOCs) were highly unlikely, information obtained later on the Argonne National Laboratory drum explosion that occurred in 1976 caused EEG to reexamine the issue. EEG used DOE's unusual occurrence reporting system in its reinvestigation and discovered reports on a number of explosions or fires involving TRU or mixed waste. In March 1991, EEG was requested to comment on DOE's Final Safety Analysis Report (FSAR) for the WIPP site. EEG suggested that the report be modified to incorporate additional incidents. In June 1991, EEG issued a report on flammability assessment (EEG-48), and in November 1992, EEG published a comprehensive review of this subject in Nuclear Safety.

Dr. Silva reviewed eight explosion or fire incidents involving mixed waste at DOE sites. He indicated that this was a complete list of incidents since 1991 that he was aware of with the exception of an incident at the Fernald facility. Dr. Pomeroy asked whether the EEG study would affect the procedures to be applied at the WIPP site. Dr. Silva responded that it would certainly affect the attitudes and awareness of the workers. He added that EEG also recommended a change in the WIPP test plan to lower the flammability levels of VOCs allowed to accumulate.

About the same time that the EEG-48 report was published (June 1991), DOE published a position paper on flammability concerns associated with TRU waste destined for the WIPP site. It concluded that the procedures and policies are adequate to preclude flammability related incidents. These procedures and policies include the waste acceptance criteria (WAC), the DOT transportation regulations, and the EPA no-migration determination that places limits on VOCs.

During the remainder of Dr. Silva's talk, he discussed the eight incidents, including the fuel involved, suspected ignition sources, and the cause of each incident. For example, a drum explosion at the Argonne National Laboratory in 1976 involved xylene and pentane as the fuel, an electrical discharge was the ignition source, and existing procedures not being followed was the cause.

Dr. Silva discussed a fire at the Hanford Engineering Development Laboratory in 1982. The fuel was uranium and the ignition source was pyrophoric metallic uranium. The cause was inadequate procedures. Uranium mixed with concrete, stored on a wooden pallet, caught fire when the uranium ignited. Dr. Silva noted that TRU waste contains small amounts of pyrophoric materials, which can serve as both the ignition source (they are spontaneously combustible in metallic form) and the fuel for a fire. The WAC allows less than one percent pyrophoric materials in the waste.

Dr. Steindler asked if it is known what portion of TRU waste contains pyrophoric material or finely divided metals, in order to determine if pyrophoric metal was a big problem for TRU waste. Dr. Steindler indicated that ordinarily transuranic, finely divided metallic materials are not produced. Dr. Silva noted that this was a good point, and DOE is conducting a waste characterization study that should provide information on what percentage of TRU waste is pyrophoric.

Another example discussed was the 1985 uranium scrap fire at the Y-12 plant in Oak Ridge. In this case, both the fuel and the ignition source are unclear. However, the fire and explosion was initiated when a forklift punctured a drum containing liquid coolant. Dr. Pomeroy asked whether regulations were in place to preclude liquid waste in drums. Dr. Silva noted that he did not know, however, the WAC does preclude liquid waste. Finally, Dr. Silva discussed incidents involving nitric acids as an ignition source. He concluded his briefing by reiterating that accidents have occurred at DOE sites because guidelines and procedures have been inadequate, improperly used, or ignored, and recommended that accidents at WIPP involving TRU waste should be anticipated, and waste handling procedures enforced.

Questions from the ACNW members include:

- Dr. Hinze asked about the motivation of the study and its implications. Dr. Silva responded that the issue of flammability of WIPP wastes at the EPA hearing was the initiating factor, coupled with concern for waste handlers. EEG hopes that DOE will account for all relevant incidents in estimating the accident potential in its Safety Analysis Report rather than relying on just a few isolated incidents. He noted that calculations performed by the Sandia National Laboratories indicate little potential for explosion of TRU waste containers at WIPP once the containers are sealed. The explosion potential during operations is not known.
- Dr. Moeller asked whether most of the incidents involved fresh waste, and if so, will this have implications for

the "aged" waste anticipated at WIPP. Dr. Silva noted that this was a good point, and he would look into the dates of waste packaging.

- Dr. Steindler asked about further implications of the EEG study, other than to be careful, be safe, and follow the rules. Dr. Silva commented that DOE is undergoing an ambitious waste characterization study under its WIPP quality assessment (QA) program. Dr. Silva also noted that the culture in DOE has changed dramatically in recent years toward safer operations. He noted that it would be useful, however, for someone to ensure that written procedures are in place, such as procedures for deactivating pyrophoric materials prior to waste emplacement, and that these procedures are being followed by DOE staff and contractors. Dr. Silva noted that the procedures in place are not enough; they must be enforced.

The ACNW members observed that these cited incidents occurred soon after the materials were placed in containers, usually less than a week. Since the waste materials going into the WIPP repository will have been in their containment drums for an extended period, the lessons learned from these incidents may not take on much significance.

This briefing was for information only. No action was taken by the Committee.

### III. ACCEPTANCE OF SCIENTIFIC EVIDENCE BASED PRIMARILY ON EXPERT JUDGMENT (Open)

[Note: Mr. Giorgio N. Gnugnoli was the Designated Federal Official for this portion of the meeting.]

Dr. Moeller introduced Donald Jose, J.D., of Jose & Wieder, Attorneys at Law. Mr. Jose is a lawyer with extensive experience in the area of legal admissibility of evidence based primarily on expert judgment. Mr. Jose briefly discussed his earlier involvement at the U.S. Department of Justice (DOJ) on medical malpractice cases. Eventually, he found that, to adequately meet his responsibilities, he had to learn enough about the science -- not just past legal precedents -- so that the legal process would yield the same result that scientists would yield, had the scientists -- not judges and juries -- been the ones to decide.

Mr. Jose described his evolving thought process regarding the subject of scientific evidence based on expert judgment. He referred to this discussion as emerging issues in litigation. He related an analogy of a road speed limit sign that states: "Drive

as slow as reasonably achievable," to illustrate his belief that the ALARA concept is unworkable as a standard of care for legal judgments. The trend is that courts generally do not overturn those standards (numerical) that are recommended and supplemented through the auspices of expert scientific authorities, e.g., ICRP, NRC, etc. The judgments rendered by such organizations are generally referred to as "consensus science" and the courts tend to support this approach. In deciding court cases, compliance with agency standards has been, historically, a successful legal defense. In the case of Johnston v. United States, the judge reasoned that courts are ill-equipped to second-guess eminent and renowned experts. So the judge deferred to those standards established by "consensus science."

Mr. Jose discussed the difficulty of communicating scientific subtleties to "average juries." In attempting to solve this problem, he has been developing a concept called attributable group odds (AGOs), in lieu of trying to convey complexities in terms of probabilistic risk or probability of causation. Specifically, in applying this concept to exposure, or dose, leading to cancer, he proposes the use of "the cancer doubling dose concept." Looking at a level of radiation that would double the expected number of cancers in a population would, in his opinion, be an easier concept for a juror to grasp.

Mr. Jose discussed the concept of "statutory employer." Here fault is dispensed with, and one merely needs to determine that an employee suffered an accident. The worker is entitled to workers' compensation without having to show employer fault. For radiation workers, cancer is an occupational hazard, although many states do not recognize cancer as an occupational disease. In the case of a nuclear utility, the resident occupational force is trained in terms of the radiation risks, but the transitory workers (outage temporary workers, consultant/contractors, etc.) may not be. Again, if utilities lobby the states to add cancer to the list of occupational diseases, these transitory workers could apply for compensation without the employer being found at fault (legally) in a court case.

These arguments and strategies are aimed at minimizing the need for courts to intercede, or if necessary, to allow the courts to equitably decide on "expert judgment" or "junk science" issues.

In response to Dr. Moeller's question on defining cancer as an occupational disease, Mr. Jose indicated that the specific type of cancer and latency period associated with a specific industry would have to be identified and clarified for the type of exposures associated with that industry. A generic connection of cancer to any industry would be unworkable.

Mr. Jose next proceeded to the O'Connor Doctrine. This case dealt with three issues:

1. What is the duty owed?
2. Is the Price Anderson Act constitutional?
3. Junk Science -- Defined as a "scientific opinion," which would not be able to withstand the normal scientific publication peer review process, but is offered in court to "assist" laymen in the resolution of a difficult legal problem.

In discussing this case, Mr. Jose reasoned that:

1. The authorized Federal agency's regulations should be the standard.
2. State authority can be applied, where it does not conflict with the Price Anderson Act. This is broadly interpreted to equate to the preeminence of the authorized Federal agency's permissible dose.
3. Legal fairness equates the worker's right to a very high level of protection from excessive exposure and the utility's right for a clear statement of how to limit a worker's exposure and to limit its own liability.

Mr. Jose next discussed the Daubert vs. Merrell Dow (Bendectin) case. In this case, a plaintiff's expert contested 30 epidemiological studies, which found no excess limb reduction birth defects. This so-called expert pooled the data in the 30 studies and concluded that there is a positive trend (to birth defects). Based on this and laboratory animal experiments, the plaintiff's expert concluded that similar chemistry led to similar causation, which can be connected to the limb birth defects. Because of the emotion factor for deformed babies, courts have limited admissibility of such expert opinion that, despite scientific evidence dismissing causation, can result in jury decisions based on sympathy. In the Bendectin case, the District and Appeals Courts rejected the admissibility of the plaintiff's expert. The case has been appealed to the Supreme Court; Mr. Jose expects it to be decided based on Federal Rules of Evidence (FRE) 702 and 703. In response to Dr. Steindler's question, Mr. Jose explained that the Lower Court of Appeal's decision that the plaintiff's expert's testimony was inadmissible was based on the lack of sufficient scientific support for contesting the preponderance of conflicting scientific evidence (based on FRE 702 and 703).

Mr. Jose discussed the four-part test for admissibility suggested by the Department of Justice:

1. Has the technique at issue received substantial acceptance by at least a significant minority within the field?
2. Can the potential rate or possibility of error be estimated? (To what extent can any uncertainty on this issue favor the opposition to this evidence?) If the possibility of error is high, perhaps it should not be admitted.
3. To what degree can the subjectivity in this analysis render intelligent evaluation of the expert's conclusions impractical? This would require the trier of fact (judge/jury) to take the conclusion "on faith."
4. To what extent has the expert exposed his/her methodology or conclusions to peers through publication or other transparent activity? (Has there been any peer review?)

Mr. Jose cautioned that this was not a codified procedure, but merely professional recommendations to judges on admissibility of evidence. In fact, Mr. Jose observed that he disagreed with use of these criteria. Dr. Steindler cautioned use of the fourth criterion, since there is a wide range in quality of journals. Perhaps publication in a generally acceptable journal should be the criterion.

Dr. Pomeroy raised the issue of what constituted "good" science and who was responsible for making that decision, especially in the legal setting. There has been a move on the part of some scientific organizations indicating that the judge should make that determination himself (herself). Mr. Jose agreed and indicated that the present rules of evidence are adequate. Mr. Jose indicated that it is incumbent on the trier to do the necessary research and study to become sufficiently literate in the subject in order to screen testimony. If the subject is too complex, the judge can, under the rules of evidence, appoint a court expert witness. This witness not only testifies but also tutors the judge on the essential issues.

In response to Dr. Pomeroy's question on the applicability of the Federal Rules of Evidence (702 and 703) and the Frye Doctrine, Mr. Jose indicated that these were used primarily for court hearings. In administrative hearings, there usually is greater latitude in what is admitted for consideration, and so the rules of evidence and admissibility do not play as large a role. Mr. Jose went on to indicate that, except for public hearings, rules of evidence should

be applied in administrative hearings to screen the evidence being considered as valid.

Mr. Jose indicated that two steps should be taken in administrative hearings, especially on issues that are expected to go to court, and these are:

1. Rely on rigid cross-examination.
2. Have scientific expertise on the hearing board. This would be the best preparation when dealing with scientific testimony which might be challenged as inadmissible in the court setting. The Atomic Safety Licensing Board, consisting of two scientists and one attorney, was cited by Dr. Steindler as a good example.

In the area of emerging issues in litigation, the following points were made:

1. It is reasonable to expect the Supreme Court to rule on what constitutes good science because they rule on the admissibility, not on the validity, of the scientific testimony.
2. One of the criteria for admissibility of scientific testimony is whether it will help the jury. If not, it's inadmissible.

Mr. Jose next addressed the legal issue of risk. If the expected number of cancers is exceeded by one, which single case is the one caused by the particular industry at issue? In this case, Mr. Jose stated that probable cause is an inadequate basis to make legal decisions. The essence of Mr. Jose's approach is that a doubling of the expected cases indicates an attributable cause for litigation and damages. The regulators are concerned with the overall risk from an activity, whereas, the courts are concerned whether this one plaintiff has received an exposure beyond what should have been expected. In these cases, where the observation is double the expectation, the judge would award all the "cancers" a judgment even though half would be naturally caused. Likewise, the courts should consider trigger levels. Thus, if workers are exposed to radiation doses that would double the likely number of expected cancers over the regulated or acceptable levels, then their employers should be liable for all the ensuing cancers.

Mr. Jose next addressed "junk science." He questioned the value of scientific opinion that would not be able to withstand normal peer review, publication, etc., especially if the motivation is to assist a layman jury/judge in finding the truth. Because the average level of scientific expertise of juries is low, they find

it difficult to distinguish fringe science from legitimate science. The courts need to be able to screen out the fringe science. Counsel cross-examination after opinion is admitted is not a sufficiently effective method to mitigate damage caused by junk science testimony.

Mr. Jose indicated that the Federal Rules of Evidence (702 and 703) are the means by which counsel and trier can screen evidence or testimony offered as "scientific." Briefly, FRE 702 states:

If specialized knowledge will assist the trier of fact to understand evidence or determine an issue of fact, then a "qualified" witness may testify.

Mr. Jose stressed that not only is "qualification" a criterion, but so is whether the testimony really offers any assistance in understanding or ruling. He questioned whether junk science helps anyone determine the truth.

Dr. Pomeroy expressed concern that, based on legal precedent, a judge would rule testimony inadmissible simply because of the time frame in which it is given. According to the FRES, a judge would not challenge a seismologist's expertise in seismology, but would challenge his opinion or predictions regarding seismological behavior 10,000 years into the future. Mr. Jose indicated that in the case of future performance of a geologic repository, the lack of a specific technical discipline in future geology or future states of society would more than likely lead to broad admissibility rather than narrow admissibility. Mr. Jose acknowledged, however, that there would be a risk in any subsequent court suit that those scientific opinions could be challenged as inadmissible.

In response to Dr. Steindler's observation that the FRES are not helpful because regulations seem to focus on "future" performance, Mr. Jose reminded him that the principle of deferral to agency expertise would be the privacy mechanism in judging the validity of regulations, as such.

Mr. Jose proceeded to the value of FRE 703, where the expert must be an expert in the particular discipline in question and, although the facts and data used must be of the kind reasonably relied on by experts in that particular field, the methodology the expert uses need not be of a type reasonably or typically used by experts in that discipline. In effect, the expert does not have to present his facts and data in order to be permitted to testify. Some courts have refined FRE 703 to include methodology, as well.

Mr. Jose pointed out that in the O'Conner III decision the judge introduced "verifiability" as a criterion for expert testimony, in addition to the FRES. The verifiability refers to the methodology,

not necessarily to the conclusion. Again, he argued that he is addressing admissibility, not judgment. Dr. Steindler and Mr. Jose argued as to whether the principle was "identifiable" as opposed to "verifiable."

Mr. Jose discussed the Frye Doctrine that requires that the methodology and reasoning used by the expert to reach his conclusion be generally accepted within the relevant scientific community. He pointed out that this is a "majority" criteria, as opposed to the four previously cited criteria of the U.S. Department of Justice, one of which referred to a significant minority. Mr. Jose indicated that the various positions of DOE, Nevada, NRC, etc., would all be based on the same geologic data.

In all likelihood, legal admissibility would not be an issue in the Yucca Mountain licensing decision, but could be in ensuing court suits. Prediction of processes into the future is speculative and there is not a well-established body of science to support it.

Mr. Jose suggested that, in those areas of scientific uncertainty, such as 10,000-year predictions of repository performance, what could be done is to commission an august, impeccable scientific body (such as the National Academy of Sciences) to study the question and publish their findings. Courts would tend to defer to such bodies and their conclusions. He stressed that law should follow science, not lead it.

In response to Dr. Steindler's question on the admissibility of models, Mr. Jose indicated some skepticism toward reliance on models. However, he indicated that when questions come down to models, the reliance should be on consensus science as a criterion for admissibility and/or judgment. Also, this would apply to the assumptions on which the model was based.

The Committee members thanked Mr. Jose for his illuminating presentation and discussion. This briefing was for information only. No action was taken by the Committee.

IV. POSSIBLE IMPACTS OF THE ENERGY POLICY ACT OF 1992 ON NRC ACTIVITIES TO ADDRESS ONGOING NRC INITIATIVES IN THE HIGH-LEVEL RADIOACTIVE WASTE PROGRAM (Open)

[Note: Mr. Howard J. Larson was the Designated Federal Official for this portion of the meeting.]

Mr. Robert Johnson, NMSS, and Dr. Daniel F. Fehringer, NMSS, outlined the background of the proposed staff response on the subject of the possible impacts of the Energy Policy Act of 1992

(EnPACT) on related ongoing NRC high-level radioactive waste (HLW) initiatives.

Mr. Johnson stated that the NRC staff has hypothesized that there are four likely recommendations that the National Academy of Sciences (NAS) could make to the EPA. He discussed the logic in their selection process and the postulated impacts of the four possible scenarios. The NRC staff believes that these scenarios are broad enough to bound the entire spectrum of possibilities.

1. Retain the 1985 cumulative release rate limits, but support them with a rationale based on doses to individual members of the public;
2. Extend the individual protection requirements of the 1985 standards to 10,000 years;
3. Add a health-based dose or risk standard, delete the cumulative release standard, and add use of institutional controls to prevent human intrusion scenarios, and
4. Above changes (2 and 3) and add use of institutional controls to mitigate the effects of natural events.

The NRC staff addressed these hypotheses, stating that, for alternative 1, program activities would not change. Although, for alternatives 2 and 3, program activities would continue with changes in the scope or emphasis being needed for some projects. However, alternative 4, which would require major revisions to Part 60 and staff guidance and review capability, is considered to be unlikely and therefore "no detailed estimate of the impacts have been attempted."

Whatever the alternative selected, the staff believes significant NRC interaction with the EPA and NAS is to be expected (which is further reinforced by the aggressive schedule (1-year) promulgated in the legislation for NRC to publish a conforming Part 60).

Based on these discussions, and in response to a request from the staff, the Committee completed and issued a report that comments on the NRC staff's views and offers additional recommendations.

V. GAS-PHASE RELEASE OF RADIONUCLIDES FROM LOW-LEVEL RADIOACTIVE WASTE (LLW) DISPOSAL FACILITIES (Open)

[Note: Ms. Lynn Deering was the Designated Federal Official for this portion of the meeting.]

Dr. Man-Sung Yim, Harvard University, opened his talk with a brief background of modeling of LLW waste sites. He noted that the NRC considers the techniques for and observations on the groundwater to be the most significant radionuclide release pathway. However, data from the West Valley LLW site in New York indicate that significant amounts of gases, including carbon-14 (C-14), radon (Rn-222), and tritium (H-3) have been generated and released. He noted a study that suggested gaseous H-3 releases would need to be diluted by  $10 \times E5$  to meet the 25 mrem limit at West Valley.

Dr. Yim noted that all performance analyses of LLW ignore the gas phase, and that current air pathway codes rely on an assumed source term at the top of the facility and subsequent air transport; they do not model gas generation and release. Engineered disposal designs, such as above-ground concrete bunkers, have added to the importance of gas pathway release modeling since these designs contain a sump connected directly through a standpipe to the outside of the vault. Another reason to consider gaseous release in performance assessment modeling is that this can be a significant pathway for release, in fact, such releases can reduce radionuclides by 50 % or more of specific source term.

Dr. Yim discussed the gases of concern for LLW sites, C-14, H-3, Rn-222, krypton (Kr-85), and iodine (I-129). He noted that C-14 is generated from aerobic or anaerobic microbial degradation where methane and carbon dioxide are produced. H-3 can be generated from the anaerobic corrosion of steel and radiolysis. Rn-222 is produced from decay of radium (Ra-226). K-85 is a gaseous fission product, can be released directly and I-129 can be produced from I-129 containing wastes. Once these gases are generated, release mechanisms include leaking from waste containers, migration through the LLW facility, migration through the concrete barrier or clay covers, or direct gas transport to the atmosphere through the standpipe in an engineered concrete structure.

Dr. Yim described the purpose of his research, which is to investigate the mechanisms of gaseous release of radionuclides from within an engineered disposal facility and to develop a computer model for assessing such releases. He has selected an earth-mounded concrete bunker for his initial studies. These studies will focus on the first 100 years after closure of the facility, i.e., after the standpipe is sealed. After this period, gaseous release through the earthen cover is likely to be insignificant, except under human intrusion scenarios.

In trying to discern the seriousness of the gas release pathway at LLW facilities, Dr. Pomeroy asked about the magnitude of gaseous release at West Valley, relative to the total curie inventory. Although this was not known, Dr. Steindler indicated that the dose impact from C-14 and other gases is likely to be trivial, as is

true in HLW, where there is substantially more C-14. Dr. Hinze asked whether the model would be calibrated against data on environmental factors. Dr. Yim indicated that he hoped to conduct sensitivity analyses to determine the important parameters and to use ranges of values as input.

Dr. Yim described the activities that he hopes to conduct in his studies. These include: developing a model for the evolution and production of radioactive gases, investigating transport mechanisms of evolved gases through the engineered disposal facility, developing time-dependent transport equations for gases of concern and analyzing the release of gases through modeled geometry using numerical solution techniques, developing exposure scenarios, evaluating source reduction, and comparing groundwater and air pathways. Dr. Hinze asked whether Dr. Yim had considered using gaseous release codes for high level waste. Dr. Yim indicated that he had not reviewed HLW codes yet for their applicability to LLW, specifically their ability to handle diffusion and advection. Dr. Steindler added that it might be useful to look at the diffusion models for radon transport for mill tailings sites. He asked why a new model was needed. Dr. Yim replied that he was using data from the mill tailings sites to do some validation, and added that the time dependency in his model is important to characterize the source term relative to external effects, such as atmospheric pumping, which changes daily. A severe pumping effect could force gases out of the facility.

Dr. Yim noted that the primary modes of gaseous transport are diffusion (as impurities in air and water vapor) and advection due to pressure gradients. Gas generation and transport depend on the type of waste disposal facility, chemistry, moisture infiltration, and atmospheric pressure variations.

Dr. Yim summarized the status of his research. He is almost completed with radon modeling and characterizing how much will be released from a facility. He is developing a model for C-14, i.e., how much will be generated as a gas, and how much will be transported. He will then conduct similar studies for tritium and other gases. The model will describe general transport via diffusion and advection, and chemical reactions. He explained that gases can go through the concrete matrix and/or through fractures and cracks in the concrete. If the concrete is saturated, gas transport will be reduced.

Dr. Yim described his general approach to performance assessment. His exposure scenarios for the gaseous release pathway include radioactive gas release to the atmosphere and exposure of an inadvertent intruder. These scenarios could result in direct exposure in the open air, inhalation of airborne radionuclides, ingestion of radionuclides that become incorporated into soil and

are subsequently taken up by plants, and ingestion of radionuclides in drinking water from a contaminated well. In addition, Dr. Yim discussed three types of uncertainty; model uncertainty, uncertainty about future site conditions, and parameter value uncertainty. He explained that uncertainty can be reduced through model comparisons, expert judgment, or additional data collection. Uncertainty in mathematical models can be reduced through validation or verification. Parameter uncertainty can be addressed using the Monte Carlo technique. Uncertainties about the future of the site are the most difficult to address.

After presenting some results from his radon release modeling, Dr. Yim made the following preliminary observations:

- Relatively large quantities of gaseous radionuclides will be generated within LLW disposal facilities.
- The concrete bunker design with a standpipe provides a direct pathway for release.
- The pumping effect due to barometric pressure changes will be far more important than diffusion as a mechanism for inducing the release of airborne radionuclides from an LLW disposal facility.
- The escape of airborne radionuclides may have a beneficial effect through inventory reduction, although this needs to be further investigated.
- Doses to individual members of the public due to releases of airborne radionuclides will be small, due to the large dilution in the atmosphere; collective doses, however, could be high.
- The disposal facility and its source term must be characterized in detail to predict the evolution and subsequent migration of gases.

Dr. Yim mentioned some outstanding technical issues that need more research, including interactions between the gas and water phase, infiltration into LLW disposal facilities, local chemistry conditions within a disposal facility, transport through concrete, and the effects of environmental factors, including atmospheric pressure, relative humidity, temperature, and precipitation.

This briefing was for information only. No action was taken by the Committee.

**VI. RECENT CHANGES TO REGULATIONS ON THE CONDUCT OF GOVERNMENT EMPLOYEES (Open)**

[Note: Mr. Richard K. Major was the Designated Federal Official for this part of the meeting.]

The Committee was briefed by Mr. John Szabo, Office of the General Counsel (OGC), on the recent changes to the Standards of Ethical Conduct for Employees of the Executive Branch (Including Part I of Executive Order 12674 and 5 CFR Part 2635), dated August 1992, as it relates to special Government employees.

Specific comments made by Mr. Szabo included:

- The new regulations require every government employee to receive at least one hour of ethics training annually.
- The OGC staff is preparing two supplemental regulations that are not covered in the U.S. Office of Government Ethics (OGE) publication. These regulations will address the issue of obtaining prior approval for certain outside employment, specifically with licensees, and the issue of prohibited stock restrictions.
- A new government-wide financial disclosure form (SF 450) will replace the NRC financial disclosure forms 443 and 269.
- Employees are encouraged to bring any ethics questions to the designated agency ethics official. The NRC General Counsel is the designated agency ethics official who is responsible for coordinating and managing the NRC ethics program. Disciplinary action for violating the ethical regulations will not be taken against an employee who has engaged in conduct in good faith based on the advice of the NRC General Counsel (or his appointed counsellors), provided that the employee has made full disclosure of all relevant circumstances.
- Special Government employees are not covered by regulations regarding compensation for teaching, speaking or writing, the so-called "honorarium ban," that specifically relates to the employee's official duties.
- Prior OGC approval is required to accept a meritorious service award from an organization with an NRC license, including an honorary degree from a university.
- Government employees, including special Government employees, cannot work for a foreign government. The

International Atomic Energy Agency is exempted because it is not considered a foreign government and the United States is a member.

Mr. Szabo and the members discussed the prohibitions on accepting unsolicited gifts, the \$20 exemption, and other special exemptions. Mr. Raymond Fraley asked about the list of prohibited stocks. Mr. Szabo stated that the list will continue to be used and updated each year. However, he noted that there is a specific regulation that allows the NRC Chairman to grant exemptions to this rule in special cases.

The members and staff discussed the ethics of accepting food and drink from licensees during widely attended events, such as conferences or conventions, specifically at hospitality suites. Mr. Szabo stated that OGC and the Commissioners are considering this issue, especially the case where hospitality suites contain equipment, new designs, and vendors willing to instruct visitors on their latest products and services.

This briefing was for information and training only. No action was taken by the Committee.

#### VII. MEETING WITH THE NUCLEAR REGULATORY COMMISSIONERS (Open)

[Note: Mr. Richard K. Major was the Designated Federal Official for this part of the meeting.]

In preparation for the meeting, the Committee reviewed the areas of interest to be discussed with the Commissioners. The Committee traveled to the One White Flint North Building, Rockville, Maryland, on Friday, February 26, 1993, for the meeting.

The Committee met with the NRC Commissioners to discuss items of mutual interest, including:

- Possible impacts of the Energy Policy Act of 1992 on NRC activities to address ongoing NRC initiatives in the HLW program
- Significant issues in the HLW repository program
- Acceptance of scientific evidence based primarily on expert judgment

The meeting with the Commissioners began at 9:00 a.m. and was adjourned by Chairman Selin at 10:33 a.m.; upon which, the Committee returned to the Phillips Building.

[According to Staff Requirements Memorandum to Mr. William C. Parler, General Counsel, from Mr. Samuel J. Chilk, Secretary, dated June 9, 1989, the Office of the Secretary provides a transcript to the ACNW as the record for this part of the meeting. The transcript is attached as Appendix VI.]

VIII. EXECUTIVE SESSION (Open/Closed)

[Note: Mr. Richard K. Major was the Designated Federal Official for this part of the meeting.]

A. Report

Possible Impacts of the Energy Policy Act of 1992 on NRC Activities to Address Ongoing NRC Initiatives in the High-Level Radioactive Waste Program (Report to Chairman Ivan Selin from Dade W. Moeller, Chairman, ACNW, dated March 3, 1993)

B. Performance Indicators for LLW Handling and Disposal (Open)

The Committee decided that a more meaningful effort at this time would be to plan a working group meeting directed toward developing a better understanding of the source term. On March 23 1993, a Source Term Working Group meeting will be convened, chaired by Dr. Moeller. It is intended that this meeting will foster an exchange of LLW-related information, such as: volumes and nature of wastes generated; isotopic and chemical composition; amounts shipped for disposal and amounts stored on-site; monitoring performed (particularly regarding groundwater protection); trends analyses utilized; and systems for, and employment of, incident-reporting database; etc. Representative participation from the NRC, States, waste disposal facility operators, consultants, and other entities involved in the spectrum of related activities was suggested.

C. Clarification of a Previous Report (Open)

The Committee issued a memorandum to Mr. B. Joe Youngblood, Director, Division of High-Level Waste Management, dated March 3, 1993, to clarify and offer additional comments on several items in the report to Chairman Selin on Issues Raised in the Energy Policy Act of 1992, Section 801 (dated February 5, 1993).

D. ACNW Future Activities (Open)

- The Committee agreed to cancel the Committee meeting scheduled for April 28-29, 1993, so that several members

and staff can attend the 4th International High-Level Radioactive Waste Management Conference and Exposition in Las Vegas, Nevada.

- Subject to the availability of resources, the ACNW staff was asked to continue planning a June site visit to the Whiteshell Nuclear Research Laboratories and the Underground Research Laboratory, located in Pinawa, Manitoba, Canada.
- The Committee requested that the ACNW staff reschedule the briefing on the decommissioning plans for the Fort St. Vrain Nuclear Power Plant (tentatively rescheduled for the ACNW meeting in May 1993) and the upcoming briefing on the Shoreham Nuclear Power Plant decommissioning.
- The Committee asked the ACNW staff to invite Ms. Margaret Federline, NMSS, to brief the Committee on the staff's appraisal of the Environmental Protection Agency's HLW and transuranic standards for WIPP and lessons learned from the WIPP experience that can be applied to the Yucca Mountain project.
- The Committee requested that the ACNW staff invite Mr. Joe Youngblood, NMSS, to provide a briefing on the NRC's timely responses and follow-up to the DOE Site Characterization Progress Reports for the proposed Yucca Mountain repository. Also, the Committee expressed interest in learning more about the revised procedures for evaluating the DOE study plans.

E. Future Meeting Agenda

Appendix IV summarizes the proposed items endorsed by the Committee for the 52nd ACNW Meeting, March 24-25, 1993, and future Working Group meetings.

The meeting was adjourned at 4:55 p.m., Thursday, January 28, 1993.

reaction to recent ACRS comments and recommendations.

**I. NRC Regulatory Review Group**—Discuss the proposed charter for and activities of the NRC Regulatory Review Group. The purpose of this group will be to conduct a comprehensive and disciplined review of power reactor regulations and related NRC process, programs, and implementation practices. Representatives of the NRC staff and of the industry will participate, as appropriate.

**J. Briefing on Recent Changes to the Regulations on the Conduct of Government Employees**—Briefing by and discussion with representatives of the NRC Office of the General Counsel on the impact on ACRS members of the implementation of the recent Office of Government Ethics government-wide changes to the regulation on the conduct of government employees.

**K. Schedules of NRC Review of Proposed Advanced Reactor Designs**—Briefing by and discussion with representatives of the NRC staff on the current schedules for the NRC staff's review of proposed advanced reactor designs.

**\*L. Miscellaneous**—Discuss information of a personal nature where disclosure would constitute an unwarranted invasion of personal privacy and matters discussed but not completed during previous meetings as time and availability of information permit.

**395th ACRS Meeting, March 11–13, 1993, Bethesda, MD.** Agenda to be announced.

**396th ACRS Meeting, April 15–17, 1993, Bethesda, MD.** Agenda to be announced.

#### ACNW Full Committee and Working Group Meetings

**Joint Meeting of the ACNW Working Group/ACRS Subcommittee on Occupational and Environmental Protection Systems, February 5, 1993**—Postponed to March 5, 1993 (tentative), Bethesda, MD.

**51st ACNW Meeting, February 24–25, 1993, Bethesda, MD.** Items are tentatively scheduled.

**A. Meet with the Commission to discuss items of mutual interest.**

**B. Briefing on Standards of Ethical Conduct for Employees of the Executive Branch.**

**C. Briefing on decommissioning plans for the Shoreham Nuclear Power Plant.**

**D. Discuss anticipated and proposed Committee activities, future meeting agenda, administrative, and organizational matters, as appropriate. Also, discuss matters and specific issues that were not completed during**

previous meetings as time and availability of information permit.

**Joint Meeting of the ACNW Working Group/ACRS Subcommittee on Occupational and Environmental Protection Systems, March 5, 1993 (tentative), Bethesda, MD.** The Working Group/Subcommittee will review the following proposed final regulatory guides related to the implementation of the revised 10 CFR part 20:

(1) DG-8006, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants,"

(2) DG-8009, "Interpretation of Bioassay Measurement," and

(3) DG-8013, "ALARA Radiation Protection Program for Effluents from Materials Facilities."

**ACNW Working Group on Low-Level Waste Repository Performance Indicators, March 23, 1993, Bethesda, MD.** The Working Group will consider the development of a performance indicator system to be used in monitoring various aspects of low-level radioactive waste handling and disposal.

**52nd ACNW Meeting, March 24–25, 1993, Bethesda, MD.** Agenda to be announced.

**53rd ACNW Meeting, April 28–29, 1993, Bethesda, MD.** Agenda to be announced.

Dated: January 13, 1993.

John C. Hoyle,

Advisory Committee Management Officer.

[FR Doc. 93-1297 Filed 01-19-93; 8:45 am]

BILLING CODE: 7590-01-M

#### Biweekly Notice

Applications and Amendments to Operating Licenses Involving No Significant Hazards Considerations

##### I. Background

Pursuant to Public Law (P.L.) 97-415, the Nuclear Regulatory Commission (the Commission or NRC staff) is publishing this regular biweekly notice. P.L. 97-415 revised section 189 of the Atomic Energy Act of 1954, as amended (the Act), to require the Commission to publish notice of any amendments issued, or proposed to be issued, under a new provision of section 189 of the Act. This provision grants the Commission the authority to issue and make immediately effective any amendment to an operating license upon a determination by the Commission that such amendment involves no significant hazards consideration, notwithstanding the pendency before the Commission of a request for a hearing from any person.

This biweekly notice includes all notices of amendments issued, or proposed to be issued from December 24, 1992, through January 7, 1993. The last biweekly notice was published on January 6, 1993 (58 FR 590).

#### Notice Of Consideration Of Issuance Of Amendment To Facility Operating License, Proposed No Significant Hazards Consideration Determination, And Opportunity For A Hearing

The Commission has made a proposed determination that the following amendment requests involve no significant hazards consideration. Under the Commission's regulations in 10 CFR 50.92, this means that operation of the facility in accordance with the proposed amendments would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. The basis for this proposed determination for each amendment request is shown below.

The Commission is seeking public comments on this proposed determination. Any comments received within 30 days after the date of publication of this notice will be considered in making any final determination. The Commission will not normally make a final determination unless it receives a request for a hearing.

Written comments may be submitted by mail to the Rules and Directives Review Branch, Division of Freedom of Information and Publications Services, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555, and should cite the publication date and page number of this Federal Register notice. Written comments may also be delivered to Room P-223, Phillips Building, 7920 Norfolk Avenue, Bethesda, Maryland from 7:30 a.m. to 4:15 p.m. Federal workdays. Copies of written comments received may be examined at the NRC Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC 20555. The filing of requests for hearing and petitions for leave to intervene is discussed below.

By February 22, 1993, the licensee may file a request for a hearing with respect to issuance of the amendment to the subject facility operating license and any person whose interest may be affected by this proceeding and who wishes to participate as a party in the proceeding must file a written request for a hearing and a petition for leave to intervene. Requests for a hearing and a



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON NUCLEAR WASTE  
WASHINGTON, D.C. 20555

February 9, 1993

SCHEDULE AND OUTLINE FOR DISCUSSION  
51ST ACNW MEETING  
FEBRUARY 24-26, 1993

Wednesday, February 24, 1993, Room P-110, 7920 Norfolk Ave., Bethesda, Maryland

- 1) 8:30 - 8:<sup>50</sup>~~45~~ a.m. { Opening Remarks by ACNW Chairman (Open)  
1.1) Opening Statement (DWM/RKM)  
1.2) Items of Current Interest (DWM/RKM)
- 2) 8:<sup>50</sup>~~45~~ - 9:<sup>50</sup>~~15~~ a.m. { Discuss an Assessment of the Flammability and Explosion Potential of Transuranic Waste (Open) (DWM/LGD)  
2.1) Presentation by Dr. M. Silva, New Mexico Environmental Evaluation Group on article in *Nuclear Safety*  
2.2) Discussion with Committee
- \* \* \* B R E A K \* \* \*
- 3) 9:<sup>50</sup>~~15~~-10:<sup>20</sup>~~30~~ a.m. { Discuss the Acceptance of Scientific Evidence Based Primarily on Expert Judgment (Open) (DWM/GNG)  
3.1) Discussion with Donald Jose, Esq. about recent trial experience with expert scientific judgment  
3.2) Roundtable discussion
- \* \* \* L U N C H \* \* \*
- 4) 10:<sup>20</sup>~~30~~-12:<sup>25</sup>~~00~~ Noon { Review NRC Staff Views on Possible Impacts the Energy Policy Act of 1992 Might Have on Ongoing Agency Initiatives in the High-Level Waste Arena (Open) (DWM/HJL)  
4.1) Presentation by NRC Staff  
4.2) Roundtable discussion  
4.3) Propose Elements of an ACNW Report
- 3:00 - 3:15 p.m. { \* \* \* B R E A K \* \* \*

{ = transcribed portion of meeting

- 5) 3:<sup>00</sup>~~15~~ - 4:15 p.m. Committee Activities/Future Agenda (Open)  
 Discuss anticipated and proposed Committee activities, future meeting agenda, administrative and organizational matters as appropriate (DWM/RKM)  
 5.1) Set March agenda  
 5.2) Review Working Group Schedule  
 5.3) Other Future Topics  
 5.4) Status of Canadian Whiteshell Visit
- 6) 4:15 - 5:<sup>45</sup>~~30~~ p.m. Preparation of ACNW Report (Open)  
 - The impacts the Energy Policy Act of 1992 might have on ongoing agency initiatives in the high-level waste arena (DWM/HJL)  
 - Scope of ACNW Activities (DWM/RKM)

Thursday, February 25, 1993, Room P-110, 7920 Norfolk Avenue, Bethesda, Maryland

- 7) 8:30-10:<sup>00</sup>~~15~~ a.m. Gas-Phase Release of Radionuclides from Low-Level Radioactive Waste Disposal Facilities (Open) (DWM/HJL)  
 7.1) Presentation by Dr. Man-Sung Yim  
 7.2) Roundtable discussion
- 10:<sup>00</sup>~~15~~-10:<sup>25</sup>~~30~~ a.m.  
 10:<sup>15</sup>~~15~~-10:<sup>45</sup>~~45~~//11:15-Noon Preparation of ACNW Reports
- 8) 10:<sup>30</sup>~~30~~-12:<sup>45</sup>~~00~~ Noon Briefing on Recent Changes to Regulations on the Conduct of Government Employees (Open) (DWM/RKM)  
 The Committee will hear a briefing by and hold discussions with representatives of the NRC Office of the General Counsel on recent changes to standards of ethical conduct for employees of the Executive Branch.
- 12:00-1:00 p.m. \* \* \* L U N C H \* \* \*
- 9) 1:00 - 2:00 p.m. Preparation of ACNW Reports (Open)  
 Continue discussion of proposed ACNW reports regarding items considered during this meeting and previous meetings, including:  
 - Impact of the Energy Policy Act of 1992 on NRC High-Level Waste Initiatives (DWM/HJL)  
 - Scope of ACNW Activities (DWM/RKM)

- 10) 2:~~00~~<sup>30</sup> - 3:00 p.m.      Performance Indicators for LLW Handling and Disposal (Open) (DWM/HJL)  
A Committee planning session to explore the creation of a nationwide system for summarizing current trends in and indicators of performance of low-level waste management and disposal
- 2:00    2:30  
2:~~00~~<sup>30</sup> - 3:~~15~~ p.m.      \* \* \*    B R E A K    \* \* \*
- 11) 3:15 - 5:00 p.m.      Prepare for Meeting with the Commission
- 6:15  
5:~~00~~ p.m.                      RECESS

Friday, February 26, 1993, Room P-110, 7920 Norfolk Avenue, Bethesda, Maryland

- 8:30 - 9:00 a.m.      Travel from Bethesda to One White Flint North, Rockville, MD
- 12) 9:00 - 10:30 a.m.      Meeting with the Commission to Discuss Items of Mutual Interest (Open) (DWM/RKM)
  - 1. Impact of Energy Policy Act of 1992 on High-Level Radioactive Waste Disposal
  - 2. Systems Analysis of High-Level Waste Disposal
- 10:30-11:00 a.m.      Return to Bethesda
- 13) 11:00-12:~~00~~<sup>20</sup> Noon      Concluding Session (Open) (DWM/RKM)
  - Follow-Up items from 51st Meeting and meeting with the Commission
- 12:~~00~~<sup>20</sup> Noon                      ADJOURN

APPENDIX III: MEETING ATTENDEES

51ST ACNW MEETING  
FEBRUARY 24-26, 1993

<u>ACNW MEMBERS</u>	<u>1st Day</u>	<u>2nd Day</u>	<u>3rd Day</u>
Dr. William J. Hinze	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>
Dr. Dade W. Moeller	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>
Dr. Paul W. Pomeroy	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>
Dr. Martin J. Steindler	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>

<u>ACNW STAFF</u>	<u>1st Day</u>	<u>2nd Day</u>	<u>3rd Day</u>
Ms. Lynn F. Deering	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>
Ms. Raymond F. Fraley	<u>      </u>	<u>  X  </u>	<u>      </u>
Mr. Giorgio N. Gnugnoli	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>
Mr. Howard J. Larson	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>
Mr. Richard K. Major	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>
Mr. H. Stanley Schofer	<u>  X  </u>	<u>  X  </u>	<u>  X  </u>

NRC STAFF

Ralph Cady	RES
Andy Campbell	NMSS
Abe Eiss	NMSS
Daniel Fehring	NMSS
Robert Johnson	NMSS
John Linehan	NMSS
Tim McCartin	RES
Bill Reamer	OGC
Fred Ross	NMSS
John Szabo	OGC

ATTENDEES FROM OTHER AGENCIES AND GENERAL PUBLIC

Joe Bannon	EMR-PMC
Robert Bishop	NUMARC
Tara Cameron	EPA
Chuck Casto	Senator Reid
Sophia Challander-Angeli	DOE
Drew Corson	ICF
Terry Crump	Weston
Linda Desell	DOE
Philip Dunn	TRW
Lynne Fairobent	DOE
Steve Frishman	State of Nevada
A. Greenberg	RDA
Patrick Harris	SERCH Licensing/Bechtel
Chris Henkel	EEl/U Waste
Andrea Jennetta	SAIC/ETM
Donald Jose	Jose & Wiedis
V. Lewis Killpack	Weston
James Metzcar	Afton Associates
Homi Miniwalla	Weston
Steve Nesbit	TRW/Duke Engineering
Perry Robinson	Winston & Strawn
Roles	DOE
John Russell	CNWRA
Daniel Semick	GAO
Matthew Silva	New Mexico EEG
Jane Summerson	DOE
Vickie Sutton	NWTRB
Robert Sweeney	Southern Technical Services
Ray Wallace	USGS/HQ
Man-Sung Yim	Harvard

## APPENDIX IV: FUTURE AGENDA

### 52nd ACNW Committee Meeting March 24-25, 1993 (Tentative Schedule)

Meeting with the Electric Power Research Institute (Open) - The Committee will meet with representatives of the Electric Power Research Institute to discuss studies EPRI has conducted on the volumes of LLW that may require interim storage, the applicable regulatory requirements, and the associated guidelines for waste generators.

Working Group Chairman's Report on Source Terms for LLW (Open) - The Committee will hear a report from the Working Group Chairman on the recent meeting on source terms for LLW.

Rejection of LLW Disposal Sites (Open) - The Committee will be briefed on the proposed LLW disposal sites rejected by the LLW host States. Representatives from the host States, NMSS, and the Office of State Programs will participate.

State Radiation Control Program (Open) - The Committee will be briefed by representatives of the NRC Office of State Programs on its recent reviews of the radiation control programs in Alaska, Florida, Ohio, Nevada, Kansas, Iowa, and Arkansas.

Rulemaking/Clarification of Assessment Requirements for Siting Criteria and Performance Objectives (Open) - The Committee will be briefed by representatives of the Office of Nuclear Material Safety and Safeguards (NMSS), on rulemaking/clarification of assessment requirements for siting criteria and performance objectives.

Committee Activities (Open/Closed) - The Committee will discuss anticipated and proposed Committee activities, future meeting agenda, and organizational matters, as appropriate. Also, the members will discuss matters and specific issues that were not completed during previous meetings.

### Working Group Meetings

Low-Level Radioactive Waste Disposal Facility Source Terms, March 23, 1993, 7920 Norfolk Avenue, Bethesda, MD, (Howard Larson) - The Working Group will meet with various groups to obtain information on the sources, quantities and characteristics of LLW being generated. The Working Group will review what percent of the waste is stored on-site by the generator as compared to that sent to disposal facilities. Also, the Working Group will discuss methods for waste volume reduction and site performance assessment techniques including methods to ensure groundwater protection.

Regulatory Guides for Implementing Revisions to 10 CFR Part 20, March 26, 1993, 7920 Norfolk Avenue, Bethesda, MD, (Giorgio Gnugnoli/Elpidio Igne) - The ACNW Working Group and the ACRS Subcommittee on Occupational and Environmental Protection Systems will jointly review the following proposed final regulatory guides being developed for implementing the revised 10 CFR Part 20: (1) DG-8006, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants," (2) DG-8009, "Interpretation of Bioassay Measurements," and (3) DG-8013, "ALARA Radiation Protection Program for Effluents from Materials Facilities."

Characterization of the Unsaturated Zone Flow and Transport Properties, May 1993, 7920 Norfolk Avenue, Bethesda, MD, (Lynn Deering) - The Working Group will examine the current understanding of processes controlling matrix and fracture-flow in the unsaturated zone at Yucca Mountain, existing approaches to model or bound fracture flow in the unsaturated zone, insights gained from performance assessment activities regarding the sensitivity of infiltration and other parameters and assumptions, on-going site characterization studies, the relationship between performance assessment and site characterization activities, and significant data gaps.

Engineered Barrier Systems, (Date to be determined), 7920 Norfolk Avenue, Bethesda, MD (Giorgio Gnugnoli/Lynn Deering) - The Working Group will review the role of, and the degree of reliance that should be placed on, engineered versus natural barriers within an HLW geologic repository.

Use of Fractals for Fluid Flow at Yucca Mountain, (Date to be determined), Bethesda, MD - The Working Group will examine the use of fractals in the development of conceptual and numerical models of fluid flow in unsaturated, fractured rock. Studies show that the roughness characteristics of fracture surfaces can be simulated by the use of fractals. DOE is considering the use of this approach in its study plan on fluid flow in unsaturated fractured rock systems.

APPENDIX V  
LIST OF DOCUMENTS PROVIDED TO THE COMMITTEE

MEETING HANDOUTS

AGENDA

DOCUMENTS

ITEM NO.

- 1 Chairman's Report
  1. Items of Possible Interest to ACNW Members and Staff, dated February 19, 1993, by Dade W. Moeller
  2. Additional Items of Possible Interest, dated February 20, 1993, by Dade W. Moeller
  3. Comments on Regulations for HLW Disposal, dated February 21, 1993, by Dade W. Moeller
  
- 2 Assessment of the Flammability and Explosion Potential of Transuranic Waste
  4. An Assessment of the Flammability and Explosion Potential of Defense Transuranic Waste, dated February 24, 1993, by Matthew Silva, NMEEG [Viewgraphs]
  
- 3 Acceptance of Scientific Evidence Based Primarily on Expert Judgment
  5. Article in Science, Vol. 259, January 29, 1993, entitled "Supreme Court to Weigh Science"
  6. Emerging Issues in Litigation, undated, by Donald E. Jose, Jose & Wiedis
  7. The "Junk Science" Problem in Radiation Litigation, undated [Viewgraphs]
  8. Brief in the U.S. Court of Appeals for the 7th Circuit, James Richard O'Connor v. Commonwealth Edison Company, August 31, 1992
  
- 4 NRC Staff Views on Possible Impacts of the Energy Policy Act of 1992 on Ongoing NRC Initiatives in the High-Level Radioactive Waste Management Arena
  9. a. Memorandum for Harold Denton, OIP, from Samuel Chilk, SECY, dated November 4, 1992, regarding SECY-92-359 - Energy Policy Act of 1992 Provisions Affecting Nuclear Exports, with enclosure
  - b. SECY-92-359, dated October 23, 1992, regarding Energy Policy Act of 1992 Provisions Affecting Nuclear Exports
  - c. Notation Vote to Samuel Chilk from Chairman Selin, Commissioners De Planque and Curtiss
  10. Article in Nuclear Safety, Volume 33, Number 2, April-June 1992, entitled "NRC Chairman Wants Radiation Release Limit and Dose Limit Standards for Licensing an HLW Repository"

11. Memorandum to Dade W. Moeller from B. Joe Youngblood, dated February 24, 1993, regarding ACNW Letter of February 5, 1993
- 5     Committee Activities/Future Agenda
12. Memorandum to Richard K. Major from Dade Moeller, dated February 20, 1993, regarding Selected NRC Products -- HLW Program
- 7     Gas-Phase Release of Radionuclides from Low-Level Radioactive Waste Disposal Facilities
13. Gas-Phase Release of Radionuclides from Low-Level Radioactive Waste Disposal Facilities, dated February 25, 1993, by Man-Sung Yim
  14. Gas-Phase Migration of C-14 Through Barrier Materials Applicable for Use in a High-Level Nuclear Waste Repository Located in Tuff, Dated December 1998, A Thesis Submitted to the Faculty of Purdue University by Linda Ross Bauer
  15. A Study of the Transport Characteristics, and Mechanisms, of Small Nuclear Reactor Generated Radiocolloids in Unsaturated Porous Media, dated August 1992, A Proposal Submitted to the Faculty of Purdue University by Richard R. Brey
- 8     Recent Changes to Regulations on the Conduct of Government Employees
16. 1993 Ethics Training, undated, by John Szabo [Viewgraphs]
- 9     Preparation of ACNW Reports
17. Memorandum to Chairman Selin from Kenneth C. Rogers, Commissioner, dated February 22, 1993, regarding Thoughts About ACNW's Program Plan
- 12    Meeting with the Commission to Discuss Items of Mutual Interest
18. Memorandum to Distribution from Martin Steindler, dated February 21, 1993, regarding Presentation to the Commissioners, 2/26/93, on Systems Analysis/HLW Issues [Official Use Only]
  19. Draft Economic Impact Analysis for Amendments to EPA's Radioactive Waste Standards (40 CFR Part 191), U.S. Environmental Protection Agency, dated December 1992 [Official Use Only]
  20. Draft SECY paper from James M. Tayler, undated, regarding Comments on Proposed EPA Standards for TRU and HLW Disposal at Sites Other Than Yucca Mountain [Official Use Only]

21. Memorandum to Samuel S. Chilk, Secretary, John Larkins, Acting Executive Director, ACNW, dated February 17, 1993, regarding ACNW Meeting with NRC Commissioners, February 26, 1993
22. Letter to Chairman Selin from Robert Loux, Nuclear Waste Project Office, State of Nevada, dated February 24, 1993, regarding Nevada Comments on ACNW Recommendations

Meeting Notebook Contents

1 Chairman's Report

1. Introductory Statement by ACNW Chairman, dated February 24-25, 1993
2. Items of Interest

2 Discuss an Assessment of the Flammability and Explosion Potential of Transuranic Waste

3. Status Report
4. An Assessment of the Flammability and Explosion Potential of Defense Transuranic Waste, Waste and Spent Fuel Management, by M. Silva, Vol. 33, No. 2, April-June 1992
5. Silva, M., "An Assessment of the Flammability and Explosion Potential of Transuranic Waste," Environmental Evaluation Group, EEG-48, DOE/AL/58309, June 1991
6. Legal and Policy Role in the Use of Transport and Fate Modeling, by W.J. Walsh, Pepper, Hamilton and Scheetz
7. A Legal Viewpoint on the Relevance of Phenotypic Variation to Risk Assessments
8. Letter for Dade Moeller from Donald Jose, dated December 30, 1992, re: National Labor Relations Board Opinion
9. Letter for Paul Pomeroy from Dade Moeller, dated December 29, 1992, re: Comments on two papers Brent R. L. [with enclosures]

3 Discuss the Acceptance of Scientific Evidence Based Primarily on Expert Judgment

10. Status Report
11. Letter for Donald Jose from Dade Moeller, dated October 26, 1992, re: Decision by Judge Michael Mihm relative to the qualifications of people who are to serve as expert witnesses
12. Memorandum for Paul Pomeroy from Giorgio Gnugnoli, dated September 29, 1992, re: Ruling on Expert Judgment [with enclosures]
13. Letter for Giorgio Gnugnoli from William Walsh, dated December 11, 1992, re: List of articles [with enclosures]

- 4 Review NRC Staff Views on Possible Impacts the Energy Policy Act of 1992 Might Have on Ongoing Agency Initiatives in the High-Level Waste Arena
  14. Status Report
  15. Memorandum for Chairman & Commissioners from William Parler, dated October 26, 1992, re: Energy Policy Act of 1992 [with attachments]
  16. Excerpted from Energy Policy Act of 1992, Title VIII-High-Level Radioactive Waste, Sec. 801. Nuclear Waste Disposal
  17. Memorandum for James Taylor from John Hoyle, dated November 25, 1992, re: COMJC-92-009 - Interaction with the National Academy of Sciences on High-Level Waste Issues
  18. Memorandum for Chairman and Commissioners from James Taylor, dated February 9, 1993, re: Response to Commission Request regarding Staff Views on Possible Impacts of the Energy Policy Act of 1992 on the Staff's High-Level Waste Repository Program (COMJC-92-009)
  19. Letter for Peter Myers from Margo Oge, dated December 8, 1992, re: EPA questions and approaches to the three issues outlined in the Energy Policy Act of 1992
  20. Federal Register, Vol. 58, No. 23, dated February 5, 1993 "Preparation of Nuclear Waste Management Plan Report; Request for Comments/Notices of Public Meeting"
- 5 Committee Activities/Future Agenda
  21. March Meeting Agenda
  22. Topics through May 19-20, 1993
  23. ACNW Visit to Canadian Research Laboratories, June 23-24, 1993, Pinewa, Manitoba Province [see attached info.]
  24. Other Topic to be Scheduled
  25. ACNW Working Group Meetings
  26. Blaha list of proposed ACNW agenda items
- 6 Preparation of ACNW Report
  27. Status Report
  28. ACNW letter to Bernero, dated December 22, 1992, re: Scope of ACNW Activities [Internal Use Only, Draft Letter]
  29. Memorandum for Dade Moeller from Kenneth Carr, dated May 11, 1990, re: Approval of a Revised Charter for the ACNW [with enclosed revised ACNW Charter]
- 7 Gas-Phase Release of Radionuclides from Low-Level Radioactive Waste Disposal Facilities
  30. Status Report
  31. Dr. Man-Sung Yim, Scott A. Simonson, and Terry Sullivan, "Modeling of Gas-Phase Release From Low-Level Waste Disposal Facilities," Prepared for presentation at Waste

Management '93

32. Man-Sung Yim, "Gas-Phase Release of Radionuclides from Low-Level Radioactive Waste Disposal Facilities, "Thesis Research Progress Report, Exposure Assessment and Engineering Program, Dept. of Environmental Health, Harvard University, School of Public Health
33. Viewgraphs for ACNW on Gas-Phase Release of Radionuclides from Low-Level Radioactive Waste Disposal Facilities, presented to ACNW, by Man-Sung Yim, dated February 25, 1993

8 Briefing on Recent Changes to Regulations on the Conduct of Government Employees

34. Viewgraphs, 1993 Ethics Training, Ethics Counselors (OGC) John Szabo, L. Michael Rafky, Geraldine Fehst

10 Performance Indicators for LLW Handling and Disposal

35. Status Report
36. "Background Information on a Proposal for the Establishment of a System of Performance Indicators for the Management and Disposal of Low-Level Radioactive Wastes", [D. Moeller, dated January 2, 1993, Draft #1]
37. Memorandum for ACNW Members from H. Larson, dated August 24, 1992, re: Indicators of Performance [with enclosures]
38. Memorandum to Dade Moeller from M. Steindler, dated September 6, 1992, re: Comments on the LLW Indicators of Performance [For Internal Committee Use; Predecisional Draft]
39. Memorandum to File from Richard Major, dated August 19, 1992, re: July 28, 1992 Meeting Between Commissioner Curtiss and Dr. Moeller to discuss Items of Mutual Interest [For Internal Committee Use Only]
40. Memorandum to File from Richard Major, dated September 16, 1992, re: Meeting between Commissioner Rogers and ACNW Members and Staff on July 29, 1992 [Prepared for Internal Committee Use Only]
41. Memorandum for ACNW Members from Howard Larson, dated January 21, 1993, re: Indicators of Performance [with attachments]
42. Executive Summary, "Performance Indicators for Operating Commercial Nuclear Power Reactors," Report for Second Quarter 1992
43. NRC Announcement #200 to All Employees, re: Revised Guidance on the Use of Performance Indicators

11 Meeting With The Commission

44. Status Report
45. Letter to I. Selin from D. Moeller, dated December 1, 1992, re: Significant Issues in the High-Level Waste Repository Program

Appendix V  
51st ACNW Meeting

6

46. Letter to I. Selin from D. Moeller, dated February 5, 1993, re: Issues Raised in the Energy Policy Act of 1992, Section 801
47. Memorandum for Dade Moeller from James Taylor, dated February 11, 1993, re: Significant Issues in the High-Level Waste Repository Program

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

Title: PERIODIC MEETING WITH ADVISORY COMMITTEE  
ON NUCLEAR WASTE (ACNW)

Location: ROCKVILLE, MARYLAND

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The transcript is intended solely for general informational purposes. As provided by 10 CFR 9.103, it is not part of the formal or informal record of decision of the matters discussed. Expressions of opinion in this transcript do not necessarily reflect final determination or beliefs. No pleading or other paper may be filed with the Commission in any proceeding as the result of, or addressed to, any statement or argument contained herein, except as the Commission may authorize.

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

- - - -

PERIODIC MEETING WITH ADVISORY  
COMMITTEE ON NUCLEAR WASTE (ACNW)

- - - -

PUBLIC MEETING

Nuclear Regulatory Commission  
One White Flint North  
Rockville, Maryland

Friday, February 26, 1993

The Commission met in open session,  
pursuant to notice, at 9:00 a.m., Ivan Selin,  
Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission  
KENNETH C. ROGERS, Commissioner  
FORREST J. REMICK, Commissioner  
JAMES R. CURTISS, Commissioner

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**STAFF SEATED AT THE COMMISSION TABLE:****SAMUEL J. CHILK, Secretary****WILLIAM C. PARLER, General Counsel****ANDREW BATES, Office of the Secretary****DADE W. MOELLER, Chairman, ACNW****MARTIN J. STEINDLER, ACNW****PAUL W. POMEROY, ACNW****WILLIAM J. HINZE, ACNW****NEAL R. GROSS**

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## P-R-O-C-E-E-D-I-N-G-S

9:00 a.m.

CHAIRMAN SELIN: Good morning, ladies and gentlemen.

The Commission is meeting at this time to receive a periodic briefing from our Advisory Committee on Nuclear Waste and we welcome Committee Chairman, Doctor Dade Moeller, and the other members of the ACNW in attendance.

We'd like to congratulate you on the milestone that you reached in January when the Committee held its 50th meeting and just yesterday completed its 51st meeting. The Commission takes note of this accomplishment and extends its congratulations to all the Committee members.

Safe and effective management and disposal of nuclear waste, both high and low-level, are fundamental in increasing importance to the beneficial use of nuclear materials. In fact, it's probably fair to say that without a perceived solution of the high-level waste problem, then much of the work that we've been doing on license renewal and on Part 52 will not be all that productive in the long run.

The Committee plays an important role in advising the Commission on nuclear waste issues and

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1 the Commission, as always, has a great deal of  
2 interest in what the Committee has to say.

3 You have a very interesting agenda today,  
4 Doctor Moeller, and we look forward to what you have  
5 to say.

6 But first, I'll ask my colleagues if they  
7 have any remarks.

8 COMMISSIONER REMICK: Nothing.

9 CHAIRMAN SELIN: Thank you.

10 DOCTOR MOELLER: Well, thank you, Mr.  
11 Chairman. We came at your invitation to discuss the  
12 two reports specifically that we submitted during the  
13 month of February. One of them on February the 11th  
14 was our -- well, we titled it, "Significant Issues in  
15 the High-Level Waste Repository Program," and in  
16 essence it was another step forward on our systems  
17 analysis of the various issues there. Then, Doctor  
18 Steindler will be responding or leading us in that  
19 discussion. Then, on the second item, the issues  
20 related to the Energy Policy Act, Section 801, I'll be  
21 handling that. So, we'll call on Marty to move  
22 forward.

23 DOCTOR STEINDLER: Thank you.

24 If you recall the background, we had a  
25 discussion with the Chairman who expressed an interest

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1 in finding out whether or not the high-level waste  
2 program had any significant holes, major show  
3 stoppers, and suggested that perhaps the thing we  
4 ought to do is have a look to see whether or not one  
5 could conveniently, or even inconveniently, do a  
6 systems analysis, top down systems analysis of the  
7 overall program to uncover any such difficulties. We  
8 looked at that, reported back to the Commission last  
9 year that we didn't see anything major and that  
10 systems analyses were being pursued by both the staff  
11 to some extent and certainly DOE.

12 Following that, the focus shifted slightly  
13 and we were asked to specifically enumerate, if we  
14 could, any major issues that we thought should be  
15 brought to the attention of the Commission. We have  
16 had a number of discussions on that topic. We elected  
17 to broaden the discussion beyond purely technical  
18 issues and found a number of interface issues. We  
19 wrote you a letter, a report in December of last year  
20 on the item and the staff has recently responded to  
21 some of the points that we raised in that. I want to  
22 kind of briefly touch on a number of those issues and  
23 certainly not go through them all again that we've  
24 already covered once.

25 Let me give you a summary, however, of the

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1 conclusions one might draw from that particular  
2 exercise.

3 First, we found no major show stopping  
4 holes, technically describable, that would lead to  
5 what we might call a hemorrhage of the program to be  
6 life threatening to it. We did identify some issues  
7 that are much less than huge, but if not attended to  
8 could become Achilles heels later on when the  
9 licensing process draws closer. Those things, which  
10 I'll touch on, require resolution to keep the program  
11 going and particularly to keep it on schedule.  
12 Schedule is an important issue as implied in the  
13 notion of having a solution at hand.

14 The things that we're going to talk about  
15 may seem like trivial minutia, but they are not  
16 necessarily so and they will become less so as time  
17 goes on. The fact, I think, remains that the  
18 technical aspect of building a repository is not a  
19 show stopping issue. And it really within very wide  
20 limits doesn't make any difference whether you focus  
21 on Yucca Mountain or some other reasonably suitable or  
22 equally suitable site. There is a presumption that  
23 Yucca Mountain is suitable. I don't know that and  
24 we're presuming that, but for the moment Yucca  
25 Mountain is the target and it seems to be an

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1 interesting target.

2 Let me simply walk through then to at  
3 least identify some of these issues that we talked  
4 about and then come to focus on those where the staff  
5 and we are not quite in agreement and tell you what  
6 our view is and what kind of things we're going to  
7 follow up on.

8 The first one that we cited, of course, is  
9 one that's already being taken care of and that is  
10 that we thought it was very important for the  
11 Commission and the staff to forward to the National  
12 Academy in response to the Energy Policy Act its  
13 advice on the kind of things that the National Academy  
14 report should contain. That's in process and it  
15 remains to be seen what the National Academy Committee  
16 will do with that.

17 We indicated that the role of enhancing  
18 one barrier in a multi-barrier system to offset either  
19 deficiencies to some extent or uncertainties in other  
20 barriers in this multi-barrier system ought to be  
21 something that the staff should begin to tolerate more  
22 so than they're currently tolerating. I'll touch on  
23 that a little bit more.

24 We have recently had some additional  
25 discussion on the issues of expert judgment and the

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1 technology that is likely to be involved in the  
2 licensing process is such that expert judgment, we  
3 feel, is a mandatory process that will have to be  
4 used. The protocols for that are subject to, we  
5 think, a horrendous amount of argumentation, since  
6 that's not a well developed, long established science,  
7 and we urge the consideration of providing through  
8 rulemaking some of the bases under this decisions  
9 about what is the suitable protocol and what is not,  
10 that that be done. I'm going to touch on that a  
11 little bit later.

12 In addition, I think the other point that  
13 predictive science and technology has to look at is  
14 the utilization of models and the qualification of  
15 both models and the data that goes into them. It  
16 isn't clear to us, and it still is not clear to us,  
17 that the methodology for deciding what is a good model  
18 and what is not has been given sufficient guidance.  
19 I will touch on that also.

20 There were a number of other points, most  
21 of which, I think, are of, we think, less importance  
22 as time goes on, which we can certainly touch on if  
23 you like. But I'd like to then pursue some of these  
24 a little more closely.

25 Let me say at the outset that none of

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1 those issues that I've touched on represent what I  
2 would call explicit scientific issues. They're all  
3 interface issues and that's in keeping with the  
4 general notion that the science and technology is not  
5 an area where there are severe uncertainties of such  
6 magnitude at the moment that would represent show  
7 stoppers. It's true that investigations in some areas  
8 are still exploring ways of doing the job. That is  
9 the science folks have not learned how to get the  
10 right answer on the first try, but that's not  
11 something that we see is going to be permanently  
12 debilitating.

13 So, the things that I intend to talk about  
14 will be interface issues between what I guess either  
15 are institutional licensing issues and the scientific  
16 community.

17 Well, let me touch on a couple <sup>of</sup> issues.  
18 The staff seems to have taken a fairly rigid position  
19 on this role of exchanging capabilities of one of the  
20 barriers for the deficiencies or uncertainties in the  
21 other. Specifically, the issue arises in the  
22 enhancement in the way in which the enhancement of the  
23 engineered barrier system could be offset for  
24 uncertainties that you would encounter when you're  
25 doing geologic studies. It may also be that some of

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1 the geology is not exactly what you would like it to  
2 be. I think the position that says, "No, you're not  
3 really allowed to do that," is not particularly  
4 productive. It doesn't seem to us to be in keeping  
5 with what the regulations indicate. Equally  
6 important, it removes from the Commission the  
7 flexibility that was specifically built into the Part  
8 60 for making decisions and potential tradeoffs. This  
9 is an issue that looks to us as though it may well  
10 turn out to be difficult in the licensing process and  
11 we probably will need to continue our discussion with  
12 the staff on that.

13 CHAIRMAN SELIN: Could I stop you for a  
14 second?

15 DOCTOR STEINDLER: Yes.

16 CHAIRMAN SELIN: Is there a possibility of  
17 coming up with a couple of examples that would satisfy  
18 both the Committee and the staff as opposed to arguing  
19 on such general terms about one says, "The  
20 probabilities can't just be divided into equal parts  
21 a priori," and the other one says, "You're against  
22 defense in depth," and these are sort of extreme  
23 positions. Is there some way to illustrate the --

24 DOCTOR STEINDLER: I would think we could  
25 do that. The specific issue that, for example, has

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1 most recently come up is whether or not a significant  
2 enhancement in the performance of the engineered  
3 barrier system, for example the canister, could be  
4 used to offset inadequate geochemistry in the far  
5 field.

6 The argument is fairly simple. If, in  
7 fact, the Department can provide a robust package and  
8 demonstrate its likely robustness over a period that  
9 pushes close to the 10,000 year period rather than the  
10 substantially complete containment 1,000 year period,  
11 then the source term for the far field migration, and  
12 hence presumably the release into the far field, could  
13 be significantly reduced and the requirements on the  
14 quality of that geology or geochemistry can be dropped  
15 while still achieving the same general level of  
16 protection for the health and safety of the public.

17 CHAIRMAN SELIN: It would be useful if you  
18 could follow that up. The kind of thing that occurred  
19 to me when I read the two comments was if you're  
20 talking about the basic underlying risks, the idea  
21 that you have to distribute the uncertainty is pretty  
22 powerful. But if you're talking about some of the  
23 peripheral criteria which are dominated by the  
24 uncertainties rather than anything else, if you're  
25 talking what's going to happen in the far field,

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1 what's going to happen 10,000 years from now, if one  
2 part could be shown to have more confidence than one  
3 thought, then one wouldn't have to be quite so  
4 conservative in some of the other criteria.

5 Well, the example you brought up appears  
6 to be relevant to the thinking I had on that. I would  
7 be useful if you could follow up on it.

8 DOCTOR HINZE: Well, that is not to say  
9 that you disregard the geology and the geological  
10 factors. I want to make it clear that that's not to  
11 stance we're taking. You don't build a battleship and  
12 drop it down the mouth of a volcano to store it. That  
13 kind of thing. But there are legitimate tradeoffs in  
14 the uncertainties that are going to remain after the  
15 characterization.

16 COMMISSIONER REMICK: Marty, I understand  
17 your arguments on balancing and tradeoff and <sup>my</sup> initial  
18 inclination is to agree. But laying this on the  
19 staff, isn't this something that DOE itself proposed  
20 in 10 CFR 960 and which we then concurred in? In  
21 other words, didn't DOE put itself in this position by  
22 proposing this in their siting guidelines back in the  
23 mid-'80s in 960?

24 DOCTOR STEINDLER: I don't know. You may  
25 be right.

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1 COMMISSIONER REMICK: They did.

2 DOCTOR STEINDLER: Yes.

3 COMMISSIONER REMICK: I can read you one  
4 paragraph. It says, "Furthermore, engineered barriers  
5 shall not be used to compensate for an inadequate  
6 site, mask the innate deficiencies of a site, disguise  
7 the strength and weaknesses of a site and the overall  
8 system and mask differences between sites when they  
9 are compared." We went on to concur with that then in  
10 the Federal Register. So, I don't think it's fair, as  
11 I understand it, to lay it completely on the staff.  
12 I think it has to be something that DOE and the staff  
13 have to --

14 DOCTOR STEINDLER: Quite so. I don't mean  
15 to identify --

16 COMMISSIONER REMICK: Sure.

17 DOCTOR STEINDLER: -- blame. That's not  
18 the issue. I think -- all I guess I'm stating is the  
19 notion we had was that there should be some reasonable  
20 tradeoff allowed again, as Bill pointed out, not to  
21 offset a totally inadequate site. The only reason the  
22 staff role comes in, it comes in for two reasons. One  
23 because of the response of the EDO and the other one  
24 is the communications that they've recently had,  
25 relatively recently had, with DOE when that issue came

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1 up.

2 But our intent, I guess, is to pursue that  
3 with the staff. We've had -- in our December 1st  
4 letter, we also pointed out the distinction between  
5 960 and 60 and their relative roles in this process  
6 seemed unclear to us and the staff, I think correctly,  
7 pointed out to us that their interest is Part 60.  
8 It's that that we try to focus on to the extent we  
9 can.

10 COMMISSIONER ROGERS: Just a little bit on  
11 that, Marty. It occurs to me that if one gives more  
12 credit for the barriers, that that might be done  
13 through dealing with not the suitability of the site  
14 but the uncertainties in the measures of suitability,  
15 rather than -- so that you're not in the business of  
16 accepting in a sense a site that's less than  
17 desirable, but that the credit that you take for the  
18 engineered barriers is to make up for uncertainties in  
19 how well you can actually establish that suitability.

20 DOCTOR STEINDLER: Right. I think that's  
21 precisely correct and I would guess that is the  
22 context in which the 960 description was likely to be  
23 written.

24 COMMISSIONER ROGERS: Well, it seems to me  
25 if that's the approach, that that's a little more

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1 sophisticated concept than the simple one of making a  
2 tradeoff of a barrier against a site deficiency. It  
3 relates to your knowledge and ability to establish the  
4 suitability of the site. But in other words, you  
5 might tolerate a little bit broader uncertainty in  
6 certain parameters, but not necessarily the mean value  
7 would be changed that you'd be willing to accept, if  
8 you know what I mean.

9 DOCTOR MOELLER: Reviewing the history of  
10 this though, and it may be that we were failing to  
11 communicate with the staff or we don't understand what  
12 they're saying or vice versa, but Commissioner Curtiss  
13 I'm sure recalls a couple years ago when you directed  
14 to us the question to review the subsystem  
15 requirements of Part 60. The Committee did that. We  
16 met with the staff and I need to look up that letter,  
17 but as I recall at that time when we discussed it with  
18 the staff, we all came to the bottom line that it was  
19 the system that must perform and meet the standards  
20 and that you could have some flexibility in the  
21 subsystem requirements. Am I wrong in that?

22 COMMISSIONER CURTISS: Well, I think, as  
23 I recall the discussion at the time, the staff's  
24 position as they reflected it in their February 11th  
25 response has been consistent throughout, which is to

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1 say that Part 60 requires that each of these subsystem  
2 performance criteria in 60.113 be viewed as a minimum  
3 and independent criterion. I'd have to go back and  
4 look at the letter specifically, but I don't recall  
5 that their position has evolved on that point.

6 Go ahead, Ken.

7 COMMISSIONER ROGERS: No, no. That's my  
8 recollection as well. So, if you really want to take  
9 some credit for the engineered barriers, then what you  
10 do is you take credit through being willing to stop in  
11 a certain sense and accept a little bit more  
12 uncertainty in the mean value of one of these  
13 essential parameters rather than change the mean value  
14 that's acceptable.

15 DOCTOR STEINDLER: Well, that  
16 fundamentally has been perhaps our ill-explained  
17 focus. Our concern was driven by the notion that if  
18 you require far field precision, you may be engaged in  
19 the process that is a 50 year exploratory operation,  
20 which you simply can't do, whereas you can solve that  
21 problem I think a lot easier. Again, schedule, I  
22 think in this case, is the driving force.

23 COMMISSIONER ROGERS: Well, it seems to me  
24 if you take this approach you can still be consistent  
25 with the necessity of satisfying individual

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1 requirements, but as best you can but willing to  
2 accept, as I say, a little bit more uncertainty.

3 DOCTOR STEINDLER: We would certainly  
4 agree with that.

5 DOCTOR HINZE: In our letter we used the  
6 term "potential difficulties," and that was really  
7 said in the context of uncertainties.

8 COMMISSIONER ROGERS: Yes.

9 DOCTOR HINZE: We didn't perhaps say it as  
10 precisely as we should have.

11 DOCTOR STEINDLER: Okay. Well, let me  
12 move on to one --

13 COMMISSIONER CURTISS: Marty, could I  
14 just --

15 DOCTOR STEINDLER: I'm sorry, yes.

16 COMMISSIONER CURTISS: Excuse me. If I  
17 could just carry it a step further. This is an issue  
18 that, as the Chairman indicated, I've been interested  
19 in pursuing. I guess the challenge that I see, and  
20 I'm not sure how to come to grips with it, is this.  
21 Whether you view it on sort of a rough level of  
22 trading off the performance that would be achieved  
23 with respect to each of the subsystem performance  
24 criteria, the release rate, the package and the  
25 groundwater travel time, or in what I think is a more

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1 sophisticated way to look at it, the trading off of  
2 uncertainty and the way you calculate that, take  
3 advantage that you're probably going to be much more  
4 highly certain of the performance of maybe the  
5 container than you would perhaps on groundwater travel  
6 time.

7           Either of those two approaches, and this  
8 is the challenge that I haven't been able to come to  
9 grips with, but either of those two approaches, it  
10 seems to me, presupposes that the subsystem  
11 performance criteria in the aggregate are designed to  
12 achieve what I think you've referred to here as an  
13 overall level of protection. That is to say if you  
14 add up the release rate and the package requirements  
15 and the groundwater travel time, the sum of those  
16 three will give you a level of performance, defense in  
17 depth, that accumulates to that level of performance  
18 that is X. In reviewing the history of this issue and  
19 in looking at the way those requirements were  
20 formulated in 113, I'm not sure that's the case. I'm  
21 not sure it was ever determined back in the late '70s  
22 and early '80s that what we've done in Part 60 was to  
23 define a level of overall performance that we would  
24 expect the repository to meet and then in a relatively  
25 disciplined way laid out the three subsystem

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1 performance criteria, the sum of which would yield  
2 that level of performance.

3 So, as you look at this question over  
4 time, it seems to me it's important, if that's in fact  
5 the case, and I think it is, to recognize that as you  
6 say, "Let's trade off performance on one or the other  
7 or maybe on the trading off of uncertainties," that  
8 that approach almost presupposes that you've defined  
9 an overall level of protection that you can then, as  
10 you trade off these things, recalculate and see if  
11 you've achieved that. I'm not sure how to do that.  
12 If your deliberations on this issue lead you to a  
13 solution to that question, enlighten me.

14 Secondly, getting down related to that but  
15 also related then to the trading off of one or two of  
16 these issues, it seems to me what you need is an  
17 algorithm in order to permit you to accomplish that.  
18 Commission Rogers' notion strikes me as a very  
19 attractive one and it's a much more sophisticated  
20 approach than simply saying, "We'll take a notch down  
21 here and crank it up a notch here." But again, here,  
22 I'm not sure what the algorithm is for making that  
23 kind of tradeoff in the context of dealing with  
24 uncertainties. At some point, of course, all of this  
25 will come before a board and when you say, "We're a

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1 little bit more confident here, perhaps a little bit  
2 less confident there," sometime between now and then,  
3 if that's an approach that the current regulations  
4 permit or that makes sense, it seems to me there'd be  
5 some merit in defining in more detail how you make  
6 that rather than just a subjective sense that we have  
7 a little bit more performance here, a little bit less  
8 here and it all sums up to the same thing.

9 So, you don't need to address those here,  
10 but as your deliberations go on, I think those are on  
11 the key issues that I see in this arena.

12 DOCTOR STEINDLER: Well, if we can digress  
13 into that issue for just a second, the assumption has  
14 been all along, but it may not have been explicit when  
15 the original regulations were written, for obvious  
16 geometric reasons, that the EPA criteria will be the  
17 final determiner of having met the requirements.  
18 That's still the case. So, you know what the sum is,  
19 you simply don't know what the components are.

20 COMMISSIONER CURTISS: Well, just to be  
21 precise here, we also know that if you meet the  
22 subsystem performance criteria, you may or may not --  
23 it doesn't follow that you meet the EPA standards and  
24 vice versa. So, I'm not sure I agree that we've  
25 established that clear a link between the two and that

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1 you can therefore use the EPA goal, whatever it might  
2 be, as the mechanism for defining how you approach the  
3 issue of 113 subsystem performance criteria.

4 DOCTOR STEINDLER: There are some  
5 subsystem -- there is at least one subsystem  
6 performance criteria, namely the release rate, that  
7 has run into problems, arithmetic problems in a sense  
8 with the former table in the EPA rules. That fairly  
9 minor glitch, although two orders of magnitude may not  
10 be viewed as a minor glitch by some people, but that  
11 arithmetic discrepancy is the only one that I can see  
12 offhand where you clearly have an existing conflict.  
13 The sum of the subsystems criteria, coupled with the  
14 site qualification process, is alleged to provide a  
15 repository framework that can meet the EPA criteria.  
16 The issue really is to what extent do you want to hold  
17 stringent requirements to the subsystems criteria, at  
18 the same time holding to the EPA criteria?

19 I think the point that you make is the  
20 only good one that needs to be answered in this case.  
21 We will know some things a lot better than others and  
22 it's that offset of uncertainties which sum to the  
23 adherence to the EPA criteria which should determine  
24 the performance of <sup>the</sup> repository.

25 I think the problem basically comes down

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1 to how much attention do we want to give to the rigid  
2 interpretation of how the various nested systems  
3 function. Looking at it from our standpoint, and of  
4 course we don't have the job you do, but looking at it  
5 from our standpoint, one can simply recognize that  
6 there needs to be flexibility in the system while  
7 keeping rigidly to the bottom line. I think that  
8 would be the mode that we would go to. But yes, we  
9 can probably find other ways of addressing the issue  
10 of uncertainties in specific technical terms and  
11 provide some examples.

12 We would like to continue to discuss with  
13 the staff their views on this and perhaps we can  
14 sharpen our respective views upon this issue and come  
15 back later.

16 Well, let me move on to at least one other  
17 area, perhaps a few more. I mentioned the role of  
18 expert judgment and we've recently had some  
19 discussions in our meetings on the whole question.  
20 Expert judgment continues to be a fairly new and  
21 somewhat unrefined technology, if you want to call it  
22 that. The various protocols that people use to make  
23 decisions on how to implement expert judgment are  
24 subject to a lot of argument. There's no doubt that  
25 the role of expert judgment will be important in this

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1 whole process of defining whether or not a particular  
2 site is suitable and whether or not the performance of  
3 a repository can be estimated into the future well  
4 enough.

5 Superimposed on that is the most recent,  
6 we think somewhat interesting issue of the Supreme  
7 Court beginning to address the question of what is  
8 good science and how do you know or who<sup>m</sup> do you trust  
9 to tell you that. All of those issues are  
10 sufficiently flexible, so our contention is that it  
11 needs to be addressed in some sort of a firm fashion  
12 in order to avoid a great deal of difficulty later on  
13 at the licensing process. Again, this is an issue  
14 that has an institutional interface, but really deals  
15 with how do you address the problems of handling  
16 models and so on and so forth.

17 Paul Pomeroy has been our resident expert  
18 on expert judgment and he may have a few words to say  
19 on the issues that we've raised here.

20 DOCTOR POMEROY: Fine. I would like to  
21 say that there are at least two things going on right  
22 now that may help us to reach some closure with the  
23 staff on the question of how much guidance in the use  
24 of expert judgment is appropriate. The first one is  
25 the Supreme Court case that Marty has mentioned. It's

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1 tentatively expected. I gather that there might be a  
2 decision by the Supreme Court in the fall with regard  
3 to some of the issues that are brought forward there.  
4 These are particularly in regard to the Rule 702 and  
5 703 and the Frye Doctrine. The Supreme Court may  
6 provide us some guidance in the appropriate way to  
7 utilize expert judgment in the decision making  
8 process.

9 It's my feeling, of course, that the  
10 existing evidentiary rules are excellent in the sense  
11 that they do allow us to eliminate a lot of junk  
12 science in the hearing processes. At the same time,  
13 they do give rise to some concerns that they could be  
14 used to eliminate much of the expert judgment that is  
15 brought forward by all of the parties in the process.  
16 So, we're looking forward to their decision on that  
17 matter.

18 The second thing is, of course, as you  
19 probably are aware, the staff is pursuing Phase 2.5 of  
20 its iterative performance assessment. Phase 2.5  
21 involves the actual selection of one area within the  
22 repository process where expert judgment will be  
23 extensively used and after that selection carrying out  
24 the entire elicitation process of expert judgment and  
25 carrying that through as far as possible to a bottom

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1 line conclusion that the staff might reach. We feel  
2 that that's going to be a very educational process and  
3 we're following the planning and execution of that  
4 phase with rather keen interest. Following its  
5 completion, we're going to explore with the staff  
6 again the question of what their feelings are  
7 regarding the appropriateness of issuing guidance,  
8 whether that guidance is in the form of a staff  
9 technical position initially followed by rulemaking or  
10 some rulemaking activity.

11 I think I just want to say also that these  
12 concerns as evidenced by a three day meeting sponsored  
13 by DOE in Albuquerque last November and conversations  
14 with individual members of most of the interested  
15 parties involved, those conversations all indicate  
16 that there is a concern for this guidance, the  
17 existence of this guidance and a concern regarding the  
18 legal aspects of the admissibility of some of the  
19 expert judgment that may come forward. We're working  
20 with those groups also to try to coordinate our  
21 efforts and not duplicate efforts within the entire  
22 program.

23 So, I think we will revisit the issue with  
24 the staff following the Supreme Court decision and the  
25 completion of Phase 2.5.

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1 DOCTOR STEINDLER: Okay. Let me touch on  
2 one or two other subjects. The whole question of how  
3 do you qualify data that has not been -- that you pull  
4 out of the literature that's been done some time ago  
5 continues to be one that we're not very comfortable  
6 with. The staff has issued a set of guidance. DOE  
7 has done the same thing. On how you do that, let me  
8 simply say we plan to test the system, so to speak, by  
9 looking at selected documents in the literature to see  
10 whether or not they would or would not with those  
11 guidelines qualify. One of the ones that I personally  
12 would like to pick on is Pons and Fleischman's paper on  
13 cold fusion, to see whether or not it would qualify as  
14 an acceptable piece of science under the guidelines  
15 that are currently being used. We haven't done that,  
16 but perhaps with some dialogue with the staff and  
17 ourselves, we may be able to test that system as a way  
18 to determine whether or not those models or that  
19 protocol is functional.

20 There is a presumption, to be sure, which  
21 we have to be a little careful of and that is the  
22 presumption is that that paper probably is not good  
23 science. We'll see what comes out of it and whether  
24 the system works.

25 COMMISSIONER REMICK: Marty, why would you

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1 use that particular paper rather than a specific  
2 reference that might be at issue in the high-level  
3 waste program? There certainly have to be examples  
4 there.

5 COMMISSIONER ROGERS: Just because it  
6 isn't?

7 DOCTOR STEINDLER: That's the point.

8 COMMISSIONER REMICK: No. I think it  
9 would be very valuable to know a specific example in  
10 the high-level waste area.

11 DOCTOR STEINDLER: There's nothing that  
12 prevents us from also doing that. If, in fact,  
13 there's general agreement, which at the moment I think  
14 is probably to be found, that that particular paper is  
15 not particularly acceptable. It's not a particularly  
16 good science and would not serve -- if it dealt with  
17 the subject that's pertinent to the repository, it  
18 would not serve the repository well. What we would be  
19 looking for is to make sure that the protocol that's  
20 going to be used would, in fact, reject that paper.  
21 That's what we're looking for. But clearly that's one  
22 sided.

23 COMMISSIONER REMICK: I think you're  
24 getting into a very delicate area.

25 COMMISSIONER ROGERS: Yes.

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1 DOCTOR STEINDLER: Well, on the other  
2 hand, that system hasn't been tested and that's been  
3 a concern of ours because models are going to have to  
4 use that. What you don't want to do is get to the  
5 licensing process and then argue about how to qualify  
6 the information that goes into the models.

7 COMMISSIONER ROGERS: Well, if I could  
8 just ask a question here, it seems to me that you're  
9 talking about two different things. One is bad  
10 science and the other is out of date science. Out of  
11 date science was good science at one time. There are  
12 a lot of things we know today that at the time they  
13 were done were the best there was and perfectly  
14 acceptable within the state of scientific knowledge  
15 and classical physics versus relativistic physics, for  
16 example, or quantum physics. And we know that some of  
17 the elements of what were incomplete early science  
18 have still a certain degree of validity, but are  
19 incomplete. So, that's a different issue from what is  
20 good science versus bad science. What it seems to me  
21 that's a more relevant concern here is early data that  
22 may have been incomplete or early experiments that  
23 were done that represent the only thing that exists in  
24 the literature that really are not quite good enough  
25 for today's needs, but at the time they were done were

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1 perfectly acceptable, ground breaking perhaps and  
2 represented the end of the work that was done. There  
3 wasn't anything done after that. But today we may  
4 feel that we need a better job on some data  
5 acquisition or something.

6 So, it seems to me that's a different  
7 question from good versus bad science. It's  
8 incomplete studies that may be perfectly -- I wouldn't  
9 want to call them bad science, just the best there was  
10 at the time, but today the instrumentation and other  
11 things might allow for much better studies and much  
12 better acquisition of data than was done say 20 years  
13 ago or something of that sort.

14 So, I would think that that would be more  
15 the serious problem than the introduction of bad  
16 science into the arguments.

17 DOCTOR STEINDLER: Well, let me make a  
18 couple of comments. One, I don't have any quarrel  
19 with the general notion that early work may be  
20 incomplete or certainly doesn't carry a subject far  
21 enough for our current needs, and that early work,  
22 nonetheless, can be perfectly good. But that tends  
23 not to be the problem. Let me draw on some personal  
24 experience.

25 One of the difficulties we had in the area

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1 of materials and the engineered barrier system is  
2 examining data that may be, at most, ten years old,  
3 which is not very long ago, and recognizing the use to  
4 which that data is going to be put. The difficulty in  
5 assessing whether or not, for example, a particular  
6 leach rate or corrosion rate or a model of a surface  
7 reaction is applicable to a particular model that  
8 somebody is using for prediction requires -- in order  
9 to be able to do that, you have to have a pretty hard  
10 look to see how it was done and how well it was done,  
11 and whether or not that extrapolation is, in fact, a  
12 valid exercise of both the experimental method and the  
13 results that are published in some journal done long  
14 before QA was involved.

15 By the way, we draw a sharp distinction  
16 between quality assurance and the assurance of  
17 quality, which is not often done. It's in that  
18 context that you want to try and make sure that the  
19 system that's been established is, in fact,  
20 functional, so that you don't get into interminable  
21 arguments about whether John's data published in an  
22 electrochemical journal is, in fact, applicable to the  
23 model that you're trying to use for extrapolation.  
24 That's probably the major issue. That involves --

25 COMMISSIONER ROGERS: I missed a point.

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1           DOCTOR STEINDLER: Well, I think that  
2 involves the question of good science versus bad  
3 science.

4           Now, insufficiency will become obvious.  
5 If you don't have acceptable kinetic data, for  
6 example, because that's not what the individual was  
7 looking at at the time, I think then the issue is  
8 fairly clear. You can't use it or you won't use it.  
9 Whether or not you have some mechanism of qualifying  
10 it is somewhat immaterial.

11           Maybe you and I need to --

12           COMMISSIONER ROGERS: No, I think I  
13 understand what you're -- I think there are several  
14 different issues here that are all involved in this.

15           DOCTOR STEINDLER: Right. Right. There  
16 may well be. The concern again -- I mean our focus  
17 tends to be somewhat long-range in the sense that we  
18 look at the licensing process and what we really want  
19 to do is avoid arguments at that time because  
20 resolution of arguments on the protocols of how you do  
21 the selection, if you have to go back and do that, now  
22 represents a significant delay. If there's a  
23 challenge to how that was done, then you basically  
24 have to start over again. That's the point.

25           COMMISSIONER REMICK: Marty, I have strong

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1 reservations about us getting into a subject of good  
2 or bad science in an area where we don't have  
3 jurisdiction. I certainly would much prefer you to  
4 take some specific examples where we might rely on  
5 some information in high-level waste if you're going  
6 to do such a test and put the test there. We've at  
7 least accomplished something we can directly use then.  
8 If you decided that particular example is worthwhile,  
9 then we know something or if it isn't. But I  
10 personally have reservations about getting into a  
11 question of good or bad science in an area in which we  
12 just are not involved.

13 DOCTOR STEINDLER: Well, I hear you and we  
14 could certainly do that.

15 COMMISSIONER REMICK: That's personal  
16 opinion.

17 DOCTOR STEINDLER: No, no, I understand  
18 that. I think that's certainly worthwhile. We would  
19 try and find suitable accumulations of data in the  
20 literature that were done before the advent of a more  
21 rigorous control to see whether or not we can make  
22 some judgment about it. What we would then have to do  
23 is engage people in discussion as to whether or not  
24 others view that data to be suitable. That would be  
25 the point that we, I think, might have already had

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1 accomplished for us if we picked on something like the  
2 cold fusion program. But I hear you and we can  
3 certainly do that.

4 Well, the final point that I would make  
5 for you, without going through the letter from  
6 December 1st, is the lack of progress on the licensing  
7 support system. It's difficult to determine where the  
8 difficulties are. It's an issue which both the staff  
9 and DOE have been attacking in one fashion or another.  
10 Here also the role of qualifying data to be inserted  
11 into that system remains somewhat uncertain. The  
12 administrator apparently is not the person to make  
13 decisions as to what goes into that system. He is a  
14 keeper of a complex information recovery system.  
15 Nevertheless, we can envision challenges to what has  
16 gone into that system based on applicability based on  
17 the ground rules that have been used by the  
18 Commission.

19 We're a little concerned that the progress  
20 on that is slow. It is not, as are most of these  
21 issues, life threatening, but they do have to be  
22 resolved in some reasonably short period of time in  
23 order to not become as severe an offense.

24 Well, we could probably walk through the  
25 rest of our concerns, some of which are relatively

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1 minor in the context of major show stoppers, but I  
2 think our conclusions are simply this. We don't see  
3 any major difficulties in the technical area. We see  
4 some interface problems between the procedure that's  
5 required for licensing and the technology. We intend  
6 to, to the extent that we find it either desirable or  
7 convenient to discuss this with the staff to pursue  
8 some of these issues, taking into account what we've  
9 heard here.

10 One other set of comments. The last time  
11 we talked to you the issue was raised as to whether or  
12 not the DOE system study was going to be available to  
13 us to do the things that we said that should be done  
14 but somebody else was already doing. Progress on  
15 that, apparently, has become difficult and the  
16 originally designed October schedule has now slipped.  
17 As far as I know, the document is not done. The  
18 technical review board has recently had a discussion  
19 with DOE on that score and has not found the thing to  
20 be complete and had some comments on it. We continue  
21 to watch to see what comes out of this and we'll let  
22 you know as soon as we get some insight on that.

23 That, I think, is probably all I should  
24 comment on at this point. We've skipped over a number  
25 of things, but I'd be certainly happy to try and

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1 address questions that may be of interest to you.

2 CHAIRMAN SELIN: Why don't we go on to the  
3 second half and then if we have a little time --

4 DOCTOR STEINDLER: All right.

5 COMMISSIONER REMICK: Excuse me. Do you  
6 want to hold off the questions on this --

7 CHAIRMAN SELIN: Oh, no, no. If you have  
8 an immediate question, that's fine. Go right ahead.

9 COMMISSIONER REMICK: Okay. I could wait  
10 or --

11 CHAIRMAN SELIN: No, no. Go right ahead.

12 COMMISSIONER REMICK: Okay. There are a  
13 couple things in the letter, Marty, I wasn't quite  
14 clear. You raise the question about the properties  
15 and suitability of the waste form and perhaps the  
16 staff should undertake to define this. I'm thinking  
17 of the glass, borosilicate glass and the spent fuel  
18 rods themselves. Do you think this is ripe for  
19 rulemaking to try to get that issue out?

20 DOCTOR STEINDLER: Well, I must say I read  
21 the staff's response and their response has a  
22 significant amount of merit in the sense that their  
23 argument, as I interpret it, is within very wide  
24 limits that's not our focus. Our focus from the  
25 regulatory standpoint comes at the edge of the

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1       engineered barrier system. How the rest of that  
2       package looks and what's being done inside within very  
3       wide limits is not a place where we should be making  
4       specific guidelines, setting out specific guidelines  
5       or regulations. That's certainly a functional view.  
6       It's not the one that we had. Our view was that it  
7       would be useful if specific guidelines on how you  
8       design criteria for a suitable waste form, which after  
9       all determined to a large extent what your source term  
10      looks like, that that should be done.

11                I don't think the staff is so far off that  
12      we would jump up and down and say, "Gee, guys, you  
13      really ought to rethink this issue." We have  
14      therefore not given any additional thought, but that  
15      was the logic that we used.

16                COMMISSIONER REMICK:    Okay.    Another  
17      question --

18                DOCTOR STEINDLER:    There is -- I'm sure  
19      you're aware of the fact that there is a significant  
20      difference in the properties of glass versus spent  
21      fuel. Spent fuel has attributes that make it much  
22      less stable to potential attack for groundwater than  
23      glass. This is why glass was elected and that  
24      particular composition chosen.

25                COMMISSIONER REMICK:    That's assuming the

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1 spent fuel is intact.

2 DOCTOR STEINDLER: Yes.

3 COMMISSIONER REMICK: I thought you were  
4 addressing that question too after long-term storage  
5 and so forth.

6 DOCTOR STEINDLER: The long-term storage  
7 issue, yes.

8 COMMISSIONER REMICK: Okay. Another thing  
9 that was not quite clear to me in addressing the MRS,  
10 you said the required life of the MRS needs to be  
11 defined but you didn't say by whom. I wasn't quite  
12 sure if that was an NRC or a DOE type of thing. I'm  
13 thinking of DOE in light of the overall plan of MRS  
14 and repository. You didn't say who should define it.

15 DOCTOR STEINDLER: Yes. That was  
16 deliberate.

17 COMMISSIONER REMICK: Okay. I see.

18 DOCTOR STEINDLER: Now that you raised the  
19 question again. It wasn't very clear to us who should  
20 do this. Our view, I guess, is that this is really an  
21 NRC function. But that gets you into the role and the  
22 scope of activities in setting boundaries like that of  
23 the Commission. We elected to leave it blank because  
24 that's not really something we're very smart on.

25 COMMISSIONER REMICK: The other thing, you

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1 indicate in that same thing the Commission should  
2 request the NRC staff to develop the details of  
3 regulations related to the licensing on MRS. But I  
4 thought Part 72 was --

5 DOCTOR STEINDLER: Yes. The staff  
6 correctly pointed out to us that as far as they're  
7 concerned Part 72 covers all that needs to be covered.  
8 We have no reason to doubt that.

9 COMMISSIONER REMICK: You also had the  
10 statement in there, "There has been little planning  
11 for this eventuality," and that means suppose that a  
12 site for an MRS is not found. I assume that's moot in  
13 light of the DOE recent indications that they may  
14 begin to look at federal sites?

15 DOCTOR STEINDLER: Correct. Circumstances  
16 overtook us on that one.

17 COMMISSIONER REMICK: Okay. All right.

18 DOCTOR STEINDLER: We hope that that issue  
19 can get resolved because that is the only game in town  
20 for backup planning. That's right.

21 COMMISSIONER REMICK: Thank you.

22 CHAIRMAN SELIN: Doctor Moeller?

23 DOCTOR MOELLER: Okay. The second item,  
24 of course, was the letter on issues raised in the  
25 Energy Policy Act. I thought I would just highlight

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1 a few of our statements in there and amplify on them,  
2 give you a little bit of the background and thinking  
3 that went into them. One of our first statements was  
4 that although they would be developing standards ~~for~~  
5 specifically directed to Yucca Mountain, they did word  
6 it as generally applicable standards. We said that  
7 those were much preferred to site specific standards.  
8 And so now, why did we say that? Well, one of the  
9 reasons was that we felt that standards that were  
10 tailor made for a specific site might lose -- the  
11 people who prepared them might lose sight of some of  
12 the fundamental principles and concepts and so forth  
13 that would underlie them. Also, if you're writing  
14 standards for a specific site, the standards may very  
15 well imply that you have more knowledge of that site,  
16 that you know a lot more about it than later you find  
17 out that you do.

18 We noted that the Board on Radioactive  
19 Waste Management of the National Academy in their  
20 report a year or so ago on rethinking the high-level  
21 waste program called for flexibility in standards and,  
22 of course, if you have site-specific standards, you  
23 run the risk of losing that flexibility. And then  
24 lastly, we were somewhat fearful that standards  
25 developed for a specific site might lose some of the

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1 objectivity or another way of saying even handedness  
2 of the work that goes into them. So, those were our  
3 thoughts there.

4 The second thought, and if you don't mind  
5 maybe I'll zip through and then come back for  
6 questions. The second thought was we suggested that  
7 there be different standards for different time  
8 periods. The reason we were thinking in terms of that  
9 was, of course, the farther out you go, the longer you  
10 go into the future, the greater is the uncertainty.  
11 We also viewed that standards applying during the time  
12 in which institutional control is being exercised,  
13 those standards might be somewhat different than those  
14 post that period when institutional control is  
15 available because specifically so long as  
16 institutional control is being exercised, of course  
17 human intrusion hopefully would be prevented. But  
18 furthermore, remedial action could be taken and people  
19 would be watching over the site and be prepared to  
20 take such action.

21 Then we also said next that we endorsed  
22 the health-based, which we interpreted as a risk-based  
23 standard. Now, we have a variety of reasons for  
24 making that recommendation and these included the fact  
25 that health or risk-based standard would permit the

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1 public or other scientific groups to compare the  
2 stringency or the care of the protection of the public  
3 at Yucca Mountain or wherever the repository is with  
4 standards for other everyday risk, an item, of course,  
5 that Commissioner Remick has been very interested in.

6 Further, a risk-based standard does permit  
7 you to set a limit on the risk. Then if the  
8 quantification of the health effects that result from  
9 a certain dose, if those change in the future and we  
10 can anticipate they will because they've changed in  
11 the past, you at least don't have to keep changing  
12 your risk limit. The risk limit is a fixed number.  
13 At least you don't have to change it for that  
14 particular reason. You might have to change it for  
15 other reasons. But that puts some continuity to the  
16 risk-based limit and allows it to be firm.

17 We did say that -- I forget our exact  
18 wording, but we did say that a -- interestingly we  
19 said, "This approach, if adopted, would place an  
20 annual versus a cumulative limit on permissible doses  
21 to members of the public. <sup>)</sup> That is, I would say in  
22 hindsight, probably not as much of an absolute truth  
23 as one might say. I mean if you had an annual risk  
24 limit, you could certainly multiply it by 70 years or  
25 whatever the lifetime of an individual is and you

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1 could come up with a lifetime risk.

2 I think the main point we would make to  
3 you is that when we were talking about a cumulative  
4 limit, we're talking about a lifetime limit for  
5 individuals, not about a 10,000 year risk limit.

6 Also, I thought, and the Committee  
7 discussed it briefly, subsequently to preparing our  
8 letter, we thought of the fact that maybe there would  
9 be some benefit in a lifetime limit versus an annual  
10 limit. Certainly that, I'm sure, is something that  
11 the staff and the academy will want to think through.  
12 A lifetime limit would allow the doses, the annual  
13 doses to vary up and down as long as the lifetime  
14 limit didn't vary. So, I thought immediately, "Well,  
15 that might be a benefit." But the Committee on  
16 discussing it pointed out that a repository is not  
17 necessarily going to release pulses or major  
18 differences day to day or year to year in the amount  
19 coming out. It will be more of a steady state or a  
20 slow release. So, a cumulative release or risk limit  
21 would not have that benefit. Furthermore, a  
22 cumulative risk limit would introduce its own problems  
23 in record keeping. You'd have to find out what annual  
24 risk each person was suffering for every year of their  
25 life and total it up at the end and so forth. It

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1 would be very difficult.

2           The next item, and I'll digress for a  
3 moment, but I believe one of the places that the staff  
4 has consistently thought in terms of one thing and we  
5 have thought in terms of several others is in terms of  
6 the radionuclide release limit versus an individual  
7 risk or cumulative risk limit for the public. The  
8 staff has said consistently that a radionuclide  
9 release ~~has~~ limit, has an advantage of being more  
10 easily interpreted and enforced. Well, when we were  
11 looking at the individual risk limit, we were viewing  
12 it also in terms of its ease of enforcement. The  
13 difference, I believe, is that the Committee was  
14 looking at the standard in terms not only as a design  
15 guide for the repository, but were looking toward its  
16 application after closure of the repository.

17           Let me show you what I mean. A  
18 radionuclide release limit of course could be used to  
19 design the repository. But so could a limit on  
20 individual risk to members of the public. After  
21 you've closed the repository, a radionuclide release  
22 limit which requires you to know releases in a 4 pi  
23 geometry, you know releases from the repository in 4  
24 pi geometry and in gaseous forms and liquid form.  
25 That release limit would be very difficult to monitor

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1 post-closure and say, "Yes, this repository is  
2 continuing to meet the standards," or, "No, it's not."  
3 We have, I guess, in the backs of our minds, always  
4 held the thought that at some time in the future, 100,  
5 200, 300, 500 years, someone is going to say, "How's  
6 the repository doing?" It would be nice to say, "Oh,  
7 it's continuing to comply fully with the standards."

8 If you had an individual risk limit, you  
9 could say that because you could go out and take  
10 samples of drinking water or the air that the people  
11 are breathing or the potatoes they're eating. And you  
12 could say, "Yes, indeed, they're still complying."  
13 It's possible, but it would be extremely difficult to  
14 respond to an inquiry in terms of radionuclide release  
15 limits and say, "Yes, indeed, this repository  
16 continues to meet the standards," particularly because  
17 we are postulating that there will be no post-closure  
18 geologic types of monitoring systems. We're not going  
19 to have underground detectors at the accessible  
20 environment to see how many radionuclides have reached  
21 that point.

22 So, we like the risk-based standard. We  
23 also thought that a risk-based standard helps  
24 significantly in overcoming the concern that people  
25 have said, "Oh, we have a site with very little water.

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1 We'd better go to one with lots of water so the  
2 radionuclide leakage or releases will be highly  
3 diluted and the individual doses will be small."  
4 Well, the risk-based limit overcomes that in many  
5 ways, an individual risk limit, because maybe if  
6 there's little water there, perhaps there is a  
7 probability that any radionuclides that are released  
8 will be dissolved in a small volume of water and if  
9 someone drinks that water, they will receive a high  
10 dose. But the probability of a particular individual  
11 out there in the public being that single one, two,  
12 ten who drink this small amount of water and receive  
13 that high dose, that probability is very low, so the  
14 risk is comparably low.

15 Furthermore, the small volume of water  
16 assures us that the collective dose, that the number  
17 of people who are able to obtain and drink that water  
18 is going to be limited. So, it tends to take care of  
19 itself. We like it and we therefore pursued or  
20 endorsed it.

21 We took up the issues. I believe I've  
22 already in a sense covered issue 1. Issue 2 in terms  
23 of long-term post-closure oversight, we simply  
24 concluded that you cannot anticipate that there will  
25 be oversight of the repository thousands of years into

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1 the future. Why not just assume there will not be  
2 such oversight. Above all, even if you assume there  
3 is post-closure oversight, we emphasize that should  
4 not be used as a justification to lessen or reduce the  
5 stringency of the design of the facility.  
6 Furthermore, even if you assume as part of this post-  
7 closure oversight that equipment and techniques for  
8 mitigating any releases will readily be available, do  
9 not let that be used as a justification for reducing  
10 the conservatism of the design.

11 However, the Committee continues to  
12 promote post-closure monitoring for the simple reason  
13 that we believe it's an opportunity to collect data  
14 and to learn some lessons from this initial repository  
15 and that those lessons then could be applied on  
16 similar facilities in the future.

17 The next item was human intrusion. We  
18 tended to concur with the Board on Radwaste Management  
19 which says it's best to assume it will occur. So, we  
20 said, "Assume a probability of one," or we suggested  
21 that for human intrusion. As I read it, I'm not a  
22 statistician. I thought maybe it should have said  
23 probability of 14 or something. We say "one" meaning  
24 that someone sometime, maybe many people many times,  
25 will intrude.

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1 We also called for or re --

2 COMMISSIONER REMICK: Excuse me, Dade.

3 DOCTOR MOELLER: Yes.

4 COMMISSIONER REMICK: By intrude you mean  
5 breach?

6 DOCTOR MOELLER: Yes, we mean really  
7 breach. Yes, we did offer several suggestions that  
8 someone who just comes close to the repository, you  
9 should treat them differently than the people who  
10 really drill all the way down and ~~the~~ right into the  
11 high-level waste. We do believe that if someone has  
12 the technology to do that, surely they'll have the  
13 technology to look at what they're bringing up and  
14 hopefully monitor it and take appropriate precautions.

15 We also reemphasized one of our earlier  
16 recommendations <sup>th</sup> at human intrusion in terms of risk  
17 assessment be separated out from the normal procedure  
18 similarly to the way or handled in a manner similar to  
19 sabotage, how that is handled in the nuclear power  
20 plant arena.

21 Then lastly, we put in a statement or a  
22 recommendation that scientifically -- that effort  
23 should be done to make scientifically supportable  
24 predictions and the probability of breaching the  
25 various barriers in the repository due to various

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1 natural events that could occur over the next 10,000  
2 years.

3 As a last comment, I would mention that in  
4 our letter we said we had not had an opportunity to  
5 read SECY-93-013, which was the staff's comment and  
6 background information on this same subject. Since  
7 that time, we have had an opportunity to read it  
8 individually. I would not say that we as a Committee  
9 have discussed it sufficiently to make a lot of  
10 comments, but I think in general we'd say that the  
11 staff has done a good job of showing the pros and  
12 cons, the advantages and disadvantages of each of the  
13 various positions that could be taken on the issues.  
14 The only places we would have questions would be --  
15 well, one that I've already cited and one that I've  
16 not. The one that we would take issue with or we  
17 would encourage them to be more specific in how they  
18 say it. That's when they say that a radionuclide  
19 release limit is the easiest type of a standard to  
20 enforce or to apply. Maybe apply is a better word.  
21 I think they should always say in terms of the design  
22 of a repository. We do not agree with it if they're  
23 looking out in the future in terms of monitoring the  
24 performance of a repository.

25 The second area where we have had a

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1 professional interchange, and I'm pleased to comment  
2 on this one, that's the concept of the critical group  
3 versus the maximally exposed individual. We see  
4 definite signs that the staff is coming around to our  
5 way of thinking in their tentative preliminary  
6 response in terms of EPA's proposed standards for the  
7 WIPP facility. They're coming around to that way of  
8 thinking and we think it's the way to go and we've  
9 learned from them. It appears they've learned  
10 something from us.

11 We will certainly be pleased to take  
12 questions.

13 CHAIRMAN SELIN: Commissioner Rogers?

14 COMMISSIONER ROGERS: Well, just on this,  
15 I did want to come back to Doctor Steindler's  
16 presentation for a moment also. How in your risk-  
17 based approach do you think about a very low  
18 probability event that might result in a significant  
19 dose to a large number of individuals? I mean, you  
20 know, the small probability, high consequence  
21 situation. What is your thinking there on your risk-  
22 based standard?

23 DOCTOR MOELLER: Our thinking is that the  
24 risk-based approach accommodates that. Maybe  
25 accommodate is not the right word, but it encompasses

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1 it and it takes care of it. Sure, you'll have a dose  
2 limit as well as a risk limit. The dose limit may  
3 very well be exceeded, but if the probability of  
4 exceeding that dose limit is very small, then it's  
5 acceptable probably, perhaps. But you could calculate  
6 and see if it's acceptable within the risk envelope.  
7 We believe, therefore, a risk-based approach permits  
8 you to account and to accept those rare occasions of  
9 high dose that may occur to single individuals.

10 DOCTOR STEINDLER: Is your reference to  
11 microrem to mega people, in effect?

12 COMMISSIONER ROGERS: Yes, that large --  
13 yes. Well, or putting it that way, yes. Yes. There  
14 the probability might be reasonable though --

15 DOCTOR MOELLER: Oh, yes.

16 COMMISSIONER ROGERS: -- for microrem.  
17 No, I'm really thinking of more the low probability  
18 but high consequence rather than reasonable  
19 probability of small exposures to large groups of  
20 people. I think that one is dealt with a little more  
21 easily.

22 DOCTOR MOELLER: And the staff has been  
23 concerned, and rightfully so, that if you had a Yucca  
24 Mountain with a small amount of water, they've  
25 estimated that a person could receive rems under

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1 certain situations. But the probability of a given  
2 individual being that one person is extremely remote.  
3 Therefore, it would be acceptable under our risk-based  
4 approach and would not rule out what is a site that is  
5 preferable to one with lots of water.

6 COMMISSIONER ROGERS: But then aren't you  
7 really talking about the probability rather than what  
8 we normally call risk? Namely the product to the  
9 consequences and the probability?

10 DOCTOR MOELLER: Yes. Yes.

11 COMMISSIONER ROGERS: You really are  
12 talking about the probability. It's the low  
13 probability that makes it acceptable rather than the  
14 low risk?

15 DOCTOR MOELLER: Well, if we calculate the  
16 consequence, the product of the consequences times the  
17 low probability, the product is low enough to be  
18 within the risk or hopefully low enough to be within  
19 the risk limit.

20 COMMISSIONER ROGERS: Suppose it's not?

21 DOCTOR MOELLER: If it's not, then --

22 COMMISSIONER ROGERS: But the probability  
23 is still very low.

24 DOCTOR MOELLER: I'd have to think about  
25 it. Sure, there could be some cases where --

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1 COMMISSIONER ROGERS: It's a little bit  
2 hypothetical.

3 DOCTOR MOELLER: But at last<sup>e</sup> a risk-based  
4 approach gives you a lot more flexibility in my  
5 opinion and a lot more reasonableness, and yet you are  
6 protecting the public health and safety. It does not  
7 lessen that objective.

8 DOCTOR STEINDLER: Just one comment.  
9 There are a couple of cutoff limits that people  
10 occasionally propose and really what you're asking is  
11 where do those come into play. We have, I think, in  
12 the limited discussions we've had, we've not found  
13 clearly acceptable governing principles on whether to  
14 implement cutoff limits. Organizations have -- the  
15 microrem for mega people issue has been addressed by  
16 ICRP, I believe, and there is a general consensus,  
17 there seems to be a general consensus that events that  
18 have a probability below a certain value need not be  
19 considered further. Those are clearly kind of  
20 societal arbitrary cutoffs that you make.

21 COMMISSIONER ROGERS: Well, it may be that  
22 being a little more explicit in your thinking to us on  
23 the cutoff question with respect to this point of view  
24 that you've been taking here of a risk-based standard  
25 might be helpful.

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1 DOCTOR MOELLER: Thank you. We certainly  
2 can consider that. As you note in our letter, we did  
3 have extensive interactions with a representative from  
4 the National Radiological Protection Board in the U.K.  
5 and they indeed have suggested cutoff limits on risk,  
6 yes, or on probability. Excuse me.

7 COMMISSIONER ROGERS: On probabilities?

8 DOCTOR MOELLER: Yes.

9 COMMISSIONER ROGERS: Marty, I wonder if  
10 you could just describe what the methods were that you  
11 employed to identify your issues in your issues paper?  
12 What was the process that floated issues up? Did you  
13 sit around and scratch your noodles? How did you come  
14 at this? Was it something systematic?

15 DOCTOR STEINDLER: To some extent. No, it  
16 was a little bit more systematic than that. Actually,  
17 we prepared several levels of diagrams for various  
18 aspects. You saw the one overview that we submitted  
19 with the letter in response to an urging to do so.  
20 But buried underneath that, for example, were -- one  
21 of the things that we put together was a detailed  
22 analysis of the system of qualifying the engineered  
23 barrier system. We prepared a diagram that indicated  
24 to us what kinds of information had to be available,  
25 where it was going to come from and how it would

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1 interact into the final designation of what the  
2 engineered barrier system's performance was likely to  
3 be.

4 We did that explicitly for some things and  
5 implicitly, you can call it scratching your head if  
6 you like, for others and from that generated a much  
7 larger list of issues that we thought at the time when  
8 we thought about them were either unresolved or could  
9 lead to difficulties. The next two processes were  
10 fairly straightforward. One, we looked at the issues  
11 and then prodded around the system to see whether or  
12 not they in fact were uncovered. That is there was  
13 nothing that we could see being done about them. And  
14 then two, we did have some fairly extensive  
15 discussions among ourselves as to what's important and  
16 what isn't and what the role of these various issues  
17 are. So, we eventually narrowed that down  
18 considerably and we had a discussion with the Chairman  
19 on a list that included a number of items that did not  
20 make the final cut.

21 CHAIRMAN SELIN: Their chairman.

22 DOCTOR STEINDLER: Yes, I'm sorry. And  
23 the logic for throwing those out seemed eminently  
24 sound to us in essentially all the cases. That's the  
25 mechanism we used to eventually get down to the final

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1 list.

2           The final list has a number of strange  
3 attributes. Frankly, I'm not as happy with that list  
4 as I might be on a personal basis, largely because it  
5 tends to be almost non-technical. The specific  
6 technical issues that you and others have prodded us  
7 to think about simply don't show up in a series of  
8 issues where the question is, "Tell me something about  
9 major show stoppers." We didn't see any. You know,  
10 the thermodynamics seemed reasonable. You can build  
11 a repository. We think we know and the staff knows  
12 what to look for when somebody says, "I've got  
13 corrosion rate data which show that a six inch thick  
14 canister is going to do the job for X years."

15           The detailed data for that may not be at  
16 hand at the moment, but it looked to us that people  
17 know how to go about getting it and people are in the  
18 process of getting the data. We didn't think that  
19 that kind of issue should be raised, but we don't  
20 think that's a show stopper. If it were 1998 or the  
21 year 2003 and those data were not at hand and it  
22 didn't look like anybody was going to get there, then  
23 we might raise for the Commission that as being, "Hey,  
24 it's way too late." But that's not the place we're  
25 in.

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1                   COMMISSIONER ROGERS:   Well, I wonder  
2                   though if -- this is very interesting to me and I  
3                   think might be very useful for us at a later date to  
4                   review the process that you've gone through here  
5                   because this seems to me to be a process that maybe  
6                   should be revisited sometime by another Commission at  
7                   a later date.  The approach that you've taken, rather  
8                   than just the results of the issues that you've  
9                   finally winnowed out of this from this process seems  
10                  to me equally interesting to the results themselves.

11                  DOCTOR STEINDLER:   We were explicitly  
12                  told, thankfully, that weren't going to have to do the  
13                  systems analysis because we would figure that would be  
14                  an enormous task.  So, the examples that we picked  
15                  were simply examples out of our own experience.  We  
16                  were looking forward to seeing the DOE-completed  
17                  package where most of the steps for that kind of a  
18                  process should be fairly evident and from that we  
19                  could then do the job that we had to do ourselves in  
20                  several areas.  I'm still hoping that that will be the  
21                  case.

22                  When we do that, I for one would like to  
23                  go back and see what they've done and see whether or  
24                  not we've got a reasonably complete package.  We may  
25                  come back to you at some time saying, "Oops, we missed

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1 a few things." We don't think so. We think we're  
2 well enough acquainted with the system at large and  
3 we've talked to a lot of people so that we don't think  
4 there are any holes in that. The staff has not given  
5 us any indication that we've missed something  
6 horrendous and we have a reasonably good working  
7 relationship with the staff.

8 COMMISSIONER ROGERS: Thank you.

9 CHAIRMAN SELIN: They're not going to tell  
10 there's something horrendous and have a whole --

11 DOCTOR STEINDLER: They have not been  
12 particularly hesitant in telling us where they think  
13 we're not on the right track.

14 CHAIRMAN SELIN: Doctor Hinze?

15 DOCTOR HINZE: Well, a good example of  
16 trying to look for the show stoppers was the  
17 occurrence of the Little Skull earthquake this past  
18 summer in the immediate vicinity of the repository.  
19 We gave that a great deal of thought. Paul and I are  
20 extremely interested in that, visited a tunnel which  
21 is just above the epicenter and we were looking at  
22 that as a possible show stopper. But indeed the DOE  
23 is doing an adequate job of investigating that and is  
24 on track, we believe, with their analysis. That's  
25 been stepped up, as you've heard from Carl Gertz. So,

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1 we just couldn't provide that as an item to include in  
2 here. But a lot of investigations have gone into this  
3 that have unfortunately, if you will, dead ended.  
4 We've looked at these in terms of the early site  
5 suitability evaluation, the work of the staff in  
6 relationship to this and with our own view on these  
7 topics.

8 CHAIRMAN SELIN: Commissioner Curtiss?  
9 Commissioner Remick?

10 COMMISSIONER REMICK: Yes. I don't think  
11 I have to say that I agree with your risk perspective  
12 and I think on the large consequence, low probability  
13 one has to limit the probability when you get down to  
14 the area of striking meteorites or asteroids and  
15 things like this. The comparative type of thing has  
16 to enter in.

17 The thing that I had difficulty with was  
18 your suggestion that assuming a probability of one for  
19 intrusion, certainly my trips out West I always am  
20 just amazed how big that is. To think that a hundred  
21 acre site, that the probability is one that sometime  
22 somebody will come in there and drill and breach, I  
23 don't know what the probability is, but to me it has  
24 to be less than one if you look at the space in this  
25 country and the probability of that being selected.

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1 But I don't know what the probability is. All you're  
2 doing is assuming that it's perhaps a reasonable thing  
3 from a conservative --

4 On the question of how do you prevent that  
5 type of intrusion, there have been a number of things  
6 that have been around a long time, pyramids. You go  
7 to Upsula, Sweden, you see the burial mounds for  
8 Viking kings that have been there a long time. You go  
9 to Korea you'll see the burial mounds for kings there.  
10 Everybody seems to know that they're there and they've  
11 been a long time and so forth. So, the thought went  
12 through my mind, well, maybe we should build a pyramid  
13 on top of the repository. Then I thought, "No, that's  
14 probably expensive." I came up with another idea.  
15 Maybe we should establish a government agency at the  
16 site. They never go away. But then I conclude that  
17 that would probably be more expensive, so I came back  
18 to the idea of something like a pyramid.

19 Why isn't it possible to conceive of  
20 something like a burial mound or a pyramid or  
21 something like that?

22 Also, I just came back from observing the  
23 enhanced participatory rulemaking out in San Francisco  
24 and listened to Russell Jim from the Yakima Indian  
25 Nation who, by the way, was in the United Airline

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1 commercial back some months ago. A very interesting  
2 person. But he made a very impassioned plea. It had  
3 to do with storing low-level waste on sites,  
4 particular Hanford, but pointing out from their  
5 standpoint that they've had thousands of generations  
6 in which things are passed down from person to person  
7 and he claims that there's something there. That's  
8 passed down by word of mouth. Now, we're not all from  
9 the Indian nations and therefore don't always live on  
10 the land.

11 But I have a tough time feeling that there  
12 isn't some way with the record keeping ability we have  
13 today, even if the United States was somehow  
14 destroyed, I'm sure the people in Europe would know  
15 that we would have had a site like Yucca Mountain and  
16 so forth. It just doesn't seem possible to me that  
17 the records of such a unique type of site would be  
18 lost and that there isn't a way of ensuring that. I  
19 have a difficult time assuming that there's just no  
20 way of identifying those sites. If we're talking  
21 about intrusion from the standpoint of somebody  
22 walking the site, no question about that. If we're  
23 talking about somebody going in there and drilling, I  
24 certainly can't necessarily preclude it, but I'm not  
25 sure you can't prevent it to a large extent.

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1 DOCTOR POMEROY: Can I make two comments  
2 on that?

3 COMMISSIONER REMICK: Yes, please.

4 DOCTOR POMEROY: One is, of course, the  
5 pyramid question has been considered extensively and  
6 some of the internal structures in the pyramids have  
7 been effectively looted at one point in time.

8 COMMISSIONER REMICK: Sure. Sure.

9 DOCTOR POMEROY: So, there has been  
10 intrusion into the pyramids. In fact, they tend to  
11 attract people's attention in the sense that --

12 COMMISSIONER REMICK: I'm talking about a  
13 pyramid above ground and a repository is a couple  
14 thousand feet below that.

15 DOCTOR POMEROY: But wouldn't another  
16 argument be made that if that pyramid is out there,  
17 it's probably marking something extremely important  
18 and perhaps very valuable --

19 COMMISSIONER REMICK: Sure.

20 DOCTOR POMEROY: -- and therefore perhaps  
21 we should look, we should intrude.

22 COMMISSIONER REMICK: My argument would be  
23 that the record of what is there would certainly  
24 presumably be known. In other words, the people  
25 looted because they knew the kings were buried in

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1 there, right, and there was loot in there.

2 DOCTOR POMEROY: The other comment I would  
3 make is that, as you know, there have been various  
4 nuclear tests conducted offsite, off the Nevada test  
5 site, specifically in Central Nevada. You and I  
6 probably could go there today and I would suspect we  
7 could at least wildcat drill immediately into that  
8 area. There's almost no physical marking in the area.  
9 There probably is a record someplace, but I suspect  
10 that record for that single test event will get  
11 progressively more lost in time and I think that  
12 that's --

13 COMMISSIONER REMICK: That's because no  
14 effort is being made to mark it.

15 DOCTOR POMEROY: That's correct. In fact,  
16 the efforts to mark it were minimal to start with.

17 COMMISSIONER REMICK: Yes.

18 DOCTOR POMEROY: And they have  
19 progressively decreased. There was a fence at one  
20 time. Now there's no longer a fence. There was a  
21 sign, now it's sort of faded and difficult to read.  
22 That's only 20 or 30 years ago.

23 COMMISSIONER REMICK: Yes. But once  
24 again, there was not a real intention to mark it. I  
25 just don't think you can remove the possibility of

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1 marking things.

2 DOCTOR POMEROY: Oh, I think markers are  
3 important, but I'm not sure they're a perfect  
4 solution.

5 COMMISSIONER REMICK: No, they're not.  
6 Nothing is perfect.

7 DOCTOR STEINDLER: Let me just make the  
8 comment that the focus of the regulations are not  
9 necessarily to agree on what the real world can do.  
10 On the contrary. We take extreme positions and  
11 scenarios in order to see whether or not the system  
12 that we've designed could withstand it. I don't think  
13 any reasonable person would disagree that you ought to  
14 be able to mark this area for extremely long periods  
15 of time. But that's not the way the regulations tend  
16 to be written. They tend to be written for those  
17 events far out, and it gets back to Commissioner  
18 Rogers' issue, that seem unlikely on the surface but  
19 whose consequences could be pretty severe.

20 It's in that context that we're stuck in  
21 a sense by having generated the policy of doing that,  
22 looking at microrem for mega people, looking at some  
23 arbitrary and argumentative issues on where do you cut  
24 your probabilities off and whether or not you can mark  
25 a high-level burial ground or for that matter you ask

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1 the same question that New York and the other low-  
2 level burial sites that have been currently  
3 essentially abandoned or they're no longer in  
4 business.

5 Is the Sheffield site going to allow its  
6 markers to remain there for prolonged periods of time?  
7 Highly likely. But yet people worry about them  
8 disappearing.

9 COMMISSIONER REMICK: No, I understand.

10 DOCTOR STEINDLER: That the county court  
11 records are suddenly lost. It's possible, but it  
12 seems unlikely. The issue only comes when we make the  
13 extreme assumptions and then we're stuck with that.

14 COMMISSIONER REMICK: Right. And my point  
15 is I think the extreme assumption of assuming that a  
16 probability of one is extreme in my mind also.

17 DOCTOR STEINDLER: Yes.

18 CHAIRMAN SELIN: I just wanted to make a  
19 couple of comments. One thing I think you might do,  
20 one thing I think you have done but you might think  
21 about making the part more explicit.

22 The thing that you might do is take a look  
23 at following the basic rule of systems analysis.  
24 Doctor Steindler, you said you didn't want to do any  
25 because they're complicated, but this part is very

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1 simple. That sort of stuck with what you think you  
2 know and then solve for what you don't know instead of  
3 following a more logical conclusion. You certainly  
4 would have a much clearer idea of what the  
5 characteristics of a particular engineered facility  
6 might be a few thousand years from now than you would  
7 what the far field effects would be or the geology.

8 So, when you're talking about these  
9 defense in depth questions and doing the analysis,  
10 it's not a bad idea to say, "Well, let's just assume  
11 that the barrier had these characteristics," and then  
12 how much more would we spend to try to reduce the  
13 uncertainty in some of these fairly artificial  
14 calculations to begin with? There are other places  
15 where it's not a philosophical argument about defense  
16 in depth versus putting all your eggs in one basket,  
17 but as Commissioner Rogers said, if I understood him  
18 correctly, how much you want to spend at the margin to  
19 reduce some uncertainties which are basically  
20 calculational or definitional in the first place.

21 The second question, one thing you've  
22 done, which I find very useful, is to take a look at  
23 the rules and see if you come up with things that  
24 violate the intuition to see if we should go back and  
25 take another look at the rules. The carbon-14 issue

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1 has always been one of them. There are a number of  
2 things that you've done. But it would be good if you  
3 did that a little more explicitly as you go into these  
4 points where we're looking for safety and some  
5 assurance. We're not looking to just set down some  
6 definitions and then slavishly carry them out.

7 So, as you come to conclusions which most  
8 reasonable people would say don't have much to do with  
9 health or safety, then you lead us to go back to look  
10 at the rules, be they our rules or EPA standards or  
11 DOE.

12 The general thing, you sort of seemed  
13 unhappy that you couldn't find technical issues that  
14 were as important as management issues, behavioral  
15 issues, philosophical issues or definitional issues.  
16 I think that's a great strength. I think you're  
17 actually characterizing a current situation where the  
18 scientific issues just are not the most pressing at  
19 this point. As you pointed out, later on in the  
20 process progress has to be made on these, but the long  
21 lead issues, the real potential show stoppers, are not  
22 ones that are amenable to a physicist's analysis.

23 Also, you know, I've sat next to  
24 Commissioner Remick for almost two years now. I've  
25 never heard him so poetic or so philosophical.

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1 There's got to be something in your presentation that  
2 brought it out today. I find it stimulating also and  
3 I've enjoyed this very much. I think it's been  
4 particularly useful to continue to follow this top-  
5 down approach that you've taken to keep looking for  
6 issues that really have to be attacked as opposed to  
7 just trying to do something a little better or in a  
8 little more depth than the other people are doing it.

9 So, I think we can all thank you very  
10 much.

11 COMMISSIONER ROGERS: Yes, very much.

12 (Whereupon, at 10:33 a.m., the above-  
13 entitled matter was concluded.)  
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PLACE OF MEETING: ROCKVILLE, MARYLAND

DATE OF MEETING: FEBRUARY 26, 1993

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