MINUTES OF THE 50TH ACNW MEETING
JANUARY 27-28, 1993

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MINUTES OF THE 50TH MEETING OF THE
ADVISORY COMMITTEE ON NUCLEAR WASTE
JANUARY 27-28, 1993
BETHESDA, MARYLAND

The 50th meeting of the Advisory Committee on Nuclear Waste was held Wednesday and Thursday, January 27-28, 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:

- Dr. Martin Steindler is retiring from Argonne National Laboratory on January 31, 1993.
- Mr. Raymond Fraley is retiring as Executive Director, Advisory Committee on Nuclear Waste. Dr. John Larkins has been named Acting Executive Director.
- The Board on Radioactive Waste Management, National Research Council, has issued a formal report summarizing its findings based on the workshop held on September 23-24, 1992.

- Staff members of the Vitreous State Laboratory, Catholic University of America, are conducting research on different kinds of glass for use in radioactive waste disposal. Research has shown that simulated glass representative of the wastes at the West Valley and Savannah River facilities can exhibit long term periodic oscillations or excursions in leach rate behavior.

- Australian scientists have issued a report on the mechanisms of water entry into underground cavities. Unsaturated soil is found at great depths in the world's well-watered regions and close to the surface in arid and semi-arid regions. In these soils, because the pressure of air in the soil exceeds that of water seeping downward, the higher pressure keeps the water out when it meets a hole.

- In cooperation with the U.S. Environmental Protection Agency (EPA), the NRC staff has conducted several studies of radioactive material users, licensed by the NRC, to determine whether they were complying with the regulations specified by EPA in its National Emission Standards for Hazardous Air Pollutants (NESHAP). All such reviews have indicated that the licensees were in compliance. As a result, the EPA suspended the applicability of its regulations and avoided the complications of dual regulation. On September 25, 1992, however, the U.S. Court of Appeals for the District of Columbia Circuit ruled that EPA is not allowed to suspend its regulations. This means that the EPA regulations apply.

- The 1993 Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP) has been set for April 7-8, 1993. The meeting will be held at the Crystal City Marriott, Arlington, Virginia. Waste management is among the topics to be discussed.

II. THE ENERGY POLICY ACT OF 1992 AND ITS IMPACT ON NRC'S HIGH-LEVEL WASTE PROGRAM
(Open)

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

Dr. Moeller stated that the purpose of this session was to discuss and provide input relevant to the three questions posed in the Energy Policy Act of 1992 (Policy Act) relevant to high-level radioactive waste, viz.:

1. Whether a health-based standard based upon doses to individual members of the public from releases to the accessible environment will provide a reasonable standard for protection of the health and safety of the public.

2. Whether it is reasonable to assume that a system of post-closure oversight of the repository can be developed based upon active institutional controls that will prevent an unreasonable risk of breaching the repository's engineered or geologic barriers or increasing the exposure of individual members of the public beyond allowable limits.

3. Whether it is possible to make scientifically supportable predictions of the probability that the repository's engineered or geologic barriers will be breached as a result of human intrusion over a period of 10,000 years.

Dr. Moeller introduced Dr. John Cooper, Head, United Kingdom National Radiation Protection Board (NRPB); Mr. William Beckner, Staff, National Council of Radiation Protection and Measurements (NCRP); and Drs. Richard Foster and Ruth Weiner, ACNW Consultants.

Dr. Cooper discussed the background of the NRPB, noting that, since its statutory establishment in 1970, it has provided advice on radiation protection to the United Kingdom. He referred to the NRPB publication entitled "Board Statement on Radiological Protection Objectives for the Land-Based Disposal of Solid Radioactive Wastes," published in 1992.

A fundamental principle recommended by NRPB is to provide at least an equivalent level of protection to future populations as is provided to current populations. The NRPB approach is to limit individual risk, not dose. The reason stated for this approach was that, with a limit based on dose, it is always possible to exceed the limits, whereas with a risk-based standard, not only is dose taken into account, but probability is also. Such an approach also permits better accounting for low probability exposure scenarios.

Another underlying principle is that individual members of the public shall not be exposed to unacceptable risks, and, therefore, the radiological risk to an average member of the critical group, attributable to a single waste disposal facility, shall not exceed 1 in 100,000 per year.

Dr. Cooper stated that, for purposes of carrying out risk calculations, the future should be divided into the following time frames:

1. 1 - 100 years (post-closure period). Institutional control is assumed.

2. 100 - 10,000 years. Human environment is assumed to stay the same (e.g., no ice age). The risk to the average member of the appropriate critical group is calculated.

3. 10,000 - 1,000,000 years (perhaps a major change in the environment - total war, ice age, et al.). A subsistence community around the area is protected. (The subsistence group lives in the area, grows and eats its own food-stuffs, etc.)

4. Beyond 1,000,000 years. No calculations are performed as they are considered meaningless.

In response to a related question from Dr. Moeller, Dr. Cooper noted that human intrusion is a difficult area, as it can occur any time. However, if only one or two barriers are penetrated the calculations can deal with it. In the subsistence community era (10,000 - 1,000,000 years), it is assumed that such a community only possesses the ability to drill for water - 50 meters or so. For a society with the capability to drill deeper (all the way into the repository - several thousand meters) then it is assumed that such a technologically advanced society would have the instrumentation, etc., to realize the peril. The British approach recognizes that if all barriers are breached the resultant dose would be unacceptable unless the probability is limited. A scenario-based approach is used to take into account the uncertainties in the calculations. This results in a distribution of possible risks, rather than a single number. It was suggested that the 95th percentile of that distribution should be compared with the risk target or risk constraint. This assumes that the resultant distribution is not flat. In that case, the distribution will need to be examined more closely. It was noted that natural events, such as volcanism or glaciation, are more likely to impact shallow rather than deep repositories.

Dr. Foster asked how one gets from radiation dose to an individual to a 1 in 100,000 per year risk situation. After explaining the belief that risk is more fundamental quantity, and looking at the risk implied by the International Commission on Radiological Protection (ICRP) dose limit of one milliSievert, Dr. Cooper noted that the NRPB believes that a 1 in 100,000 per year risk of death is the sort of number that individual members of the public will accept as risks to themselves.

Dr. Weiner asked where the risk factor of 5%/sievert came from and was told it was directly from ICRP Publication No. 60. After further discussion as to what happens to risk-based standards if new information changes the risk factor, it was agreed that, while the same could occur with dose-based criteria, the risk target

would be less likely subject to change because it is a fundamental quantity.

Dr. Steindler reminded Dr. Cooper of the problem that the public has with changing numbers, e.g., the BEIR reports, and wondered whether the same situation might exist in the UK. Dr. Cooper noted that in Britain, disposal is disposal -- once the waste is disposed of then further considerations are over. Insofar as changing risk factors, it was his belief that there was sufficient conservatism in the assumptions such that there should be very little movement in the fatal cancer risk factor. For example, the design target for the maximum risk to an individual in the future is 1 in a million, which is an order of magnitude below the current risk limit.

Dr. Hinze questioned the rationale for selecting the critical groups. Dr. Cooper noted that most nuclear power plants in the UK are situated along the coast. Therefore, UK government agencies have identified critical groups as coastal communities because there is much information concerning their habits. In the 100 - 10,000 year time frame, the critical groups and their habits will be based on current observations. For the next time frame, there is no critical group, but rather a subsistence community, which is, however, hypothetical. Also, the assumption of a subsistence community is believed to be conservative.

After further discussion on risk probabilities, it was noted that the scenarios used are not predictions, but, rather, represent informed estimates. Dr. Pomeroy asked about the role of expert judgment in proving any probability. Dr. Cooper proclaimed not to have expertise in this area, however, he noted that the use of expert judgment should be transparent and defensible with assumptions clearly indicated.

Dr. Moeller asked about the concept of release limits and discussed the problems in calculating the total quantity of any radionuclide that left the repository and gained access to the accessible environment. Dr. Cooper noted that he did not know the specific answer other than to say "use mathematical models." Dr. Foster noted his belief that there are two relevant kinds of standards for a repository: design versus compliance. He further noted that he did not believe that the Committee has ever "gotten into the compliance standard type thing."

Dr. Pomeroy asked what the next step is to be in the UK, particularly insofar as the "Board Statement of Radiological Protection Objectives..." noted earlier. Dr. Cooper pointed out that, if there is a geologic solid waste disposal site proposed in the UK, then the NRPB document would be another input into the public inquiry that would be held. He discussed the current situation in

the UK, noting that, in the past two to three years, the subject of solid waste disposal has been in a state of flux. He also noted that the advice provided by the NRPB since 1981 has always been risk-based.

Dr. Moeller asked for the British philosophy on post-closure monitoring. Dr. Cooper stated that the assumption is that there will be no monitoring after the period of institutional control. When further asked if the UK believed there was any advantage in non-intrusive monitoring after the facility was sealed, it was stated that this issue was not addressed. On a personal basis, Dr. Cooper stated that he would be worried that any form of direct monitoring might violate the integrity of the repository in some way and introduce exposures that would not have been there were it not for the performance of post-closure monitoring.

The next person to address the members was Mr. William Beckner, NCRP. He noted that he would discuss only the first issue -- collective dose standards. He discussed the evolution of the NCRP standards commencing with 1984. He informed the Committee that a revision to NCRP Report No. 91 is expected to be published late in 1993 or early 1994. It is expected that this document will back away from the concept of negligible individual risk limit (NIRL) and will introduce an annual negligible dose of 0.01 milliSievert for each source. It is expected that the report will not recommendat a cutoff for collective dose calculations and will strongly emphasize that ALARA be applied.

For a single practice facility, such as a nuclear waste storage installation, a 0.25 milliSievert annual dose limit applies for the maximally exposed individual or else it needs to be demonstrated that a maximally exposed individual will receive less than one milliSievert annually from all manmade sources other than medical. Specific advice on the use of collective dose statistics is being developed.

Dr. Steindler questioned the utility of the NIRL and why this concept was no longer in favor. Mr. Beckner described the NCRP's current thoughts on the subject. Dr. Moeller asked about the NCRP's thoughts on the implementation of the critical group concept. Mr. Beckner stated that, although the NCRP has not condemned the concept, it has yet to implement it.

Dr. Daniel Fehringer, Office of Nuclear Materials Safety and Safeguards (NMSS), next addressed the Committee. He provided his perspectives on the Policy Act's charge to the National Academy of Sciences (NAS). He stated that the NRC staff had been asked to provide a background information paper to the Commission for its use in formulating positions not only on the items noted in the Policy Act but also on any other substantive items that might arise

during the NAS review of the EPA standards. Dr. Fehringer presented background information only. He did not address either NRC staff or Commission opinions.

Dr. Fehringer noted that the Policy Act was only one piece of legislation addressing high-level radioactive waste issues. The Waste Isolation Pilot Plant Land Withdrawal Act, separately passed by Congress, directs EPA to propose amendments to the 1985 standards for all sites other than Yucca Mountain. These revised standards are to address the particular items that the courts previously held deficient, namely the individual protection and groundwater protection standards.

Dr. Fehringer stated his belief that the major controversial issues related to the EPA standards can be classified into seven subject areas, as follows:

1. Release limit format (it was noted in response to a query by Dr. Pomeroy, that the NRC staff had back calculated the EPA standards, and their numbers are correct -- as long as it is recognized that the standards are truly generic). The advantage of the release limit format is that it simplifies the compliance calculations. The drawback, however, is that the release limit may not correspond to the actual health protection goal when it is applied to a specific site.

2. Population impacts basis (it was noted that this is one of the more controversial features). This is a departure from most conventional radiation protection standards in that in most cases numerical limits are placed on health risks or doses to individuals, not to the collective impacts within the population. This departure makes it difficult to compare against other measures such as the exposure due to natural background radiation. One advantage of the EPA approach is that containment rather than dilution of wastes is encouraged. It is anticipated that the wording in the Policy Act will result in a change to EPA standards.

3. The 10,000 year period of concern (it was noted that some advisory groups and the regulations of some nations are open-ended). Although the cutoff at 10,000 years limits speculation about potential long-term disruptions of repository performance, conversely, for some repository designs or sites, the most significant releases may occur after 10,000 years (such as, for example, the slow degradation of a long-lived waste package in a way that allows releases after that period).

4. As low as reasonably achievable (ALARA). It was noted that, although the EPA's 1985 standard does not require ALARA, such a requirement is part of the recommendations of international advisory organizations. While an explicit ALARA standard would be consistent with other radiation protection standards, evaluation of compliance would be very speculative.

Dr. Steindler asked if the inclusion by EPA of an ALARA requirement in their regulations was within their charter. Dr. Fehringer replied that, in the opinion of NRC legal counsel, it is not.

Dr. Pomeroy asked about the speculative nature of an ALARA requirement. Dr. Fehringer noted that it could bring into the licensing process some things that the NRC does not currently anticipate evaluating, for example, the partitioning and transmutation of wastes prior to disposal.

5. and 6. Stringency and Technical Achievability (it was noted that the 1985 standards were primarily technology-based, limiting cumulative releases to the levels that EPA considered to be technically achievable at reasonable cost). The current realization that gases, such as carbon-14, could be released now questions whether the original EPA standards are technically achievable. An alternative would be health-based standards that are not susceptible to changes in projections of waste isolation capability but, which would likely be accompanied by an additional requirement for releases to be ALARA. A two-step derivation that first made a health-based determination of allowable level of impacts and then used technology-based reasoning to determine the additional margin of safety could perhaps combine the advantages of both types of standards.

Dr. Weiner questioned whether health-based standards were the same as risk-based standards. In Dr. Fehringer's opinion, the Policy Act permits a risk-based standard. In response to a related question from Dr. Moeller, it was noted that although the Policy Act notes specifically "doses," one could say that the doses shall not exceed certain levels depending upon the probability that those doses will be received or that the expected value of the dose shall not exceed a certain level.

7. Active institutional controls (it was noted that although the 1985 standards assume that active institutional controls will not be relied upon for more than 100 years, the Policy Act requires the Department of Energy (DOE) to provide post-closure oversight indefinitely and the NRC

to assume that such controls will be effective). The nonreliance beyond 100 years is conservative but nonreliance can increase the costs of compliance, particularly if the repository is to withstand frequent human intrusions. It was pointed out that another subtle disadvantage of active controls could lead to the acceptance of an otherwise unsafe repository, by arguing that any unacceptable releases will be detected and mitigated by active controls.

Dr. Foster asked if the EPA might provide guidance on costs associated with person-Sieverts saved. Dr. Fehringer believed that such was not likely. Rather, he expected that the ALARA criteria would be qualitatively stated that, in addition to meeting the release limits, releases shall be shown to be as low as reasonably achievable. It would then be left up to the applicant and the licensing agency to determine how to interpret that wording.

After some discussion by Drs. Pomeroy and Steindler on the possible value of post-closure monitoring, Dr. Fehringer indicated that it was his belief that the Policy Act wording would lead one to assume that some form of remediation plans would be in effect indefinitely.

Lastly, Dr. Fehringer discussed the advantages and problems with the probabilistic format of the 1985 standards. He noted the difficulties in estimating low probabilities and the difficulty of their evaluation during the licensing process. It was recognized that there is some precedent for using probability estimates in licensing (e.g., eastern U.S. seismicity) but pointed out that the subjective probabilities may be contentious. He also noted that some type of probabilistic formulation might be appropriate in order to accommodate large uncertainties in potential geologic evolution, climate change and human activities. One of the strongest reasons for having a probabilistic format is to allow higher doses when probabilities of those doses occurring are relatively low.

In response to Dr. Steindler's question whether the probabilistic evaluation included geologic events, Dr. Fehringer responded by noting that the committee report accompanying the Policy Act seemed to encourage the NAS to broaden its review beyond the probability of human intrusion and to address the scientific basis for predicting natural event probabilities as well, particularly since this subject has been the source of controversy.

Dr. Pomeroy questioned whether the staff has taken a position on critical group average dose or dose to the maximally exposed individual. Although the NRC staff has not taken a position on the subject, the rest of the agency has used the maximally exposed

individual, notably in 10 CFR Part 20. Based on discussions with the EPA, Dr. Fehringer believed their position to be the same.

Dr. Hinze asked Dr. Fehringer for his opinions as to what the NAS should consider as it goes through the process specifically focused on the proposed facility at Yucca Mountain, rather than a generic site. In response, Dr. Fehringer stated that the question of technical achievability is more critical for Yucca Mountain because it is different from the hypothetical repositories used in the derivation of the standard. It is an unsaturated zone repository located in a geologically active part of the country. The biosphere around Yucca Mountain is also very different from the generic biosphere used by EPA. In response to another question, Dr. Fehringer stated his belief that a "site-specific standard is probably going to make it easier to apply the standard at the time of licensing."

After discussing the Policy Act inference of a 10,000 year institutional control period, Dr. Weiner asked whether that assumption would result in changes to the NRC regulations. It was Dr. Fehringer's evaluation that an indefinite reliance on active controls would have a significant impact on the NRC regulations.

Dr. Foster postulated that the Policy Act might require the NRC to accept the NAS's findings without the NRC staff making its own assurance that the performance criteria resulting from the NAS study are correct. Dr. Fehringer noted that, while his current paper did not address this aspect, the second paper being prepared by the staff in response to the Commission's Staff Requirements Memorandum is directed to the impact of the Policy Act upon the NRC.

In his concluding comments, Dr. Steindler stressed his belief that the concept of perpetual surveillance was impractical and regretted that the staff would have to spend a significant amount of time analyzing the implications of that concept. He also noted that human intrusion is a national policy issue that may be solved by the NAS or the NRC. He proposed that the handling of that problem by the UK, as presented by Dr. Cooper, was quite an interesting model that should be investigated further.

Dr. Pomeroy voiced his concerns over the two related EPA high-level radioactive waste regulations (one generic and one site specific) and their potential impact on the NRC regulations. Dr. Hinze emphasized that the subject of scientifically supportable predictions of natural events over "x" period is a major issue, and stated that perhaps this study by the NAS provides an opportunity for the issue to be properly investigated.

As a result of the discussions, a report was prepared and issued that provides comments and recommendations by the Committee. The Committee agreed to continue to review the impact of the Energy Policy Act of 1992 during future meetings.

III. USE OF NATURAL ANALOGS IN RADIOACTIVE WASTE DISPOSAL (Open)

[NOTE: Mr. Giorgio Gnugnoli and Ms. Lynn Deering were the designated Federal Officials for this portion of the meeting.]

Mr. Melvin Silberberg, Office of Nuclear Regulatory Research (RES) began the presentation by stating that the staff's objective was to update the ACNW on the progress in natural analog research toward understanding processes and overall HLW system behavior, with emphasis on how to use the results to support performance assessment. He indicated that this work was a slow process, with much work ahead, and that RES continues to be mindful of the need to tie natural analogs to performance assessment, and whether this can be accomplished to meet regulatory needs. Mr. Silberberg introduced Dr. Linda Kovach as the next speaker.

Highlights from each presentation are described below:

Progress in Natural Analog Research

- Dr. Linda Kovach, RES, described the history of the focus of the NRC natural analog research program, the history of the involvement of the international community in natural analog studies, the evolution of the natural analog program since its inception in 1985, and DOE's involvement.

- Dr. Kovach described the role of natural analogs in the licensing process, specifically, site characterization and performance assessment. She explained that natural analog data best support the detailed, auxiliary analyses portion of performance assessment, by providing confidence that conceptual models, computer models, and data bases are adequate representatives. In addition, natural analog data can be used to support site characterization to address questions regarding the kind and amount of data that must be collected.

- Dr. Kovach described how the NRC plans to use natural analog data for conceptual model development, auxiliary analyses, such as detailed source term modeling, confirmation of DOE modeling approaches and data, and evaluation of disruptive scenarios.

- Dr. Kovach discussed the role of natural analog studies in support of model validation, which she defined as a process to

build confidence in models. The current approach of the NRC staff is to participate in international efforts to build confidence in performance assessment models. These efforts include the Alligator Rivers Analog Project (ARAP), and studies at Oklo, Pena Blanca, and the Apache Leap site, and organized model validation programs including INTERCOIN, HYDROCOIN, DECOVALEX, and INTERVAL.

- Dr. Kovach described the scope of the NRC's natural analog studies including work at Vales Caldera, Pena Blanca, Santorini, Oklo, and Alligator Rivers, and noted that there is also a great deal of international cooperation in the NRC supported natural analog studies. The need for natural analog research was recognized on an international level due to concerns in the validity and applicability of analytical tools used in performance assessment. The Natural Analog Working Group (NAWG) was established in 1985, when it was recognized that natural analog research may be useful in providing confidence in models used to assess repository safety. The NAWG [Dr. Kovach is a member] is sponsored by the Commission of European Communities (CEC). There have been four major international cooperative programs, including ARAP, Oklo, Cigar Lake, and Pocos de Caldas, all of which are uranium ore bodies.

- A NAWG Workshop was held in Toledo, Spain in September 1992 to close the ARAP, and discuss expansion of the natural analog studies to include nontraditional applications, such as paleohydrology, neotectonics, hydrothermal ore deposits, and climatology, and to improve on the application of natural analog research to performance assessment.

- DOE has been a member of NAWG since 1985 and DOE personnel were major participants in the Pocos de Caldas Project. They are minor participants in ARAP, but are not involved in Oklo. DOE convened a group of international experts, the Natural Analog Review Group (NARG), to recommend a strategy for DOE to conduct analog studies. [Dr. Paul Cloke, present in the audience, headed the NARG.] Dr. Kovach explained that the NRC took issue with one aspect of the report, that is, the NARG suggests that natural analogs are geochemical in nature, and are best used to understand processes, and not to support site characterization. The NRC staff believes this definition is too limiting. DOE is considering recommendations made in the NARG paper in funding natural analog research.

- Dr. Pomeroy asked for examples of how the results of the natural analog work are being fed into iterative performance assessment (IPA) and vice versa. Dr. Kovach indicated that Dr. English Pearcy, Center for Nuclear Waste Regulatory Analyses (CNWRA), would address this, including an example of

the Swede's using K_ds derived from natural analog work in performance assessment, and how data collected at Alligator Rivers were used to validate the thermodynamics data base. Dr. William R. Ott, RES, added that the interface between performance assessment and natural analog research is quite active. As an example, he cited a draft paper written by Dr. Kurt Nordstrom, USGS, that is to be included in the NAWG workshop proceedings on the need to quantify the uncertainty in geochemical models and natural analog data being provided to performance assessors.

- Dr. Pomeroy asked Dr. Kovach to define the term, "validation." Dr. Kovach suggested that the RES staff did not necessarily have a single definition, but she described validation as a process of building confidence in models. Dr. Steindler asked whether all models used in the licensing process must be validated. Dr. Ott responded that yes, the applicability of the models used must be addressed relative to their purpose in the licensing arena, and that while a model cannot be validated, only invalidated, it is important to test the applicability of models over a range of conditions, to gain confidence in their use. Dr. Steindler asked whether the confidence building process is qualitative. Dr. Kovach responded, that at first it is, but the purpose of the ongoing work is to try to assess quantitative uses of natural analog data.

- Dr. Pomeroy asked about DOE's funding involvement in international efforts relative to NRC. Dr. Paul Cloke, DOE, explained that DOE is funding projects in New Zealand, ARAP, and Cigar Lake. However, to date, DOE has not considered natural analogs to be very useful, but this is changing. Mr. Silberberg indicated that the NRC has recommended a technical exchange on natural analogs to DOE, as DOE is revising its research strategy and program. Mr. Silberberg agreed that NRC would like to understand better DOE's level of involvement in natural analog research and how this fits in with its performance assessment program.

- Dr. Hinze asked for more examples of natural analogs supporting site characterization, but this question was deferred to await Dr. English Pearcy's presentation.

Oklo Natural Analog

- Dr. William Ott reviewed the history of the Oklo site in Gabon, Africa, the only known location where natural uranium ores have been concentrated to the point where a sustained fission reaction took place. A number of natural reactor sites have been identified thus far. The fission reaction occurred approximately 1.8 billion years ago. There has been

extensive sampling of the reactor zones before and during present and past mining excavations of the ore zones; however, not much hydrologic data have been collected. The presence of fission products, and depleted uranium ore allows for study of degradation, mobilization, and transport of fission products and their decay products. In addition, a large dolerite dike intruded into the ore body, approximately 800 million years ago, which allows for examination of the effects of a thermal pulse on reactor products.

In addition, some reactor sites contain bitumen and other organic materials that are thought to retard the movement of fission products.

- The current CEA/CEC program at Oklo is focused on reactor zones 10, 13, 16, OK84, and Bangombe Bay, with extensive effort devoted toward assessing migration around sites 10 and 13, as an analogy for source term and transport processes. In addition, a program is being developed to characterize the hydrogeology at the unmined Oklo 84 site, and Bangombe Bay, as well as look at mineralization aspects of the ore body.

- The Division of Low-Level Waste Management and Decommissioning is funding two small projects at Oklo. The first project is to determine mechanisms for alteration by which uranium, lead, and rare earth metals are released from uraninite, as an analog for the corrosion and alteration of spent nuclear fuel. Dr. Rodney Ewing, University of New Mexico, is (1) developing a model of uraninite behavior in a geologic disposal system under reducing conditions, in the presence of a hydrothermal solution, (2) determining mass balance reactions, and (3) determining the time and temperature of the alteration. The NRC staff considers the information that will be gained with respect to uranium mobilization will apply to both low-level radioactive waste (LLW) and HLW. The second project focuses on radionuclide containment by organic matter; specifically, bitumen as a potential immobilization agent. Dr. Bert Nagy, University of Arizona, is the Principal Investigator. He is looking at the release, migration and distribution of uranium, lead, and rare earths, in the presence of bitumen. Both projects were initiated in 1992.

- Dr. Steindler asked how this work differed from the work done at the Los Alamos National Laboratory (LANL) 15 years ago on the migration of rare earths. Dr. George Birchard commented that the current Oklo work is extending the LANL work, and was expanding on the hydrology, geology, and geochemistry aspects, because the migration problem is so difficult.

- Dr. Steindler asked how the site ore body is analogous to volcanic tuff, with respect to transport processes. Dr. Ott explained that the Oklo site environment contains uraninite embedded in a sandstone formation. The chemistry is not analogous to tuff; however, they are trying to develop models that apply in a variety of conditions. Dr. Steindler asked whether Dr. Ott meant that generic models are better than site-specific, and Dr. Ott replied no. Dr. Kovach added that the work at Oklo was funded for LLW, which is relevant to the bitumen issue, in that one U.S. vendor, and people in France may consider bitumen as a component of the LLW package.

- Dr. Hinze asked how the original conditions at Oklo, that control transport, such as geology and climate, are determined? Dr. Ott explained that the French CEA/CEC personnel are focusing on dating methods to determine the duration and time of the igneous intrusion to bound the original conditions. He referred to reports available on Oklo, however, the reports are written in French.

- Dr. Hinze asked how much the NRC, as a contributor, can influence the Oklo studies. Drs. Ott and Kovach explained that NRC tries to influence the CEC work through participation in annual technical meetings, and through the Oklo Steering group, which convenes to discuss progress and next steps.

- Dr. Moeller asked what quality assurance (QA) guidelines are required for the NRC funded international projects. Dr. Ott responded that these projects are bound by the typical requirements required for all NRC contracts, but they are not bound by the QA requirements imposed on DOE.

- Dr. Pomeroy asked how the results of the Oklo work were fed to the Division of LLW, who are the users. Dr. Ott explained that the project was new enough that not much technology transfer has occurred. However, RES typically conducts technology transfer through transmittal of reports, research summaries, presentations by the principal investigator, and workshops.

Alligator Rivers Analog Project (ARAP)

- Dr. George Birchard (RES) explained that the final draft reports for ARAP are in internal review, and the summary report has not yet been drafted. He explained that he would provide his impressions of the results, but could not discuss project conclusions now.

- Formal participants in the ARAP are the Australian Nuclear Science and Technology Organization (ANSTB), the Japan Atomic

Energy Research Agency (JAERI), the Japanese Power and Nuclear Fuels Cooperative (PNC), the Swedes (SKI), the UK Department of Environment, and the NRC.

- Dr. Birchard cited a quotation by Mr. Paul Davis, "Performance assessment models cannot be validated," and indicated that he agrees completely with this statement, based on his experience with the ARAP. He added, however, that reasonable assurance must be established in the results of performance assessment models.

- Dr. Birchard indicated that there is no perfect analog to a site. Analogs are useful in developing an understanding of processes and coupled effects that may affect site safety. He added that the approach to gain reasonable assurance should involve an integration of lab and field experiments, analog, and modeling studies. Dr. Steindler asked whether this meant that the utility of analogs is simply a learning process. Dr. Birchard responded that he viewed performance assessment as a hypothesis that needs to be tested, with natural analogs being one type of test.

- Dr. Steindler asked about the link between site-specific performance assessment, and the Alligator Rivers Analog studies. Dr. Birchard explained that analog studies are primarily used to test generic conceptual models of a site and, occasionally, can be used to test site-specific processes, such as what is needed at a specific site for site characterization.

  He also stated that the focus of the ARAP is on the Koongarra dispersion fan because it is an ore body composed of pitch blend similar in composition to spent fuel, which has been subject to oxidizing groundwater and radionuclide transport, over the last million years.

- ARAP is an INTERVAL validation test case. It is a heterogeneous site with fracture and matrix flow, which has created difficulties in site characterization. Dr. Birchard indicated that four separate iterations were carried out between site characterization and model development. A number of approaches, ranging from simple to complex, were taken in evaluating the site.

  Estimates of the time frame over which uranium migration has occurred range from one to three million years. Uranium has been transported approximately 100 meters. Dr. Birchard noted that little uranium has been lost from the system, thus geochemical reactions are playing a major role in limiting the solubility release and transport via sorption and secondary

phase formations, such as phosphates. Overall, the performance assessment and hydrology proved to be very difficult given the complexity of the site.

- Dr. Pomeroy asked how the mechanism worked for NRC's involvement in ARAP. Dr. Birchard explained that NRC has an international agreement, contributing about $18K a year for a million dollar per year project. In addition, NRC has a grant with Messrs. Grant Garvin and Dimitri Srajenski at John Hopkins University to conduct coupled modeling. Dr. Birchard recommended that the ACNW staff invite Dr. Grant Garvin to discuss this work with the Committee.

- Dr. Hinze asked what Dr. Birchard could say about promise, in that his talk was to address accomplishments and promise. Dr. Birchard responded that there will be a tremendous amount of data analyzed that will be available to the world to build on. There is opportunity for additional work.

Geochemical Natural Analog Research at the Center for Nuclear Waste Regulatory Analyses

- Dr. English Pearcy described the goals of the analog program at the Center for Nuclear Waste Regulatory Analyses (CNWRA): (1) provide data from field, laboratory, and theoretical analyses of natural systems analogous to important aspects of the Yucca Mountain site, and (2) use these analyses to develop a better understanding of the utility and timetables of natural analog studies in regulatory licensing. Specifically, the goals are to learn how to transfer data from one field site to another, and how to derive reasonable assurance from natural analog studies.

- Dr. Pearcy noted that the Pena Blanca site in Mexico was selected for analog study 19 months ago, and the first field trip was taken to the Akrotiri site in Santorini, Greece, this past July. The Akrotiri site was selected as an analog site because of its history. It was inhabited by Minoan civilization and buried by silica tuff about 3,600 years ago, which is near the center of the 10,000 year regulatory period of interest. There are few engineered, man-made materials this old that are available for study, and there are few geologic sites this young. Further, the site is in the unsaturated zone, in oxidizing conditions, and in an area of semi-arid climate, similar to Yucca Mountain. Finally, bronze metallic artifacts have been buried, which are analogous to trace element and contaminant transport at Yucca Mountain, as well as a potential analog for container corrosion.

- The Pena Blanca site is located in the northern Mexico desert, and is part of the same trend of tertiary volcanic rocks as is the Yucca Mountain site. It was selected for study because of the coincidence of uranium mineralization with tertiary silicic volcanics in a desert climate, analogous to Yucca Mountain. The fault and fracture patterns are also analogous to Yucca Mountain. The site is several hundred meters above the water table in fractured, unsaturated tuff. The conditions are oxidizing similar to the repository formation at Yucca Mountain, and the presence of uraninite is most important.

- Current efforts have included development of a topographic base map; using a 20 centimeter interval, which is the level of resolution needed to resolve the local topography. The ore body is approximately 20 meters, by 40 meters, and extends 100 meters vertically.

- Dr. Pearcy showed a slide of a sample of uraninite, with alteration to uranyl oxides, oxihydroxides, and silicates, which is what is hypothesized as the alteration sequence under long term corrosion of spent fuel at Yucca Mountain. He noted that this corrosion sequence is identical with that found in laboratory experiments by Dr. David Wronkiewicz, Argonne National Laboratory, where well water was equilibrated with crushed Topapah Spring tuff and dripped onto unirradiated UO_2 for a period of four and one-half years. He indicated that this kind of convergence of laboratory and field data is an example of integrating a variety of data to build confidence in models and to gain reasonable assurance.

- Dr. Hinze asked whether the structural control on the ore body is considered a breccia pipe. Dr. Pearcy remarked that the literature refers to it as a breccia pipe, but he refers to it as a near vertical, highly fractured zone, containing abundant uranium mineralization. Most of the fractured rock is not, however, true breccia, in that it has not been recemented.

- Another analog, besides corrosion, is to use the site for evaluating containment transport. Dr. Pearcy discussed evidence for bulk diffusion of uranium, where ore grades go from very high to background over the space of a few meters. He contrasted to this the evidence of uranium transport in large fractures, which cut across the ore body. Along the fracture uranium concentrations drop rapidly, but they persist at about 50 times background along the extent of the sampled length of the fracture, about 12 meters, suggesting the importance of fracture flow.

- Dr. Pearcy also noted that there is very little uraninite left in the ore body, suggesting that the alteration of uraninite to uranyl silicates has been rapid, relative to the transport of uranium from the system. This information can be used in developing source form and transport models at Yucca Mountain.

- Dr. Pearcy discussed an initiative at the Center to encourage more formal interaction between the analogs group and the performance assessment people. The project involves interpreting small scale micrometer transport of uranium through use of data and samples collected in the analog program, combined with hydrology data collected in performance assessment.

- Dr. Weiner asked what data being collected by DOE for site characterization would be compared to the data collected at the analog sites. Dr. Pearcy responded that the degree of resolution and scale needed for the analog studies can be applicable or transferable to the level of detailed resolution needed for data collection at Yucca Mountain.

- In response to a question from Dr. Steindler, Dr. Pearcy indicated that the analog program at the Center is being funded at a level of $500,000 per year.

- Dr. Pomeroy asked whether any of the preliminary results from the analogs had been incorporated into the phase II IPA. Dr. Pearcy said that they had not.

Round Table Discussion

Mr. Silberberg introduced several additional members to the roundtable, including Drs. Norman Elsenberg, John Bradbury, Dick Codell, and Keith McConnell, all of NMSS.

- Dr. Codell remarked that some Pena Blanca results have already been used as input parameters for the oxidation rates of uranium fuel as part of the radioactive source term model.

- Dr. Hinze asked whether the IPA process has identified analog study needs. Dr. Codell remarked that not much of this has happened yet, but it will as they go through more iterations. He cited an example of how IPA has indicated that some radionuclides are important and some are not. Uranium itself is not important radiologically, except that it is in the matrix of the fuel, and may determine the rate of release. Carbon-14 is very important, but not much on carbon-14 will be obtainable from analog studies.

- Dr. Hinze asked whether analog studies have pointed to a need to collect additional data beyond what is planned by DOE. Dr. Kovach responded that the Alligator Rivers project highlighted the usefulness of geophysics in defining the hydrologic systems that DOE needs to explore greater use of.

  Dr. Hinze added that there is a need to test the applicability of various geophysics methodologies cited in the SCP. He also asked whether NRC planned to ascertain through analog studies the appropriateness of various methodologies such as Ground Penetrating Radar (GPR).

  Dr. Kovach explained that the NRC does not have the money to expand the Pena Blanca project to address geophysics, but the Mexicans may do this. She added that, with the participation of the Mexican government, much more information could be gained.

- Dr. Hinze inquired about the time frame of the analog studies, that is, would the results be available in time to be useful? Dr. Kovach described the RES strategy is to involve other groups, such as the Mexican government, to move the process along more quickly.

- Dr. Hinze asked how priorities are set in the analog program, given the resource limitations. Mr. Silberberg indicated that RES is updating the RES strategy document.

- Dr. Bradbury commented on the need for DOE to broaden its concept of natural analogs, to include areas beyond geochemistry and ore bodies. He recommended that the definition include conditions, processes, events, or combinations of the above, that are similar in another environment and/or time. He added that analogs could even include a literature search, for example, comparison of the results of an experiment, to what has been reported in literature. This would help determine whether the results are analogous to other systems that have been reported on.

  He added that expert judgment is based on experience with analogous sites, conditions, and processes. This ties expert judgment in with natural analogs.

- Dr. Hinze asked why a non-ore body analog in the Yucca Mountain area is not being studied as an analog. Dr. Paul Cloke, DOE commented that DOE ruled out about two years ago funding any new analog studies until DOE developed a strategy plan. The NARG report replaced the strategy. DOE's perception is that the NRC is fairly comfortable with the NARG report. He believes DOE will soon begin funding new analog

work, based on the recommendations in the NARG report, at other sites such as Pena Blanca and Santorini.

- Dr. Steindler asked how DOE considers results from natural analog studies will impact site characterization. Dr. Cloke indicated that he was unaware of any considerations for use of analogs along these lines. Dr. Steindler asked NRC RES the same question. Dr. Kovach remarked that DOE is applying analog results in the area of volcanism to site characterization, and that the NRC sees analog results helping to determine necessary tasks and methodologies that should be used, and whether DOE is collecting the proper data to support various conceptual models.

- Dr. Steindler noted that analog work should include rare earth deposits, and glasses. Dr. Kovach remarked that early analog studies had addressed alteration of basaltic glass as an analogy to waste glass. Dr. Pearcy noted that rare earth migration is being examined at Pena Blanca. Dr. Ott added that there are also non-ore body analogs in the program.

- Dr. Steindler applauded Mr. Silberberg for bringing the performance assessment people to the round table, and Dr. Pearcy for the new initiative at the Center to integrate communications between the performance assessment and natural analog programs.

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

IV. EXECUTIVE SESSION (Open/Closed)

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

A. Reports

Issues Raised in the Energy Policy Act of 1992, Section 801 (Report to Chairman Ivan Selin from Dade W. Moeller, Chairman, ACNW, dated February 5, 1993)

Program Plan for the Advisory Committee on Nuclear Waste (Report to Chairman Ivan Selin from Dade W. Moeller, Chairman, ACNW, dated February 9, 1993)

B. Source Term Data on Low-Level Radioactive Waste Handling and Disposal (Open)

Discussion of a proposal for the establishment of a system for evaluating source term data on the management and disposal of low-level radioactive waste was postponed until the 51st ACNW meeting, February 24-26, 1993.

C. ACNW Four-Month Plan (Open)

The Committee prepared and issued to the Commission its four-month plan for the period February - May 1993. The Committee briefly discussed a draft memorandum that would delineate additional areas of interest. The Committee agreed to defer further discussions until it has an opportunity to examine the current draft NRC Five Year Plan.

D. TLD Monitoring Network (Open)

Dr. Moeller discussed the NRC TLD Monitoring Network Report, NUREG-0837, that summarizes data recorded by TLD monitoring stations that have been established by the NRC around each U.S. nuclear power plant. Dr. Moeller observed that, on first impression, the data appear to represent exposure rates to nearby population groups arising as a result of radionuclide releases from these plants. On further examination, however, a careful reader will note that the exposure rates, as recorded, have not been adjusted for the contribution from natural background radiation. Since radionuclide releases from the nuclear power plants are minimal, the published data, in essence, represent summaries of natural background dose rates. Dr. Moeller suggested that consideration be given to rewording the text of these reports to be sure that readers were made aware of this fact. The Committee concurred. No formal action was taken by the Committee.

E. ACNW Personnel Matters (Closed)

The Committee met in closed session to discuss ACNW organizational, management and personnel matters.

F. ACNW Future Activities (Open)

- The ACNW staff was asked to begin planning a June site visit to the Whiteshell Nuclear Research Laboratories and the Canadian Underground Research Laboratory, located in Pinawa, Manitoba, Canada.

- The Committee requested that the ACNW staff inquire about the status of the Licensing Support System (LSS). If appropriate, a briefing should be scheduled.

- The Committee requested that the ACNW staff schedule a briefing on the decommissioning plans for the Fort St. Vrain and Shoreham Nuclear Power Plants. A briefing on Fort St. Vrain decommissioning is tentatively scheduled for the 53rd ACNW meeting in April 1993. A briefing on the Shoreham Nuclear Power Plant decommissioning is tentatively scheduled for the 54th ACNW meeting in May 1993.

- In response to a suggestion from the NRC staff, Dr. Moeller recommended that a representative from Johns Hopkins University be invited to brief the Committee on the Alligator Rivers Analog Project. The members concurred.

- Dr. Moeller recommended that Dr. Man-Sung Yim, Harvard University, be invited to brief the Committee on his work in developing models to assess the gas-phase release of radionuclides from low-level radioactive waste (LLW) disposal facilities. The members concurred.

- The Committee discussed the merits of a briefing on the use of codes, such as NEFTRAN and DITTY, that are being used in assessing the performance of LLW disposal facilities. The ACNW staff was asked to develop a proposed schedule for reviewing these codes.

- The members asked the ACNW staff to invite Mr. Donald Jose, Esq., to brief the Committee on recent radiation related court decisions based on testimony involving expert opinion.

- Dr. Moeller recommended that representatives of the States of Nebraska and Illinois be invited to brief the Committee on the status of their Low-Level Radioactive Waste Disposal Facilities. The Committee concurred.

- Dr. Moeller recommended that the NRC staff and representatives of the State of Maine be invited to brief the Committee on the LLW Disposal Facility Conceptual Design Report submitted by the Maine LLW Authority. The members concurred.

- Dr. Pomeroy discussed a proposed training session, to be conducted by the NRC staff, to examine the methodologies involved in constructing a complementary cumulative

distribution function (CCDF). It was suggested that two training sessions be planned with Drs. Pomeroy and Hinze attending one meeting and Drs. Moeller and Steindler attending the other. The ACNW staff was asked to explore the various options with the NRC staff.

- Dr. Pomeroy recommended that the NRC staff be invited to brief the Committee on the Decision Support System used for environmental risk analysis. The members concurred.

- The Committee agreed to cancel the proposed Working Group meeting on Synergistic Data Needs for Resolving Volcanic and Tectonic Concerns at Yucca Mountain.

G. Future Meeting Agenda

Appendix IV summarizes the proposed items endorsed by the Committee for the 51st ACNW Meeting, February 24-26, 1993, and future Working Group meetings.

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

following proposal for the collection of information under the provisions of the Paperwork Reduction Act of 1980 (44 U.S.C. chapter 35).

1. Type of submission, new, revision, or extension: New (Expedited OMB review requested within 30 days).

2. The title of the information collection: NRC Survey: "Assessment of the NRC Operator Licensing Program," and follow-up interview.

3. The form number if applicable: Not applicable.

4. How often the collection is required: One time for the initial survey and one time for a follow-up interview with a small percentage of the survey respondents.

5. Who will be asked to report: A sample of nuclear industry personnel; including members of the Professional Reactor Operator Society (PROS), the Nuclear Management Resource Council (NUMARC), and the Institute for Nuclear Power Operations (INPO); as well as a cross-section of plant facility personnel.

6. An estimate of the number of responses annually: 144 (120 survey responses and 24 interviews).

7. An estimate of the total number of hours needed annually to complete the requirement or request: 84 hours (30 minutes per survey and one hour per interview).

8. An indication of whether section 3504(h), Pub. L 96-511 applies: Not applicable.

9. Abstract: NRC plans to conduct a voluntary survey and follow-up interviews with a sample of nuclear industry personnel as part of an evaluation of the NRC operator licensing program. The primary objectives of the survey are to:

(1) Identify problems with examination consistency, quality, efficiency, and management of the operator licensing program and determine whether these problems are the result of decentralization.

(2) Identify the advantages and disadvantages of a centralized versus a decentralized approach to operator licensing.

(3) Identify other recentralization issues; such as, transfer of responsibility, and relocation of employees.

Copies of the submittal may be inspected or obtained for a fee from the NRC Public Document Room, 2120 L Street, NW. (Lower Level), Washington, DC.

Comments and questions should be directed to the OMB reviewer: Ronald Minsk, Office of Information and Regulatory Affairs, (3150-), NEOB-3019, Office of Management and Budget, Washington, DC 20503.

Comments can also be submitted by telephone at (202) 395-3084.

The NRC Clearance Officer is Brenda Jo. Shelton, (301) 492-8132.

Dated at Bethesda, Maryland, this 19th day of January 1993.

For the Nuclear Regulatory Commission.

Gerald F. Cranford,

Designated Senior Official for Information Resources Management.

[FR Doc. 93-1946 Filed 1-26-93; 8:45 am]

BILLING CODE 7590-01-M

Advisory Committee on Nuclear Waste; Meeting

The 50th meeting of the Advisory Committee on Nuclear Waste (ACNW) scheduled to be held Wednesday and Thursday, January 27 and 28, 1993, 8:30 a.m. until 6 p.m., room P-110, 7920 Norfolk Avenue, Bethesda, MD has been revised as follows:

Portions of this meeting may be closed to public attendance if deemed necessary to protect information provided in confidence by a foreign source (5 U.S.C. 552b(c)(4); 10 CFR 2.790(d)(2)), information that relates solely to the internal personnel rules and practices of the ACNW (5 U.S.C. 552b(c)(2)), and information the release of which would represent a clearly unwarranted invasion of personal privacy (5 U.S.C. 552b(c)(6)). These sessions will be devoted to meeting with the National Radiological Protection Board of the United Kingdom to discuss information provided by the Board regarding standards for a high-level radioactive waste repository and ACNW office structure and personnel.

Notice of this meeting was published in the Federal Register on Wednesday, January 12, 1993 (58 FR 3982). All other items pertaining to this meeting remain the same as previously published.

Dated: January 21, 1993.

John C. Hoyle,

Advisory Committee Management Officer.

[FR Doc. 93-1948 Filed 1-26-93; 8:45 am]

BILLING CODE 7590-01-M

Advisory Committee on Reactor Safeguards; Meeting Agenda

In accordance with the purposes of sections 29 and 182b. of the Atomic Energy Act (42 U.S.C. 2039, 2232b), the Advisory Committee on Reactor Safeguards will hold a meeting on February 11-13, 1993, in Room P-110, 7920 Norfolk Avenue, Bethesda, Maryland. Notice of this meeting was published in the Federal Register on December 23, 1992.

Thursday, February 11, 1993

8:30 a.m.-8:45 a.m.: Opening Remarks by ACRS Chairman (Open)—The ACRS Chairman will make opening remarks regarding conduct of the meeting and comment briefly regarding items of current interest. The Committee will discuss priorities for preparation of reports during this session.

8:45 a.m.-11 a.m.: Key Policy Issues for Preapplication Designs (Open)—The Committee will review and comment on key policy issues identified by the NRC staff for resolution with respect to advanced reactor designs such as the MHTGR, PIUS, PRISM, and CANDU-3. Representatives of the NRC staff, the Department of Energy, and the industry will participate, as appropriate.

11 a.m.-11:45 a.m.: Schedules of NRC Review of Proposed Advanced Reactor Designs (Open)—The Committee will hear a briefing by and hold discussions with representatives of the NRC staff on the current schedules for the NRC staff's review of proposed advanced reactor designs.

12:45 p.m.-2:15 p.m.: FitzPatrick Nuclear Power Plant (Open)—The Committee will hear a briefing and hold discussions regarding restart of the Fitzpatrick nuclear plant following an extended shutdown for plant and organizational changes. Representatives of the licensee and of the NRC staff will participate, as appropriate.

2:15 p.m.-4:30 p.m.: NRC Regulatory Review Group (Open)—The Committee will 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.

4:30 p.m.-5 p.m.: Appointment of New Members (Open/Closed)—The Committee will discuss the qualifications of candidates proposed for appointment to the Committee.

Portions of this session will be closed to discuss information the release of which would represent a clearly unwarranted invasion of personal privacy.

5 p.m.-5:30 p.m.: Preparation of ACRS Reports (Open)—The Committee will discuss proposed reports regarding items considered during this meeting.

APPENDIX II

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

January 13, 1993

SCHEDULE AND OUTLINE FOR DISCUSSION
50TH ACNW MEETING
JANUARY 27-28, 1993

Wednesday, January 27, 1993, Room P-110, 7920 Norfolk Ave., Bethesda, Maryland

1)	8:30 - 8:45 a.m.	Opening Remarks by ACNW Chairman (Open) 1.1) Opening Statement (DWM/RKM) 1.2) Items of Current Interest (DWM/RKM)
2)	8:45 - 4:00 p.m.	Review and Comment on Issues that Concern Radioactive Waste Disposal Raised by the Energy Policy Act of 1992 and the Impacts This Act Will Have on NRC's High-Level Waste Program (Open/Closed) (DWM/HJL) 2.1) Perspective on Radioactive Waste Disposal by U.K.'s National Radiological Protection Board NOTE: Portions of this session may be closed to hear information provided in confidence from a foreign source.
	10:~~15~~ 20 - 10:~~30~~ 45 a.m.	* * * B R E A K * * *
	10:~~30~~ 45 - 11:~~15~~ 00 a.m.	2.2) Perspectives on Radioactive Waste Disposal by a representative of the U.S. National Council on Radiation Protection and Measurements
	11:~~15~~ 00 - ~~1100~~ 12:10 p.m.	2.3) General Discussion by NRC staff on the Potential Impacts of the Act and Evolving Staff Advice
	~~1100~~ 12:10 - 2:00 p.m.	* * * L U N C H * * *
	2:~~00~~ 20 - 4:~~00~~ 20 p.m.	Continue Discussion of Impact of Energy Policy Act of 1992 2.4) General Discussion with Invited Guests, Consultants and Staff 2.5) Formulate ACNW Advice on the Impact of the Act on NRC's HLW Program.
	4:~~00~~ 20 - 4:~~15~~ 55 p.m.	* * * B R E A K * * *

[= Transcribed portion of meeting

3) 4:~~15~~-~~5:15~~ (55 6:15) p.m. Committee Activities/Future Agenda (Open/Closed) (DWM/RKM)
Discuss anticipated and proposed Committee activities, future meeting agenda, administrative and organizational matters, as appropriate.
3.1) Set February agenda
3.2) Review Working Group Schedule
3.3) Other Future Topics
3.4) ACNW personnel matters (Closed)
NOTE: Portions of this section will be closed to discuss items the release of which would be a clearly unwarranted invasion of personal privacy.

Thursday, January 28, 1993, Room P-110, 7920 Norfolk Avenue, Bethesda, Maryland

4) 8:30-12:30 p.m. Briefing on the Use of Natural Analogs in Radioactive Waste Disposal (Open) (WJH/LGD)
4.1) Introduction - Mel Silberberg (10 min.)
4.2) Natural Analog Program: NRC Perspective and Activities - Historical Interest (PA), International Scope, etc. How analogs can be used in regulatory/ analytical/performance assessment process - Linda Kovach (30 min.)
4.3) OKLO - Initiatives for further study and NRC participation - Bill Ott (30 min.)
4.4) International Alligator Rivers Analog Project (ARAP). A review of five years of investigation of the Koongara uranium ore body -- accomplishments and promise. George Birchard (60 min.)

10:~~40~~ (15) -10:~~55~~ (35) a.m. * * * B R EA K * * *

10:~~55~~ (35) -~~12:30~~ (1:10) p.m. 4.5) Research on Natural Analogs at the CNWRA Pena Blaca and Akrotiri -- Progress and Future Activities. English Pearcy (60 min.)
4.6 Round-table discussion (35 min.)

~~12:30~~ (1:10) -~~1:30~~ (2:20) p.m. * * * L U N C H * * *

5) ~~1:30 — 2:30~~ p.m. (Not discussed)

4:00 - 4:10 Break

6) 2:20 - ~~5:30~~ 4:55 p.m.

Performance Indicators for LLW Handling and Disposal (Open) (DWM/HJL)
A Committee planning session to explore the creation of a performance indicator or event reporting system that would monitor the current status and trends in the management and disposal of low-level radioactive waste.

Preparation of ACNW Reports (Open) (DWM/RKM)
Discuss proposed ACNW Reports regarding items considered during this meeting and previous meetings, including:

6.1) ACNW Comments on the Impact of the Energy Policy Act of 1992
6.2) ACNW Four Month Plan
6.3) Scope of ACNW Activities

APPENDIX III: MEETING ATTENDEES

50TH ACNW MEETING
JANUARY 27-28, 1993

ACNW MEMBERS	1st Day	2nd Day
Dr. William J. Hinze	X	X
Dr. Dade W. Moeller	X	X
Dr. Paul W. Pomeroy	X	X
Dr. Martin J. Steindler	X	X

ACNW CONSULTANTS	1st Day	2nd Day
Dr. Ruth F. Weiner	X	X
Dr. Richard F. Foster	X	X

ACNW STAFF	1st Day	2nd Day
Ms. Lynn F. Deering	X	X
Mr. Giorgio N. Gnugnuli	X	X
Mr. Howard J. Larson	X	
Mr. Richard K. Major	X	X
Mr. H. Stanley Schofer	X	X

NRC STAFF			
G. Birchard	RES		X
J. Bradbury	NMSS		X
R. Codell	NMSS		X
S. Coplan	OCM	X	
F. Costanzi	RES		X
A. Eiss	NMSS	X	X
N. Eisenberg	NMSS		X
D. Fehringer	NMSS	X	
J. Holonich	NMSS	X	
J. Kotra	OCM	X	
L. Kovach	RES		X
K. McConnell	NMSS		X
W. Ott	RES		X
H. Pastis	NRR	X	
L. Person	NMSS		X
M. Silberberg	RES		X
J. Trapp	NMSS		X
J. Wolf	NRR	X	
B. Youngblood	NMSS	X	

ATTENDEES FROM OTHER AGENCIES AND GENERAL PUBLIC

Carl Anderson	National Academy of Sciences
Joseph Bannon	ERM
Tony Batt	Donrey Media Group
Dennis Bechtel	Clark Co. Nevada
William Beckner	NCRP
Tara Cameron	EPA
C. Casto	Senator Reid
R. Clark	EPA
Paul Cloke	SAIC, Las Vegas, NV
John Cooper	National Radiation Protection Board
Thomas Cotton	M&O Research Assoc.
Terry Crump	DOE/Weston
Paul D'angus	SAIC
Dan Dresser	Weston
R. Foster	ACNW Consultant
Steve Frishman	State of Nevada
Michael Gilbert	GAO
James Gruhlke	EPA
M. A. Haghi	M&O
Patrick Harris	SERCH Licensing/Bechtel
Bruce Hastings	Intera, Vienna, Va
Charles Hermann	SAIC
Paul Krishna	M&O/TRW
Robert Luce	NWTRB
Mike Lugo	M&O/TRW
Walter Matyskiela	M&O/TRW
Ronya McMillen	Embassy of Australia
Homi Minwalla	Weston/Jacobs
Peter Myers	NAS
Bonnie Packer	M&O/TRW
English Pearcy	CNWRA
M. Phillips	Newman & Holtzinger
Edward Regnier	DOE
Len Reiter	NWTRB
Perry Robinson	Winston & Strawn
Gene Roseboom	USGS
Victor Sgobba	GAO
Sharon Skuchko	DOE
Stephen Spector	CNWRA
Gerry Stirewalt	CNWRA
Jane Summerson	DOE
Robert Sweeney	Southern Technical Services, Inc.
Ed Taylor	M&O/TRW
Lauren Waters	GAO

APPENDIX IV: FUTURE AGENDA

51st ACNW Committee Meeting February 24-26, 1993

Meeting with the Commissioners (Open) - The Committee will meet with the Commission to discuss items of mutual interest. These include the Committee's report on a systems analysis of the HLW disposal program and its review of the charge given by Congress to EPA and the National Academy of Sciences regarding the development of standards for the proposed Yucca Mountain HLW repository.

Energy Policy Act of 1992 (Open) - The Committee will review with the NRC staff possible impacts of the Energy Policy Act of 1992 on ongoing agency initiatives in the HLW arena.

Standards of Ethical Conduct (Open) - The Committee will be briefed by the NRC staff on standards of ethical conduct for employees of the Executive Branch.

Gas-Phase Release of Radionuclides (Open) - The Committee will be briefed on computer models for evaluating gas-phase radionuclide releases from LLW disposal facilities.

Computer Models for Conducting Performance Assessments (Open) - The Committee will discuss computer models for conducting performance assessments of LLW disposal facilities.

Expert Judgment (Open) - The Committee will be briefed on the acceptance, in an adjudicatory review, of scientific evidence based primarily on expert judgment.

Low-Level Radioactive Waste Performance Indicators (Open) - The Committee will explore the creation of a performance indicator or event reporting system that would monitor the current status and trends in the management and disposal of low-level radioactive waste.

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 Performance Indicators, March 23, 1993, 7920 Norfolk Avenue, Bethesda, MD, (Giorgio Gnugnoli) - The Working Group will explore the creation of a nationwide performance indicator or event reporting system that would monitor the current status and trends in the management and disposal of low-level radioactive waste.

Regulatory Guides for Implementing Revisions to 10 CFR Part 20, March 26, 1993, 7920 Norfolk Avenue, Bethesda, MD, (Giorgio Gnugnoli) - 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 relationships between precipitation, recharge, and flux through the unsaturated zone at the proposed Yucca Mountain site, and the adequacy of ongoing field studies to ascertain these relationships. The Working Group will focus on the status of modeling activities of flow in the unsaturated zone, and alternative conceptual models of fracture versus matrix flow, and the conditions under which fracture flow can be shown to predominate. The Working Group will also focus on the recharge term in hydrogeologic models, alternative conceptual models for how and where regional recharge occurs, and the sensitivity of assumptions about recharge on model results.

Potential Impact of Groundwater Use on the Performance of a Proposed High-Level Waste Repository, (Date and location to be determined), - The Working Group will consider the impacts of potential groundwater use on site performance. The Working Group will also consider the potential for the development of geothermal energy as a natural resource within the vicinity of the proposed site. This will be a follow-on meeting to the Working Group meeting on the potential for natural resources at the Yucca Mountain site, held October 20, 1992.

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 ITEM NO.	DOCUMENTS
1	Chairman's Report
	1. Items of Possible Interest to ACNW Members and Staff, dated January 20, 1993, by Dade W. Moeller
2	Review of the Energy Policy Act of 1992 and its Implications
	2. Viewgraphs used by Dr. William Beckner, NCRP, during his briefing, undated
	3. Potential Impacts of Energy Policy Act on NRC's High-Level Waste Program, dated January 27, 1993, Presentation by Daniel Fehringer, HLWM
	4. Memorandum to ACNW Members from Howard Larson, Senior Staff Engineer, dated January 26, 1993, regarding Energy Policy Act of 1992, with enclosure (Official Use Only)
	5. Memorandum to ACNW Members from Howard Larson, Senior Staff Engineer, dated December 2, 1992, regarding WIPP Withdrawal Act, [with enclosures]
	6. National Radiological Protection Board Statement on Radiological Protection Objectives for the Land-based Disposal of Solid Radioactive Waste, Volume 3, Number 3, 1992
4	Use of Natural Analogs in Radioactive Waste Disposal
	7. Progress in Natural Analog Research, Presented by Linda Kovach, RES, dated January 28, 1993 [Viewgraphs]
	8. The Oklo Natural Analog: NRC Perspectives, Presented by William Ott, RES, dated January 28 1993 [Viewgraphs]
	9. Geochemical Natural Analog Research at the Center for Nuclear Waste Regulatory Analyses, Presented by English Pearcy, Southwest Research Institute, undated [Viewgraphs]
	10. Applications of Natural Analogue Studies to Yucca Mountain as a Potential High Level Radioactive Waste Repository. Recommendations of the Natural Analogue Review Group (NARG), undated
	10a. Geometric Analyses of Faults at Yucca Mountain: Applications to the High-Level Waste Regulatory Program, Presented by Stephen Young, dated December 17, 1992 [Viewgraphs]
	11. Letter to John Roberts, Office of Civilian Radioactive Waste Management, DOE, from Joseph Holonich, NMSS, dated September 28, 1992, regarding Department of Energy Development of Natural Analog Studies, with enclosure
	12. Draft Statement by the Natural Analogue Working Group (NAWG) Core Group, undated

13. A Watertight Lesson from the Ancient? Article from Science, Vol. 258, December 18, 1992
14. Alligator Rivers Analogue Project Overview, Presented by George Birchard, RES, dated January 28, 1993

5 Performance Indicators for LLW Handling and Disposal

15. Background Information on a Proposed for the Establishment of a System of Performance Indicators for the Management and Disposal of Low Level Radioactive Wastes, draft #2, by Dade Moeller, January 24, 1993

Meeting Notebook Contents

1 Chairman's Report

1. Introductory Statement by ACNW Chairman, dated December 17, 1992
2. Introductory Statement by ACNW Chairman, dated December 18, 1992
3. Items of Interest, undated

2 Review and Comment on Issues that Concern Radioactive Waste Disposal Raised by the Energy Policy Act of 1992 and the Impacts This Act Will Have on NRC's High-Level Waste Program

4. Memorandum for The Chairman and Commissioners from William Parler, dated October 26, 1992, regarding Energy Policy Act of 1992, with attachment OGC Analysis
5. Title VIII - High-Level Radioactive Waste, Sec. 801 Nuclear Waste Disposal
6. Memorandum for James Taylor from John Hoyle, dated November 25, 1992, regarding COMJC-92-009 - Interacting with the National Academy of Sciences on High-Level Waste Issues
7. Letter for Peter Myers from Margo Oge, dated December 8, 1992, regarding EPA questions and approaches to the three issues outlined in the Energy Policy Act of 1992
8. Individual and Collective Doses and Radionuclide Concentrations and Releases (Relevance to Standards for HLW Repositories) EPA-STD: 1/6/93 Dade Moeller

3 Committee Activities/Future Agenda

9. Update to Committee Activities
10. February Meeting Agenda
11. Topics through May 1993
12. Other Topics Scheduled
13. Working Group Meetings
14. Blaha list of proposed ACNW agenda items

4 Briefing on the Use of Natural Analogs in Radioactive Waste Disposal

15. Status Report
16. Memorandum for File from Richard Major, dated September 16, 1992, regarding Meeting between Commissioner Rogers and ACNW Members and Staff on July 29, 1992 [Official Use Only]
17. Letter for James Taylor from Dade Moeller, dated May 1, 1992, regarding Review of NRC High-Level Radioactive Waste Research Program Plan (Draft NUREG-1406)
18. Progress in Natural Analogs Research, presented to the Nuclear Safety Research Review Committee by Linda Kovach

5 Performance Indicators for LLW Handling and Disposal

19. Status Report
20. Background Information on a Proposal for the Establishment of a System of Performance Indicators for the Management and Disposal of Low Level Radioactive Wastes, Draft #1, Dade Moeller, dated January 2, 1993
21. Memorandum for ACNW Members from Howard Larson, dated August 24, 1992, regarding Indicators of Performance
22. Memorandum for Howard Larson from Dade Moeller, dated August 15, 1992, regarding Indicators of Performance
23. Data Bases on Low Level Radioactive Waste Management and Disposal, Dade Moeller, dated August 15, 1992
24. Memorandum to D. Moeller from M. Steindler, dated September 6, 1992, regarding Comments on the LLW Indicators of Performance [Official Use Only; Predecisional Draft]
25. Memorandum for File from Richard Major, dated August 19, 1992, regarding the July 28, 1992 Meeting Between Commissioner Curtiss and Dr. Moeller to Discuss Items of Mutual Interest [Official Use Only]
26. Memorandum for File from Richard Major, dated September 16, 1992, regarding Meeting Between Commissioner Rogers and ACNW Members and Staff on July 29, 1992 [Official Use Only]

6 Preparation of ACNW Reports

27. Excerpt from minutes, Draft #1: dated January 21, 1993, regarding Program Plan for the ACNW [Prepared for Internal Committee Use]
28. Status Report
29. Excerpt from minutes, Draft #1: December 22, 1992, regarding Scope of ACNW Activities
30. Memorandum for Dade Moeller from R. Fraley, dated May 16, 1992, regarding Revised ACNW Charter
31. Memorandum for Dade Moeller from Kenneth Carr, dated May 11, 1990, regarding Approval of a Revised Charter for the ACNW

32. Letter for Kenneth Carr from Carlyle Michelson Dade Moeller, dated July 11, 1990, regarding Division of Responsibilities Between ACRS and ACNW
33. Memorandum for Chairman Carr from Fraley, dated February 23, 1990, regarding Division of Responsibilities Between ACRS and ACNW [with attachments]