DEVELOPMENT AND IMPLEMENTATION OF

THE DIVISION OF HIGH-LEVEL WASTE MANAGEMENT PROACTIVE PROGRAM

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Division of High-Level Waste Management
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ENCLOSURE 1

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this paper is to describe how the U. S. Nuclear Regulatory Commission (NRC) staff of the Division of High-Level Waste Management (HLWM) develops and implements the proactive component of its overall High-Level Waste Repository Program. The paper will specifically focus on how proactive work has been identified, prioritized, and integrated and how this effort is now being enhanced by the Systematic Regulatory Analysis (SRA) of 10 CFR Part 60 and the Iterative Performance Assessment (IPA). In addition, the development and implementation of the Office of Nuclear Regulatory Research (RES) Program in support of the HLWM proactive program will be addressed.

1.2 Overall HLWM Repository Program

The goals, objectives, and activities of the overall HLWM Repository Program are described in NRC's Five-Year Plan and in the HLWM staff's Regulatory Strategy presented in SECY-88-285. The goals of the overall HLWM Repository Program are to conduct effective pre-license application consultation and an effective license application review to facilitate a construction authorization decision for a geologic repository within the 3-year time period mandated by the Nuclear Waste Policy Act (NWPA), as amended.

To achieve this goal, the program's three major objectives during the pre-license application phase are to: (1) refine the regulatory framework so that it is clear and complete; (2) identify and resolve potential licensing issues using guidance to the U.S. Department of Energy (DOE) to help ensure that DOE submits a complete and acceptable license application; and (3) develop the staff's technical capabilities to review DOE's site characterization program and license application.

The activities for achieving the program's objectives have been divided into proactive and reactive components. The proactive activities generally do not depend on an action by DOE, but are timely enough to support DOE's program. Proactive activities are in the following three Five-Year Plan/Budget areas: (1) NWPA regulatory requirements and technical guidance (e.g., rulemakings and staff technical positions (STPs)); (2) technical assessment capability for repository licensing review (e.g., review plans, analysis methods, and IPA); and (3) SRA. In contrast to proactive activities, reactive activities are responsive to DOE actions and are activities in the following two Five-Year

Plan/Budget areas: (1) quality assurance (e.g., reviews and audits) and (2) pre-licensing and site characterization reviews (e.g., study plan reviews).

As mentioned previously, this paper focuses on the proactive program.

2.0 HLWM PROACTIVE PROGRAM

2.1 Program Overview

Two of the most basic products that will be developed by the HLWM proactive program are the Format and Content Regulatory Guide (FCRG) for the license application and the License Application Review Plan (LARP). These are the primary guidance documents addressing the license application. The FCRG gives guidance to DOE on the general information needed in the license application. The LARP, on the other hand, will be issued as guidance to the HLWM staff and will describe how the staff will review DOE's license application to determine if DOE has acceptably demonstrated compliance with 10 CFR Part 60. It also will help guide the staff's review of DOE's program during the pre-license application phase. Therefore, the LARP also will provide indirect guidance to DOE.

Before completion of the FCRG and the LARP, HLWM may need to provide pre-licensing guidance to DOE in areas where there are issues of immediate concern, such as those that could affect site characterization or those that might need a long lead-time to address. Issuance of this pre-licensing guidance is done through a number of methods. The staff may provide feedback to DOE as part of its reactive program by commenting on DOE documents such as the Site Characterization Plan. Alternatively, the staff may issue STPs that are developed through the proactive program for a few of the most important technical areas. STPs provide guidance to DOE on acceptable methods it can use to demonstrate compliance with 10 CFR Part 60. Eventually, the STPs will be incorporated into the LARP by reference or by restating the positions contained in them directly in the LARP, as acceptance criteria.

As another activity of its proactive program, the staff is evaluating 10 CFR Part 60 to identify areas where changes or clarifications are needed. Rulemakings are used to make changes to 10 CFR Part 60, whereas guidance documents such as the FCRG, LARP, and staff positions (SPs) can serve to clarify the meaning of the regulation. This work will help the staff ensure that the regulatory framework for licensing a repository is adequate, and that ambiguities in the regulations will not become a major focus in the licensing hearing.

The program's proactive activities also include analysis method preparation and IPA. Under analysis method preparation, the staff's focus is on developing analytical methods needed to make determinations of compliance with subsystem performance objectives and other requirements of 10 CFR Part 60. Under IPA, the staff's focus is on developing a capability to evaluate the overall system performance objective. However, in actual implementation, both

are closely coordinated to assure development of a comprehensive technical review capability. Because of its importance in developing and implementing the proactive program, IPA is further described in section 2.3.

The final proactive activity is the SRA. Because of its importance to developing and implementing the proactive program, it is described in Section 2.2.

2.2 Systematic Regulatory Analysis (SRA)

In general, the SRA is a disciplined and documented process specifically developed by the HLWM and the Center for Nuclear Waste Regulatory Analyses (CNWRA) staffs to apply the principles of systems engineering to the needs of the NRC's HLWM program. SRA defines a framework in which technical work is conducted and documented. This framework includes a process for systematically and comprehensively analyzing 10 CFR Part 60 to identify and conduct the appropriate staff work needed to support licensing. The framework is a tool that helps focus, in a consistent and documented manner, the staff's technical and programmatic judgments. This approach is particularly well suited for dealing with some of the challenging aspects of the repository licensing program (e.g., it is complex, first-of-a-kind, multi-disciplinary, and of long duration). The SRA process is designed to be a tool for the staff to use throughout the licensing process to effectively and efficiently manage the HLWM program. The staff considers it a key method in helping it identify, prioritize, and integrate work. As a result, the staff will have greater confidence that all the necessary work is done to achieve the program's objectives, that the work is done in a consistent and coordinated manner, that the work has been done as efficiently as possible, and that it is sufficiently documented to preserve a record for future reference.

Specifically, the SRA process defines a number of analyses of 10 CFR Part 60. The first analysis involves placing those parts of the regulation covering common areas into groups called regulatory requirements. In addition, each regulatory requirement is subdivided into regulatory elements of proof, which are direct statements from the regulation as to what must be proven by DOE in order to demonstrate compliance with that portion of the regulation. This analysis is important because it provides a description of the often very complex logical interrelationships between the various portions of 10 CFR Part 60. The regulatory requirements and their associated regulatory elements of proof are the starting point and foundation for all further SRA analyses, which are described below.

Each regulatory requirement is analyzed, and where the existing regulation is unclear or incomplete, regulatory uncertainties are identified. Similarly, where the roles or actions of organizations responsible for implementing a portion of the regulation are unclear, institutional uncertainties are identified. Once these uncertainties are identified, each uncertainty is analyzed using criteria to both prioritize and identify the appropriate method for the staff to use to reduce the uncertainty. The results of these analyses, including the rationales for the decisions, are documented.

Alternative reduction methods include major rule, minor rule, or guidance. Based on the uncertainty reduction methods selected, the staff will prepare the appropriate document to reduce the uncertainty.

Each regulatory requirement is further analyzed to select the type of license application review that is appropriate. Five standard types of reviews have been defined, which involve different levels of detail and different review methods. The type of review is then used to develop the review strategy that will be included in the LARP sections dealing with the regulatory requirement. The review strategy is used to help the staff streamline its work and optimize its resources during the license application review. It does this by focusing the staff work on those areas most important to compliance with 10 CFR Part 60 and identifying those areas where more detailed reviews and rigorous methods of review will be needed. In addition, the review strategy will help identify what research, model development, and pre-license application reviews are needed to prepare for the staff's license application review.

An additional analysis of each regulatory requirement consists of developing, within the bounds of the review strategy already developed, the review methods, procedures, and acceptance criteria that the staff will use to evaluate DOE's license application. The detailed information needs that the staff will use to implement each review method also will be identified. The results of this analysis will be direct input to the LARP.

Each regulatory requirement also is analyzed to identify the general information that DOE should provide in its license application. These general information needs will be used as direct input to the FCRG. Because the staff has already developed a draft FCRG, many of the general information needs for the various regulatory requirements have already been developed in draft form. Therefore, in this case, the SRA process will help the staff identify any additional information needs that should be included in the FCRG and will also serve as a check of the draft FCRG material.

Another analysis is the identification of technical uncertainties. Technical uncertainties can be questions of "how to" or "how well" to do something or questions about the site or repository-induced conditions or processes. Those technical uncertainties that the staff judges to pose a high risk of non-compliance with 10 CFR Part 60, and, in particular, the performance objectives, are identified as key technical uncertainties. These key technical uncertainties are considered by the staff in applying criteria to select the appropriate review strategy and in developing the review methods, procedures, and acceptance criteria. In this way, the staff's review methods for each regulatory requirement are focused on the most important technical uncertainties that must be addressed in evaluating repository performance and determining compliance. This analysis is, therefore, a primary method for prioritizing the work needed to prepare for the license application review, as well as the review itself.

Finally, the staff recognizes the exploratory and evolving nature of the repository program, as well as the need for flexibility under these conditions. Because of this, the staff expects to apply the SRA process iteratively. The staff's initial judgments and products resulting from applying the SRA process may be reevaluated periodically, as needed, based on new information, new insights, or as new analytical methods become available. For example, the staff's initial judgments in identifying key technical uncertainties that pose a high risk of non-compliance will eventually need to be evaluated more quantitatively by using sensitivity analysis methods developed by the IPA activity. Any changes that result may lead to changes in the review strategies or review methods.

2.3 Iterative Performance Assessment (IPA)

A second activity being conducted in parallel with SRA is IPA. IPA is an iterative process of technical analyses primarily using predictive models and computer codes to obtain quantitative estimates of repository performance. More specifically, IPA consists of developing system descriptions and conducting scenario analyses, consequence analyses, performance measure calculations, sensitivity and uncertainty analyses, and comparisons to regulatory standards. These analyses are repeated as new data and increased understanding become available. Through this iterative process, progressively refined assessments of repository performance as it relates to performance objectives in 10 CFR Part 60 may be obtained.

The overall objective of the IPA program is for the NRC staff to develop, maintain, and enhance its capability to perform an effective review of DOE's performance assessment, which will be the principal way that DOE will demonstrate compliance with the performance objectives of 10 CFR Part 60, in its license application. IPA also provides a tool for technical integration because it provides the structure for examining couplings between phenomena that might not be adequately evaluated within the limits of a specific technical discipline. In addition, the multi-disciplinary involvement with data inputs, assumptions, and code development more clearly defines activities and interfaces of the many disciplines involved. In this way, IPA also contributes to programmatic integration.

The other objectives of IPA are:

(1) support the development of regulatory guidance and the LARP, especially in developing and refining the basis for the review strategies and review methods for the performance objectives;

(2) provide practical insights into the feasibility of implementing existing requirements of 10 CFR Part 60 and 40 CFR Part 191, and the alternatives that might be considered; and

(3) support the pre-license application reviews of DOE's site characterization program (including field and laboratory studies, early performance assessments and performance allocations, and design analyses).

IPA will achieve these objectives by illustrating how site characterization data and general information can be used to demonstrate regulatory compliance. In the course of such exercises, the need for additional site characterization data, regulatory guidance, or potential change to regulations might be identified. Sensitivity and uncertainty analyses will be key to identifying those data, assumptions, or regulatory interpretations with the greatest potential for introducing uncertainty into demonstrations of compliance.

IPA complements the SRA process by feeding the results of integrated technical analyses back into the SRA process. As mentioned previously, knowledge gained through IPA will be used to reevaluate the significance of key technical uncertainties initially identified in an SRA analysis, and thereby provide a quantitative basis for determining the need to revise the key technical uncertainties and associated review strategies. As the SRA process is developed, it will help to ensure that IPA activities are appropriately focused to contribute in a logical fashion to regulatory products and, eventually, the review of the license application, by ensuring that the work performed is relevant to the regulatory process.

3.0 HLWM PROACTIVE PROGRAM DEVELOPMENT AND IMPLEMENTATION

The staff's approaches for identifying, prioritizing, and integrating work are principal elements of developing and implementing the HLWM program. In this section, the approaches that have been used for each of these elements are discussed. Furthermore, how the existing approaches are being enhanced by using the SRA and IPA processes will be addressed. It is important to emphasize that the staff is in the process of developing the SRA and IPA. Therefore, these approaches are just beginning to be applied to the program.

3.1 Identifying Work

The approach used to date to identify topics for proactive work consisted of: (1) independent staff judgment regarding needs; (2) results of research; and (3) interactions with DOE and others. Such interactions included staff reviews of DOE documents submitted to NRC, dialogue with DOE and others on technical issues, and requests from DOE, or others, for guidance or regulatory changes (e.g., DOE's petition for a rulemaking regarding Design Basis Accident Dose Limit). Using this approach the staff identified the work which it is now undertaking in the proactive program. However, this approach, while controlled, was not systematic or comprehensive and the rationales for decisions were not always documented.

SRA and IPA are now reaching a state of development where the staff can begin to use these tools as a more comprehensive approach to enhance the identification of work. For rulemaking and STP work, the SRA is being used to identify areas in the existing rule requiring changes or where the rule appears to be incomplete. In addition, it identifies areas where these are questions or concerns regarding how compliance with 10 CFR Part 60 can be determined. This enhanced approach will give the staff greater confidence that the appropriate rulemaking or STP topics have been identified. Once the STPs or rulemakings are identified, the staff has defined the areas where some of its proactive work should be done. Also, the identification of these areas help the staff to identify where research work might be needed to support these efforts.

As key technical uncertainties are identified using SRA and IPA, and as the review strategies are developed, the staff will be able to identify, in a consistent, better justified, and well documented manner, the specific research, model development, or pre-license application reviews that are needed to develop the LARP and prepare to review the license application. Because the development of the LARP is just beginning, the SRA process is being used to identify and conduct the specific work needed for preparing the LARP. The review strategies will also identify what type of modeling capability to develop, to review key technical uncertainties. Specifically, the review strategies will identify where the staff will need to develop its capability to use models already developed by DOE or other parties, or where the staff will need to independently develop its own models and capability to apply them. Such development work might be done by HLWM, RES, or as a joint effort, similar to the way the IPA is currently being developed. Similarly, the review strategies will identify where research work is needed to support the LARP. Complementing the SRA process is the practical experience gained from exercising the models and codes as part of the IPA.

3.2 Prioritizing Work

The staff prioritizes its work annually as part of the development of the Five-Year Plan and Budget and during the year, as the program is implemented. Ongoing work has been prioritized by considering one or more of the following factors: programmatic needs, importance, timing, and resource constraints. Programmatic needs include, for example, the need for a LARP or the FCRG based on past licensing experience. Importance can depend on many factors such as impact on DOE site characterization activities, potential adverse impacts on waste isolation due to DOE's site characterization activities, importance to repository performance, risk of non-compliance with 10 CFR Part 60 requirements, or resolution of regulatory uncertainties with 10 CFR Part 60. Timing considers DOE's program schedules and the lead time needed by the staff for developing guidance or preparing for reviews of DOE's program. Finally, resource constraints involve limitations in HLWM staff, CNWRA funding, and availability of appropriate technical expertise.

As the SRA process is developed and implemented, it will be used to help prioritize work in many ways. The SRA, through the development and application of criteria, will help focus the staff's considerations and decisions in assigning priorities. For example, as described in Section 2.2, prioritization criteria will help the staff determine the appropriate type of license application review, based on the technical uncertainties most important to compliance with 10 CFR Part 60. This prioritization analysis will also prioritize the regulatory requirements, the technical uncertainties most important to compliance, and the pre-license application activities needed to support the type of license application review selected.

In addition, the SRA data base will provide the staff with the information pertinent to prioritizing work. Finally, the SRA process requires that the rationales supporting many prioritization decisions are documented for future staff use and management review.

IPA will also begin to support the staff in prioritizing its work by providing the overall system modeling capability that can be used to conduct sensitivity analyses, to determine, quantitatively, the importance of many factors to repository performance. These quantitative results will greatly enhance the staff technical judgments presently being used and thereby strengthen the justifications or rationales for priorities. In particular, IPA will be able to check the initial judgments the staff will make in applying the prioritization criteria, to determine the appropriate type of license application review. Furthermore, results of sensitivity analyses will contribute to a more complete record documenting the staff's decisions.

3.3 Integrating Work

Ongoing HLWM work is integrated through the HLWM matrix management organizational structure. The staff has relied on, and has had success in, effectively using multi-disciplinary teams for conducting much of its work. Team meetings and informal team member discussions have contributed to exchange of information and views among the various disciplines. Both the Site Characterization Analysis and the draft FCRG are examples of where multidisciplinary teams were used to achieve integration of information in the product.

In addition, the staff uses review plans and procedures to help integrate its work. Within these plans, formal steps or tasks are identified, scheduled, and staff assigned to explicitly focus on technical integration of the work. Such explicit integration steps were identified in the staff's Site Characterization Review Plan.

The SRA process is intended to greatly enhance the integration of work. SRA and the associated relational data base have been designed and are being developed to provide an effective and efficient tool for integration. As the SRA process is conducted, relationships of information on many levels are explicitly identified, documented, and entered into the relational data base.

For example, the interrelationships of the regulatory requirements of 10 CFR Part 60 have been determined. These relationships establish the basic structure that will control the integration of much of the staff's work in implementing the SRA process. In addition, when these relationships have been entered into SRA's relational data base, they can be used to identify where work under one regulatory requirement might also affect work under other regulatory requirements. Finally, technical integration activities are built into the SRA analyses, much as they have been in the review plans.

Complementing the SRA process, IPA evaluates compliance with the overall system performance objective through the examination of all technical elements of the system performance; this necessitates technical integration. Because IPA analyzes all aspects of the repository performance, participation and input are required from all the technical disciplines associated with the various repository systems. Program integration is enhanced by establishing the relationships of the different technical disciplines to each other.

4.0 RESEARCH PROGRAM DEVELOPMENT AND IMPLEMENTATION

This section describes the process for developing and implementing the research program in coordination with the HLWM program. Identifying, prioritizing, and integrating research needs are specifically addressed.

As mandated by NWPA, DOE will conduct site characterization activities (including field and laboratory studies) and prepare a license application to demonstrate compliance with 10 CFR Part 60. NWPA mandates that NRC review DOE's license application, conduct a licensing hearing, and make a construction authorization decision. Because of these different statutory responsibilities, NRC's research activities are different from those of DOE, and are consistent with its (NRC's) licensing role. Accordingly, the staff believes it is appropriate to conduct independent research for any one of the following reasons:

(1) develop the licensing tools and technical basis necessary to judge the adequacy of DOE's license application;

(2) ensure a sufficient independent understanding of the basic physical processes taking place at the geologic repository; and

(3) maintain an independent, but limited, confirmatory research capability, under NRC auspices.

NRC's licensing role and the aforementioned objectives have guided the development of the current research program that supports the HLWM repository program. Because HLWM is responsible for the repository licensing program, it is the user of research. As such, it is responsible for identifying user needs. These were identified in 1984 and updated in 1990, in coordination with RES and the CNWRA. Based on these HLWM user needs, RES, in coordination

with HLWM and the CNWRA, currently is developing a draft overall research program plan. Specific research work also is refined and focused through technical discussions, management meetings, and formal reviews of proposed research tasks involving the staff of RES, HLWM, and the CNWRA. Based on these interactions, RES has developed statements-of-work for its contractors that address the user needs. The contractors have developed research work plans that respond to the statements-of-work and guide the actual research work.

In identifying the existing user needs, HLWM used its judgment based on pre-licensing experience to refine and focus the areas where it believes research is needed. This pre-licensing experience includes insights gained from the initial SRA and IPA activities, research conducted to date, reviews of DOE's site characterization work and design activities, and interactions with DOE and others.

Like the prioritization of HLWM work, the identified research needs have also been prioritized according to one or more of the following considerations: (1) programmatic needs; (2) importance; (3) timing; and (4) resource constraints. These factors have already been described in Section 3.2.

As the SRA and IPA processes are further developed, the staff will also use them for identifying and prioritizing needed research. As mentioned previously, the review strategies that will be developed under the SRA and IPA will allow the staff to identify areas that are judged most important to compliance. For some areas, detailed safety reviews of the license application will rely on the use of NRC research results. This identification will help the HLWM staff revise its research user needs in a more systematic and comprehensive way that is more directly linked to its license application review needs and those areas that are most important to repository performance and determining compliance. In this way, the priorities of research can be clearly justified and documented. The research needs identified as a result of the SRA review strategy development will be compared to the ongoing research program and necessary adjustments will be made. As research work progresses, the staff will evaluate the results as part of the SRA process, to determine if additional research is needed to satisfy review needs.

Integration of research activities occurs in many ways. First, there is coordination between HLWM and RES. This includes the process, described above for identifying research needs and developing the research program plan. It also is achieved by HLWM reviews of research program activities and products with resulting comments to RES. The CNWRA also plays an important integrating role because it conducts both the research and HLWM work. Integration will also be enhanced by using the integrating features of the SRA to link the research needs and results to the specific review strategies and methods that HLWM will be developing for the LARP. Through this mechanism, the results of research will become linked to many products of the HLWM program, so that together, they will provide the staff with the capability to review the license application and determine if DOE has adequately demonstrated compliance with 10 CFR Part 60 requirements.

5.0 CONCLUSION

The HLWM staff has developed and is implementing a structured program with formal controls to ensure that there are mechanisms in place to direct and support its ongoing proactive work. In addition, these mechanisms help HLWM to identify, prioritize, and integrate the work of its program. However, the pace of work completed by HLWM is often constrained by the availability of resources including the availability of appropriate technical expertise.

As implementation of the SRA and IPA by HLWM continues, the staff will have available to it a process that will give it a systematic and disciplined approach for performing its work. It provides a framework that helps the HLWM staff identify activities and issues that need to be explored and considered in the program. The final decisions on what work to pursue and in what order are determined by close coordination among HLWM, RES, and the CNWRA. This process is ultimately controlled by staff and dollar resources available to the program.

U. S. NUCLEAR REGULATORY COMMISSION STAFF

RESPONSE TO

ADVISORY COMMITTEE ON NUCLEAR WASTE'S SPECIFIC COMMENTS

1. Assignment of Priorities

Although the CNWRA [Center for Nuclear Waste Regulatory Analyses] staff is engaged in a variety of projects, it is not clear to us how these projects are identified and, more importantly, whether the most important subjects are being addressed. We believe it would be useful to outline the methodology for establishing priorities for work at the CNWRA. Specific questions to be addressed include: Who sets priorities? What criteria are used? How often are the priorities reviewed?

R. As discussed during the August 28, 1991, presentation to the Advisory Committee on Nuclear Waste (ACNW), the ongoing work in the Division of High-Level Waste Management (HLWM) has been identified through three different means. These are: (1)independent staff judgments; (2) interactions with the U.S. Department of Energy (DOE) and others; and (3) staff assessment of the results of ongoing high-level waste (HLW) research.

The work is then prioritized according to one or more of the following considerations:

(1) Programmatic needs such as the support of the License Application Review Plan (LARP) and the Draft Regulatory Guide, "Format and Content for License Application for the High-Level Waste Repository" (FCRG);
(2) Importance or significance to site characterization activities, repository performance, and resolution of issues/uncertainties related to the implementation of Part 60 (including the U.S. Environmental Protection Agency Standard);
(3) Timing (DOE's program schedule and/or NRC lead time);
(4) Constraints due to resource or staff availability.

The work identified and the priority are reviewed annually by HLWM during its budget cycle, and as discussed below, on a continuous basis through the Systematic Regulatory Analysis of 10 CFR Part 60 (SRA). SRA and the staff's Iterative Performance Assessment program (IPA) are now reaching a developmental state where the staff can begin to use these tools in a more comprehensive approach to enhancing the identification and prioritization of work. The SRA assists the staff in making the necessary judgements on prioritizing the work that HLWM undertakes. In addition, the SRA process provides a feedback on what work is being done and how it fits into the

overall program. Thus, HLWM continuously reviews its work identification and prioritization through its implementation of the SRA. The specific details on how SRA and IPA will be used are presented in Section 3.1, "Identifying Work," and Section 3.2, "Prioritizing Work," of "Development and Implementation of the Division of High-Level Waste Management Proactive Program."

2. Performance Assessment and Model Validation

We are pleased to note that increasing attention by CNWRA staff is being directed to performance assessment. This, in our opinion, is a high priority item that should receive focused and increasing attention and be supported by a vigorous effort to recruit additional people who are competent in this subject. There is a need for ongoing external peer review of the total (CNWRA and NRC [U. S. Nuclear Regulatory Commission] staff) performance assessment program. This requires more than the reviews provided through working group meetings of the Advisory Committee on Nuclear Waste.

To support the performance assessment program, there is a need to validate the various computer models being used to analyze the effects of various parameters on the performance of a high-level waste repository. Although the proposed studies at the Pena Blanca site in Mexico will assist in confirming certain aspects of these computer codes, efforts need to be directed to other aspects of repository performance. Without such confirmation, the usefulness and application of these codes will be questioned.

R. The staff agrees that the CNWRA should give high priority to performance assessment, and that the CNWRA is doing so. It is making a vigorous effort to recruit competent people in that area, and, since the ACNW visit, the CNWRA has hired a new staff member in performance assessment and is attempting to recruit one more senior-level person.

The current overall objective of the NRC/CNWRA performance-assessment activity is to develop, maintain, and enhance the NRC capability to effectively review the high-level waste (HLW) performance assessments in DOE's license application. This NRC capability will be applied to evaluating DOE's assumptions about conditions that may have public health and safety implications and to evaluating the sensitivity of DOE's conclusions regarding these assumptions. Thus, any conclusions that the NRC staff might draw from its calculations would be used primarily to identify strengths and weaknesses in DOE's analysis. The NRC staff's calculations will be made publicly available so that DOE, the State of Nevada, and other interested parties may review them. Such was the case with the NRC staff's Phase 1 iterative performance-assessment work which was presented at the Second Annual International High-Level Radioactive Waste

Management Conference and in other forums. The NRC staff expects to continue in this way through other phases of IPA which allows it to receive feedback from other countries on the staff's approach and work being done in these countries to address the same issues. The NRC staff considers that this level of review is the minimum that should be sought. In later phases of iterative performance assessment (Phase 2, etc.), for areas of modeling that are new or controversial, the NRC staff may seek more rigorous peer review from U.S. and international sources.

With regard to validation, the NRC HLW research program is testing the validity of conceptual and mathematical models that the staff expects will be used in the HLW licensing process. Natural analogues are just one of several lines of inquiry that the NRC staff is using to test models. Natural analogues are especially useful for testing long-time predictions of processes that may affect HLW repository performance. The NRC HLW research program also is using laboratory and field testing to test conceptual and mathematical models of HLW-related processes. Finally, the NRC staff has entered into specific agreements (i.e., its agreement with SKI of Sweden) which allows for NRC to take advantage of international expertise in the area of code validation.

3. Systematic Regulatory Analysis

During the past several years, the staff of the CNWRA has conducted a careful analysis of 10 CFR Part 60 and the associated regulatory inconsistencies and uncertainties. We were informed that this effort has provided a framework for planning much of the work of the CNWRA, including the iterative performance assessments that will be used to determine relevant data needs and to identify the key parameters affecting the performance of the proposed Yucca Mountain repository.

There is a need to bring to closure the issues that have been raised and to factor the results of this effort more directly into the research and technical assistance activities of the CNWRA. We look forward to receiving more information on this subject during the scheduled upcoming briefing by the staff of the Division of High Level Waste Management.

R. As noted in Enclosure 2 to SECY-91-225, "Second Update of the Regulatory Strategy and Schedules for the High-Level Waste Repository Program," the staff reviewed the regulatory and institutional uncertainties that the CNWRA identified and determined the methods to be used to reduce them. Some of these uncertainties will be reduced through rulemakings, staff technical positions, the FCRG or the LARP. These are all ongoing features of HLWM's proactive program. Progress in resolving these uncertainties will be discussed in future updates to SECY-91-225. Having completed the

identification of regulatory and institutional uncertainties, the focus of the SRA has now shifted to technical issues and technical uncertainties. The staff is undertaking, through the SRA process, the technical work to develop the LARP and the FCRG. Also through the SRA, the staff has begun to develop models and codes, including IPA, that will support its review of the license application. The results of the SRA will also assist the NRC staff in determining areas where additional research may be needed to resolve technical uncertainties.

4. Timeliness of Studies and Results

We believe that it is important for the CNWRA staff to realize that timeliness is a key factor in developing necessary experimental and computational techniques, in generating data through the application of these techniques, and in issuing reports summarizing the related information. An example of timeliness is the need for the CNWRA staff to develop a capability to conduct evaluations of the long-term resistance of various waste canister materials to corrosion under relevant repository conditions. This work should progress even though DOE has not yet identified the specific canister material to be used. Otherwise, the required testing capabilities may not be ready when needed. Tests also need to be developed for predicting repository behavior under the dry-wet-moist cycle that will exist within an unsaturated environment. Also important in meeting this goal is a requirement on the NRC staff to rapidly review CNWRA reports submitted to it.

R. The importance of timeliness has been stressed to the CNWRA since its inception. As the CNWRA's staff size has increased and it has moved past the initial phase of staffing and learning NRC's HLW program, the NRC staff has noted an improvement in the timeliness of the completion and delivery of CNWRA products. The NRC staff believes that it is important to carefully and thoroughly review reports that the CNWRA submits. However, it is aware of the need to provide comments and responses to the CWNRA in a timely manner.

Also mentioned were two specific areas where the ACNW believes timely development of analytical capabilities is especially important -- waste-canister corrosion and prediction of repository cyclical behavior. In evaluating the timeliness of work to be undertaken, two major considerations are the need to provide timely guidance to DOE and to develop an independent review capability. One of the first major long-term research programs that the NRC staff directed the CNWRA to begin was a study of waste-canister corrosion mechanisms.

However, the staff cannot be in a position where it is in front of DOE in the choice of materials. Having considered the status and schedule of DOE's program and it's need to develop an independent review capability, the staff has made the following conclusions. The staff believes that its

program puts it in a position to give DOE guidance as DOE investigates containter materials. The staff's program will enable it to develop a review capability which will be available when DOE has chosen a material. As long as this project continues to support the program's mission, it will continue to be funded.

Regarding ACNW's suggestion that tests be developed for predicting repository behavior under the dry-wet-moist cycle, this is an area that has been identified as one of the Office of Nuclear Material Safety and Safeguards (NMSS) user-needs. It will be specifically addressed as NMSS and the Office of Nuclear Regulatory Research (RES) consult on the development of NUREG-1406, "High-Level Waste Research Plan."

5. Technical Assistance and Research

It was not clear from our review how projects being conducted by the CNWRA in providing technical assistance are coordinated with those pertaining to research. There appears to be a need for relevant program managers within NMSS and RES to ensure that the demands being placed on the CNWRA are well coordinated, and that these demands fit into the overall agreed upon priorities. A major goal of such coordination should be to minimize the number of conflicting and competing demands being placed on the CNWRA staff.

R. There are several means by which NMSS and RES coordinate technical assistance and research work. First, both RES and NMSS identify individuals responsible for specific areas of technical assistance and research. These individuals communicate regularly and are responsible for coordination of specific activities. Second, RES, based on NMSS user-needs, develops statements of work (SOWs) that identify the specific work that will be done. The CNWRA then develops research project plans that responds to the RES SOWs. These project plans are reviewed by NMSS as part of the integration with ongoing technical assistance activities.

After these coordination activities have been accomplished, the NRC and CNWRA staffs expend significant time and resources in developing and reviewing the CNWRA Operations Plan. NRC program-element managers and project officers are also required to review and comment on CNWRA periodic progress reports. An important part of these development and review activities involves consideration of how well related NMSS and RES projects are being coordinated.

Discussions are also held, at the staff level, between the appropriate NMSS and RES program-element managers and project officers. The development of NUREG-1406 as a baseline for the overall HLW research program, should also enhance coordination of technical assistance and research carried out by the CNWRA. More detail on the coordination of

technical assistance and research activities is given in Section 4.0, "Research Program Development and Implementation" of "Development and Implementation of the Division of High-Level Waste Management Proactive Program," in Enclosure 1.

6. Laboratory Equipment and Computer Support

Many of the studies underway (or being planned) at the CNWRA require sophisticated laboratory equipment and supporting computer capabilities. To the extent practicable, we recommend that capital funds, beyond the current operating budget, be provided to the CNWRA for the acquisition of laboratory facilities and equipment. We also understand that there is a need at NRC headquarters for computer hardware, software, and the leased lines necessary to facilitate electronic communications between personnel at the CNWRA and NRC headquarters. We urge that these problems be resolved.

R. The NRC staff does not believe that capital funding for CNWRA facilities is necessary. The CNWRA is a Federally Funded Research and Development Center, but it is not equivalent to a DOE national laboratory. The CNWRA is a wholly-owned subsidiary of the Southwest Research Institute (SwRI). Pursuant to the contract between NRC and SwRI, SwRI has provided all equipment currently used at the CNWRA. The CNWRA also has the guarantee of use of other SwRI laboratory equipment. When there are no existing SwRI facilities, and it is not economically feasible to equip a new laboratory, given the level of funding of a particular program, the CNWRA has arranged the use of existing superior facilities. For example, in the case of the rock-mechanics program, the CNWRA has arranged for the use of the excellent facilities at Texas A & M University and the University of Arizona. The NRC staff is satisfied with the quality and quantity of laboratory equipment available at the CNWRA.

The staff agrees with the committee's concern about ensuring adequate computer capabilities for NRC staff. The NRC staff has undertaken a study of computer needs and capabilities to ensure interaction with the CNWRA. Although a limited number of HLWM employees now possess the necessary software and computer links to interact with the CNWRA, the HLWM program calls for all employees to have this capability. Upgrading of HLWM computer facilities is being addressed as part of a pilot program with other NRC staff offices.