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ACNW/ROGERS LTR

MEMORANDUM FOR: Commissioner Rogers

FROM: James M. Taylor
Executive Director
for Operations

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION STAFF CAPABILITIES IN PERFORMANCE ASSESSMENT FOR HIGH-LEVEL WASTE FACILITIES

Your memorandum of April 29, 1991, requested an Advisory Committee on Nuclear Waste (ACNW) review of the adequacy of the U.S. Nuclear Regulatory Commission (NRC) staff's and the Center for Nuclear Waste Regulatory Analyses' performance assessment and computer-modeling capabilities regarding a geologic repository for high-level radioactive waste. The ACNW provided its comments to you in a letter dated December 2, 1991. In the enclosure to this memorandum, the NRC staff presents its views and, particularly, its responses to the ACNW comments.

I appreciate the ACNW's generally favorable critique of our program, and I have found the ACNW's recommendations helpful.

Original Signed By:
James M. Taylor
James M. Taylor
Executive Director
for Operations

Enclosure:
Staff Response to 12/02/91
ACNW Letter

cc: Chairman Selin
Commissioner Curtiss
Commissioner Remick
Commissioner de Planque
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ENCLOSURE

STAFF RESPONSE TO DECEMBER 2, 1991, ADVISORY COMMITTEE
ON NUCLEAR WASTE (ACNW) LETTER

PERFORMANCE ASSESSMENT
General Observations

1. The ACNW endorses our plans to conduct selectively focused, rather than comprehensive, reviews of the performance assessments submitted by the U.S. Department of Energy (DOE) in support of a license application. As noted by the ACNW, we intend to support our relatively simple bounding performance analyses with in-depth analyses in key areas. We appreciate the ACNW's endorsement of our plans. We agree that such a review provides a product that can be understood and defended in the licensing process and is historically consistent with the U.S Nuclear Regulatory Commission's (NRC's) approach in other types of license reviews.

2. The ACNW notes that the NRC staff must make considerable use of the data, codes, and methodologies developed by DOE. We have spent, and will continue to spend, considerable resources to develop and maintain the expertise necessary to independently evaluate the quality and applicability of DOE's information and techniques.

3. The ACNW recommends that the Commission endorse and affirm the staff's approach to the use of performance assessment in support of licensing. When considering whether such endorsement and affirmation are warranted, the Commission may wish to consider the enclosed document, which gives a general overview of the Division of High-Level Waste Management's (HLWM's) performance assessment strategy. The staff plans to revise the enclosed strategy, in about a year, to incorporate "lessons learned" from the staff's current "Phase 2" iterative performance assessment (IPA) activities. The "audit-type" review approach outlined in this strategy is consistent with that previously described in HLWM's August 1991 white paper entitled "Development and Implementation of the Division of High-Level Waste Management Proactive Program," which was the subject of an August 28, 1991, briefing to the ACNW. Moreover, the staff has made the Commission aware of its audit-type review philosophy during the past several years through the Commission review of the Five-Year Plan and the budget. In the Five-Year Plan and the budget, for example, the staff has noted that it intends to perform detailed reviews on approximately 20 percent of DOE's Study Plans.

The ACNW also recommends additional funding for performance assessment staff and facilities. We agree with the ACNW that adequate resources are essential to ensure the continuation of a successful performance assessment program, in light of the need to continue development of staff capability, as well as to review increased DOE initiatives in this area. The need for additional staff and resources will be considered in future budget requests.

Specific Comments

1. The ACNW agrees with the need, previously identified by the staff, to develop a strategy specifying the goals of the NRC high-level waste (HLW) performance assessment program and the details of the staff's plans for accomplishing those goals. The enclosed strategy, which was previously reviewed by the ACNW, is a first step toward development of the recommended strategy. As just noted, the staff plans to revise and update the enclosed document after completion of the current "Phase 2" IPA activities, as the program transitions, from an emphasis on developmental activities, to implementation to support review of DOE activities, which will culminate with the license application review.

2. The ACNW notes staff difficulties in obtaining data and software developed by DOE and its contractors. The ACNW believes that formal generic arrangements should be developed that permit ready NRC staff access to DOE data and codes. The staff is completing negotiations, with DOE, to revise the NRC/DOE "Morgan-Davis Procedural Agreement," identifying the interface protocol between the two agencies during the site characterization phase. Revisions to this agreement (currently being agreed to by both staffs) will facilitate NRC's timely access to DOE data and analyses. The staff will seek additional revisions to this agreement, to address NRC access to software.

Also, the staff is mindful of the need for quality assurance (QA) in software and data as pointed out by the ACNW. For IPA "Phases 1 and 2," guidance for software and data QA was promulgated. For IPA "Phase 2," software and data QA have been enhanced by adoption and implementation of a configuration management and control system, at the Center for Nuclear Waste Regulatory Analyses (CNWRA), for all IPA-related work. Moreover, the NRC and CNWRA staff will evaluate the QA pedigree of any IPA codes or data acquired from DOE, as appropriate, and use these codes or data in a manner that is consistent with that pedigree.

3. The ACNW recommends, in its letter, that the NRC staff expand its interactions with appropriate groups, in foreign countries, so as to benefit from their efforts in developing codes for estimating the radiation doses that might result from radionuclide releases. Although the staff actively participates in a variety of HLW international activities, including meetings of the Performance Assessment Advisory Group of the Nuclear Energy Agency, specific participation in activities for establishing doses has been marginal, because of limited staff availability and resources. Given that the U.S. Environmental Protection Agency's HLW standards emphasize limits on releases of radionuclides to the environment rather than radiation dose limits, the staff continues to believe that development of a capability to project releases should have a higher priority than translation of those releases to radiation doses. Future resource needs will be evaluated for additional international interactions specifically focused on dose modeling.

4. The ACNW agrees with the staff's use of performance assessment as one of the ways to establish research priorities in the HLW repository program. Performance assessment will provide insights for this identification and prioritization. It can do this not only through uncertainty and sensitivity analyses, but also, more importantly, through the identification of gaps, in the knowledge, that affect the validity of the performance assessment models themselves.

The final report of the staff's current "Phase 2" performance assessment will document specific research needs. This information will be used to revise and prioritize Research Need Summaries, which communicate licensing office needs to NRC's Office of Nuclear Regulatory Research (RES). RES staff participation in the "Phase 2" work will also help to establish research priorities. RES will consider HLWM recommendations for HLW research based on IPA, its own insights gained from IPA, and other sources of technical information and programmatic considerations, in establishing research priorities. It should also be noted that RES is developing a research program plan for NRC's HLW repository program, in coordination with HLWM. Through this process, the two staffs will establish, and periodically revisit, a mutually agreed-on set of priorities regarding HLW research.

The ACNW also endorses the staff's plan to provide performance assessment training for all members of the staff in the HLW repository program. HLWM intends that all HLW staff will receive this training. Two week-long sessions have been offered through the Office of Personnel, and the staff is currently working with the Idaho National Engineering Laboratory (INEL) to continually improve this course. In addition, NRC staff participates in training related to specific performance assessment models and codes. The extent of training will be commensurate with each staff member's expected involvement in IPA activities.

5. The ACNW recommends that the staff use the ongoing "Phase 2" performance assessment activities as an opportunity to illustrate the mechanisms for formal use of expert judgment in a performance assessment. The staff agrees that such a demonstration would be useful. Since completion of "Phase 2" is planned in June, and incorporation of a formal elicitation process at this point would disrupt this analysis involving interdependent modules, we propose that "Phase 2" be completed as planned. After completion of "Phase 2," the staff then proposes a "Phase 2.5," in which formal elicitation methods will be used to produce expert judgments, for comparison with the "Phase 2" results. Completing "Phase 2" will provide a baseline for evaluating the advantages and disadvantages of the more formal elicitation methods recommended by the ACNW, and their consistency with the NRC licensing process.

6. The ACNW agrees with the staff's plans to develop a strategy for use of expert judgment in performance assessments and computer modeling, both in conducting NRC's analyses and in reviewing how DOE uses expert judgment in its assessments. The staff will study the feasibility of using formally elicited expert judgment in a licensing process, and will develop a strategy based on the following principles:

a. Formal elicitation of expert judgments must be carried out in a manner compatible with NRC's licensing procedures;

b. Judgment should be used to interpret data and analyses, but not as a substitute when data and/or analyses are reasonably available or obtainable; and

c. Expert judgment, even if formally elicited, is no better than the rationale on which it is based. If an expert (or group of experts) is unable to articulate a convincing basis to support a judgment, then that judgment may carry little weight in NRC's decision-making process.

COMPUTER MODELING CAPABILITIES

1. The ACNW notes that the computer hardware NRC staff currently uses is outdated and inadequate, and that there is inadequate electronic communication between NRC headquarters and the CNWRA, primarily because of a lack of equipment (e.g., hardware) at NRC headquarters. The staff agrees that hardware upgrades are needed and, as noted by the ACNW, has developed a plan for a pilot program to define these needs and to resolve any deficiencies. As part of the mid-year budget review, the availability of resources to support this plan will be determined. In the meantime, the CNWRA will initiate the first task in this plan, which is to update a 1990 NRC staff assessment of hardware and software functional needs in the area of HLW.

2. The ACNW believes that the NRC staff's capabilities for developing conceptual, mathematical, and computer models are good. The staff will endeavor to retain and expand on this strength, and will continue to encourage the CNWRA to expand its expertise in this area, also.

3. The ACNW endorses the staff's efforts to provide performance assessment training for itself and for the CNWRA. The staff will continue to pursue training opportunities, including those discussed in Item No. 4 above, both within and outside of NRC.

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ATTACHMENT

NRC POST-CLOSURE PERFORMANCE ASSESSMENT STRATEGY FOR A HIGH-LEVEL NUCLEAR WASTE REPOSITORY

In its broadest sense, any qualitative or quantitative estimation of the isolation capability (pre- and post-closure) of the high-level nuclear waste repository constitutes a performance assessment (PA). In this paper, however, performance assessment is restricted to mean only quantitative post-closure estimates of the repository's isolation capability. Furthermore, the quantitative estimates are restricted to those that are called for in relevant regulations, primarily 10 CFR Part 60 and 40 CFR Part 191.

The U.S. Department of Energy (DOE) is required, by regulation, to provide a comprehensive performance assessment in its license application. The law requires the U.S. Nuclear Regulatory Commission (NRC) to review the license application prior to granting, or denying, a construction authorization. As a part of the review process, the NRC will form its own estimates of the potential performance of the repository described in the license application. If it determines that it is necessary and appropriate to do so, the NRC may use independent calculations in forming these estimates. It should be understood that performance assessment is only one input, albeit important, into NRC's decision process as will be made clear in the much broader License Application Review Strategy (LARS) that is currently under development. It is also worth noting that at no time during the life cycle of the repository is the NRC expected to carry out its own site investigations or perform any engineering design. It will, however, provide guidance to the DOE on both site characterization and engineering design.

The general question considered in this paper is how should the NRC use performance assessments in implementing its proactive and reactive regulatory program? This breaks down to the following issues: (1) where in its review of DOE's license application should the NRC perform independent performance assessments, and (2) how should performance assessment be used in the overall program? In essence, what should be the NRC's performance assessment strategy, taking into account its mission and resource availability?

REGULATORY BASIS FOR PERFORMANCE ASSESSMENT

The Regulatory requirements for the geologic repository are codified in 40 CFR Part 191 (EPA) and 10 CFR Part 60 (NRC) - two complementary, but independent regulations. Part 191, the "generally applicable standards for protection of the general environment from off-site releases from radioactive material in repositories" (NWPA, Sec. 121) is concerned with the acceptable level of performance of the overall repository system. It specifies three broad quantitative performance objectives: (1) limiting the cumulative release at the accessible environment boundary over 10,000 years; (2) individual protection objectives for the first 1,000 years; and (3) requirements for protection of special sources of ground water for the first 1,000 years. (For purposes of this document, it is assumed that 40 CFR Part 191, though vacated by Court Order, will be repromulgated without material change.)

: PA STRATEGY 1/14/91

In contrast, Part 60, the "Disposal of High-Level Radioactive Wastes in Geologic Repositories" is more comprehensive in its scope. The generally applicable environmental standards of Part 191 are incorporated into Part 60 by reference. In addition, consistent with the mandate of the Nuclear Waste Policy Act as amended (NWPA), Part 60 makes it explicit that a repository include a system of multiple barriers. This concept of multiple barriers is enforced by establishing three minimum sub-system performance objectives, namely, the substantially complete containment performance objective for the waste package; the release rate performance objective for the engineered barriers; and the ground water travel time performance objective for the site. In addition to performance objectives, siting and design criteria (for waste package and engineered barriers) are also specified in Part 60. However, the subsystem performance objectives of 60.113(a) for the engineered barriers apply only with respect to the "anticipated processes and events." An additional flexibility with respect to the subsystem standards is included in 60.113(b). So long as the total system performance objective is met for anticipated processes and events, the NRC can approve or otherwise specify a radionuclide release rate, containment time, or groundwater travel time other than the nominal values stated in section 60.113(a).

With regard to judging compliance with these objectives (including the EPA Standard) and criteria, Part 60 states: "Proof of the future performance of engineered barrier systems and the geologic setting over time periods of many hundreds or many thousands of years is not to be had in the ordinary sense of the word. For such long-term objectives and criteria, what is required is reasonable assurance, making allowance for the time period, hazards, and uncertainties involved, that the outcome will be in conformance with those objectives and criteria."

In the Supplementary Information Statement, the Commission explained that the subsystem performance objectives of Part 60 are meant to provide confidence in meeting the overall system performance objective. Technical support is provided in NUREG-0804 Part C by evaluation of the extent to which compliance with the three subsystem performance objectives increases the likelihood of compliance with EPA's overall system performance criteria. Additional analyses of how the three subsystem performance objectives increase the likelihood of compliance with EPA's overall performance criteria are given in NUREG/CR-3111. This technical support was prepared prior to promulgation of Part 191. An early working draft of Part 191 was used to carry out the evaluation. EPA is currently in the process of reissuing Part 191, and changes from the earlier working draft and the remanded final version are uncertain. A performance assessment capability will allow the NRC not only to reevaluate the extent to which the subsystem performance objectives will provide additional confidence of compliance with the EPA's standards, but it also will identify refinements to the subsystem objectives that might be appropriate.

Because of the long period of regulatory concern (10,000 years set by EPA) and large spatial scales (tens of cubic kilometers), the future subsystem and total system performance of the repository are expected to be projected by way of mathematical models. Direct performance testing of either the total system or its subsystems over such scales is not possible. The DOE has the

responsibility to develop, validate, and implement, to the degree appropriate, these models and to provide a complete description of the performance assessments in its license application. The NRC, on the other hand, has the responsibility of assuring that the licensed repository will adequately protect public health and safety. In performing its regulatory function, the approach to be taken will be one of reviewing DOE's entire performance assessment at a broad level of detail and doing more detailed reviews in the most significant areas. The NRC must, therefore, decide which selected parts should include independent verification through independent performance assessments. The NRC will adopt the strategy described below in applying performance assessments in its high-level waste work.

NEED FOR THE NRC'S PERFORMANCE ASSESSMENTS

Many relatively complex technical issues of a multi-disciplinary nature are involved in assessing the future performance of the geologic repository. To meet the NRC mission of protecting public health and safety, the NRC staff must, during the licensing process, take positions on the potential performance of the repository as it relates to the performance objectives. In addition, the NRC will comment on and provide guidance to the DOE on the completeness and adequacy of the site characterization program and engineering design, as well as on the DOE's plans to construct, operate and close the repository. Thus, the NRC has a definite role to play throughout the life cycle of the repository.

It is conceivable that the NRC staff can form an opinion about the performance of the repository without independent calculations. However, due to the complexity of the system and in the absence of accumulated historical experience, such an opinion will not be sufficiently well founded to support licensing decisions. Therefore, the NRC should conduct its own performance assessments. The NRC must devise a plan based on this strategy to select critical portions of DOE's license application for intensive review by independent performance assessments. This strategy should also help the NRC in meeting its obligations to provide guidance to the DOE during site characterization, construction, operation and closure. This strategy will be implemented by all of the NRC organizations involved in performance assessment aspects of the High Level Waste Program and their contractors.

STRATEGY FOR PERFORMANCE ASSESSMENT

The key features of NRC's performance assessment strategy are derived from a few basic considerations: The complex and interdisciplinary nature of PA; its potential use in both the reactive and proactive programs; a top-down approach to guide resource utilization by identifying components important to repository performance; the integration of technical work performed on how the subsystems work; and keeping the NRC staff knowledgeable in PA methodology. These features are discussed below.

General Program

Assessing performance of a geologic repository requires execution of a number of steps. These include conceptualizing the system in terms of its

identifiable components, the formulation of mathematical models representing all important processes, the translation of the mathematical models into computer programs, the verification and to the extent possible validation of the models, the analyzing of field and laboratory data to extract model parameter values, the executing of computer programs, performing sensitivity and uncertainty analyses, and, finally, analyzing results to draw conclusions.

While all parts of the performance assessments presented by DOE will be reviewed at some level, critical parts will be selected for in-depth review (see License Application Review Strategy for definitions of various review levels). In reviewing DOE's performance assessments, the NRC staff will not need to duplicate the work done by the DOE. The DOE will perform these calculations under an auditable QA program. As part of its reactive HLW licensing program, the NRC will conduct audits as needed. The NRC staff will perform, at least at a rudimentary level, a calculation to check all of the DOE estimates of performance. In addition, the NRC staff will use independent calculations to evaluate the significance of key assumptions regarding conceptual models, process models, and parameter values included in DOE's performance assessments. This evaluation will draw heavily from the proactive work described below. Other applications of PA in the review of DOE's program will include determination of the adequacy of performance allocations and other facets of the DOE's site characterization program. Particular attention will be given to evaluating DOE's evolving iterative performance assessment program. Auxiliary analyses done as part of independent performance assessments will also provide a technical foundation for evaluating alternatives with respect to conceptual models, process models, parameter values, and sensitivity analyses presented by DOE, and to identify those that may not be considered adequately in the DOE's work. Such work will provide technical credibility to recommendations that the NRC will make to the DOE for its investigations. The NRC HLW research program will generate scientific information to support staff positions on whether alternatives have been adequately explored by the DOE.

Special attention will be paid to uncertainties involving the assumptions that form the basis of models, future states of nature, and estimation of parameter values that are fed into performance assessment computer programs. Again, one may assume that the DOE's raw data will be collected under an approved QA program. The interpretation of these data leading to model parameter values not only will be spot checked, but the NRC itself will interpret selected data sets for critical parameters. It is in the interpretation of these data that alternate hypotheses or inferences may be identified that were not adequately considered by the DOE. Special attention may be directed to issues identified by external reviewers as well as those identified by the NRC staff.

The primary aim of the NRC's proactive performance assessment program will be to evaluate its regulations, develop sound technical guidance, train and keep its staff current, and develop appropriate technical review procedures. The NRC will use the DOE developed computer codes, if available, provided that these codes have enough flexibility to also allow NRC evaluation of DOE

assumptions about conditions that may have public health and safety implications and the sensitivity of DOE's conclusion to these assumptions. Otherwise, the NRC will develop its own codes or modify existing codes to suit its purpose. The proactive program will be also supported through NRC's HLW research program (see draft NUREG-1406). Performance assessment issues that are related directly to NRC's regulatory function of technical review will be addressed through NRC's HLW research program. Such issues will include (1) understanding processes that affect HLW repository performance, (2) understanding coupling among processes that affect HLW repository performance, (3) techniques for probability estimation, (4) assessing reliability of long-term mathematical predictions and (5) numerical methods (if needed).

Because performance assessment of nuclear waste repositories is a relatively new field and because it is interdisciplinary in nature, very few formal educational opportunities exist to train staff in this aspect. While the NRC has developed a course on performance assessment, learning through experience, by conducting limited performance assessments, is the best and most efficient method for training of the NRC and contractor staffs. Insights gained by NRC staff will allow development of meaningful regulatory guidance and review procedures. Together with the NRC's Systematic Regulatory Analysis (SRA) program, performance assessment modeling also will help in evaluating current regulations regarding their interrelationships, completeness, and sufficiency in providing assurance that public health and safety will be protected.

Integration of Subsystems

NRC's regulations require that the total repository system should include engineered and natural barriers. These regulations also require that each of several barriers attain a certain performance objective. Therefore, these subsystem performance objectives have an important role in assuring that the multiple barrier concept is maintained and thereby provide additional confidence that public health and safety goals are met. In view of this, the DOE is expected to develop a repository system that will be comprised of engineered and natural barriers. Due to potential complex interactions between these barriers under future environmental states, the net impact of individual barriers on the total system performance is not known a priori. Therefore, it is natural and necessary to account for all of these barriers in conducting performance assessments of the total system.

It has recently been suggested that there is a need to reevaluate the relationship between the subsystem performance requirements of 10 CFR Part 60 and the EPA HLW Standard. As discussed previously the staff will do this reevaluation in connection with repromulgation of the EPA standards. This reevaluation will examine the extent to which meeting subsystem requirements of 10 CFR 60.113 relates to compliance with the EPA standards. The data and analyses needed for compliance determination with requirements of Section 60.113 will also be examined.

The relative contribution of each barrier in meeting the total system performance objective can be determined only after an assessment of total system performance is conducted. Therefore, from the performance assessment

view, there is no natural hierarchy to subsystems, that is, all subsystems will be considered during performance assessments of the total system. Depending on their relative technical importance, which will be determined during initial iterations, eventually and for certain purposes (e.g., sensitivity analyses) some subsystems may be treated in more detail than others.

Irrespective of the relative importance of any barrier in meeting the EPA standard for the total system performance, subsystem performance assessments will be conducted to judge whether the subsystem performance objectives of Part 60 are met. As stated before, the subsystems do not perform independently of each other; that is, the performance of the engineered barriers is determined by the site conditions and vice versa. Also, due to large time and space scales inherent in the subsystem performance objectives, like the total system, the subsystem performance assessments will also require mathematical modeling. In view of the above, it is possible that the assessments of the subsystems can become a part of the total system performance assessments. However, it is also possible to investigate the performance of these subsystems in greater detail by isolating them within properly selected boundaries. Initially, both options will be followed by the NRC staff. However, eventually the subsystem performance assessment efforts and the total system performance efforts will be thoroughly integrated. This will be done by implementing an "interdisciplinary team approach" in conducting the performance assessments. The members of the various teams will be drawn from various NRC branches involved with the HLW program's offices and subcontractors. Suitable management controls will be designed and implemented for the success of the team approach.

Timing and Iterative Nature of Assessments

There are two different approaches to decide upon the right time to carry out a performance assessment. In the first approach, one waits until the computational tools are fully developed and the collection of site-specific data is complete before attempting a performance assessment. In the second approach, iterative performance assessments are carried forward with the help of available data at a given time with computational tools available at that time. From a regulatory perspective, the second approach should receive the higher priority by the NRC staff. This approach should apply to both the subsystem and the total system performance assessments.

Performance assessment of geologic repositories, including engineering barriers, is inherently iterative in nature. Because different conceptual models must be explored, the effect of various simplifications must be assessed, and uneven and sparse data must be dealt with. The selection of iterative performance assessments as the primary NRC staff approach is based on the fact that NRC has responsibility to make a series of judgments during site characterization and the license review, for which performance assessment is needed. Additionally, in making these judgments, it is axiomatic that complete scientific understanding of processes, fully validated computational tools, and complete and unambiguous site-specific data are objects to be strived for, but are unable to be achieved. Therefore, NRC recognizes that judgments will be made under conditions of substantial uncertainty and that it is necessary to learn to use less than perfect computational tools and incomplete data sets.

There are several other reasons why the iterative performance assessment approach will be followed. Iterations will be invaluable in pointing out the shortcomings in existing models and data, and will also indicate topics in need of further investigations or research. Incremental improvements in understanding of processes, computational tools, and data will be strived for in each iteration. It is also imperative that the iterative performance assessments perform a technical integration function by being truly interdisciplinary. Thus, the concepts developed for the engineered subsystem and the natural subsystem must be brought together in each iteration of the performance assessment.

Top-Down Approach to Resource Allocation

Iterative performance assessment will provide an important input to deciding priorities on work in both NMSS and Research in order to best use limited resources. This input will be in the form of problems identified during iterative performance assessments that need a solution. In addition to identification of problems, iterative performance assessment, especially sensitivity and uncertainty analyses, will show which unresolved problems contribute most to uncertainties in performance. Obviously, priorities indicated by PA should be considered in conjunction with needs identified by other means.

Training of Staff

Iterative performance assessments combined with participation in international performance assessment programs such as INTRAVAL will keep the NRC staff current on pertinent methodologies. This is an essential step in providing assurance that the staff will have at its disposal the needed skills to review critically DOE's performance assessments at the time of license application review. Of equal importance, it will provide the staff with needed tools for developing regulatory guidance and additional reactive work, such as review of prelicense submittals including site characterization data and interactions with the DOE, State, and other affected parties.

PROGRAMMATIC PRIORITIES

Highest priority in the near term will be given to developing staff and contractor technical capabilities in the conduct of performance assessments. Progress has already been made as indicated by the recently released staff report entitled, "Phase I Demonstration of the Nuclear Regulatory Commission's Capability to Conduct a Performance Assessment for a HLW Repository" (April, 1990). The second phase of this effort has been initiated and is intended primarily to combine the knowledge of specialized technical disciplines (engineering and earth sciences) with those of the system modelers to produce integrated performance assessments. Special attention will be directed toward improvements in methodology for scenario identification and screening, retardation phenomena, mechanistic treatment of radionuclide release and near-field coupled effects, disruptive consequences, and alternative sensitivity and uncertainty analysis methods. Of equal importance in this

effort is a planned evaluation of the effects of the NRC subsystem requirements on EPA Standard compliance.

Skills acquired in the Phase-I development exercise and the planned second phase will have immediate applicability to the other two principal areas of performance assessment work: support to the DOE program review and the development of regulatory guidance for use by the staff and DOE. The staff Phase I effort has already had substantial influence in dealings with DOE in its site characterization activities and led to the staff's first formal technical exchange with DOE on performance assessment (November 27-29, 1990). Immediate benefits also accrue to the regulatory guidance efforts under the Systematic Regulatory Analysis (SRA) program, which is investigating technical uncertainties related to model validation, scenario identification, data uncertainty, and use of expert judgment. Depending on SRA program results, rulemaking may also be warranted.

In the future iterations, high priority will be given to integration of the subsystem performance assessment work with the total system performance assessment. In the present organizational structure, important work on the subsystems, including compliance determination with respect to the siting and design criteria of 10 CFR Part 60, is being funded separately. Irrespective of the funding mechanisms, a plan to implement a team approach for integration of work with respect to each one of the subsystem performance assessments will be developed. To be successful, each team must be comprised of experts from different disciplines interested in a particular subsystem and the total system. The compositions of the teams, the responsibilities of the team leader, relation of the teams to line management, and funding of the work of the teams will be the subject of the "NRC Performance Assessment Implementation Plan."

UPDATING OF STRATEGY

The NRC performance assessment strategy will be reviewed periodically (once a year) and updated based on possible program redirection. This applies especially to the updating of programmatic priorities stated in the last section. The proportion of reactive and proactive performance assessment work may also change from year to year depending upon the extent and nature of DOE's pre-license submittals.