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NUCLEAR REGULATION

Regulatory and Cultural Changes Challenge NRC

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Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to discuss the Nuclear Regulatory Commission's (NRC) move from its regulatory approach which was largely developed without the benefit of quantitative estimates of risk, to an approach—termed risk-informed regulation—that considers relative risk in conjunction with engineering analyses and operating experience.[1] Our testimony addresses (1) the views of NRC staff (based on our survey that was reported to you in January) on the quality of the work NRC performs,[2] NRC's management of and the staff's involvement in changes occurring in the agency, and the move to a risk-informed regulatory approach; and (2) the status of NRC's efforts to develop a comprehensive strategy to implement a risk-informed regulatory approach.

In addition, you asked us to provide information based on past reports on the disagreement between NRC and the Environmental Protection Agency (EPA) on radiation standards.[3] EPA is responsible for setting radiation limits outside the boundaries of nuclear facilities and for establishing residual radiation standards for the amount of radioactivity that can safely remain at a nuclear power plant site and still not pose a threat to public health and safety and the environment. In addition, the Energy Policy Act of 1992 directed EPA to develop environmental protection standards for the Department of Energy's (DOE) proposed high-level nuclear waste repository at Yucca Mountain, Nevada.

In summary, we found the following:

- Although our survey results showed that the vast majority of NRC staff feel their work contributes to protecting public health and safety, their views on NRC's efforts to change its regulatory approach were less favorable. For example, less than one-quarter of the staff believe that senior management is receptive to suggestions for change made by the staff. While almost half of the staff who responded to the survey said that the change to risk-informed regulation has had a positive effect on nuclear safety, only about one-fourth believe that NRC staff have "bought in to" the process. Relatedly, many staff expressed concern

[1] NRC differentiates between "risk-informed" and "risk-based" regulation, noting that the latter approach relies solely on the numerical results of risk assessments. NRC does not endorse a risk-based approach.
[2] To obtain a diversity of views, we surveyed 1,581 NRC staff; 1,076, or 68 percent, responded. See: Nuclear Regulation: NRC Staff Have Not Fully Accepted Planned Changes (GAO/RCED-00-29, Jan. 19, 2000).

about a central element of risk-informed regulation—the new risk-informed process for assessing the performance of nuclear power plants. Sixty percent of the staff who responded to questions about this oversight process believe that it will reduce the margins of safety at nuclear power plants. Our findings are similar to the results of an NRC survey, which found that 70 percent of its staff who expressed an opinion do not believe that the new oversight process will allow for the identification of declining safety performance. Based on the results of the NRC survey and input from stakeholders, NRC has made some changes to the new oversight process in anticipation of its implementation in April 2000.

- NRC staff expect to provide the Commission with a draft comprehensive strategy, which NRC is calling an Implementation Plan, for moving to a risk-informed regulatory approach in March 2000. NRC will then seek public comments on the plan, and it may then take another year to put it in place. The outline of the draft implementation plan that was provided to the Commission in January 2000 touched on the elements we recommended be included in a strategy for moving to a risk-informed regulatory approach in our March 1999 report.

- Disagreement between NRC and EPA over appropriate standards for regulating radiation levels at nuclear facilities could impact the costs to decommission nuclear power plants (dismantle them and dispose of their wastes) and develop a proposed repository for the plants' high-level waste at Yucca Mountain, Nevada. Although EPA has authority to establish a standard for residual radiation at nuclear power plants that have been decommissioned, it has not done so. Utilities are using a standard developed by NRC that EPA believes is not restrictive enough. Utilities are concerned that they may ultimately have to use a more restrictive EPA standard, which would increase their decommissioning costs. EPA has proposed a radiation standard to protect public health and safety at the proposed nuclear waste repository, as it was required to do in 1992. However, NRC, the Nuclear Energy Institute (NEI), a board of the National Academy of Sciences, and others have raised concerns.[4] The Academy, for example, stated that the proposed standard may have a

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[3] Nuclear Regulation: Better Oversight Needed to Ensure Accumulation of Funds to Decommission Nuclear Power Plants (GAO/RCED-99-75, May 3, 1999) and Nuclear Health and Safety: Consensus on Acceptable Radiation Risk to the Public Is Lacking (GAO/RCED-94-190, Sept. 19, 1994).

[4] NEI includes members from all utilities licensed to operate commercial nuclear plants in the United States, as well as nuclear plant designers, major architectural/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry. NEI establishes unified policy for the nuclear industry on such matters as generic operational and technical issues.

negligible impact on the protection of the public and could complicate the licensing of the facility.

Background

NRC has been incorporating risk into the regulatory process for many years and, in August 1995, it issued a policy statement that advocated certain changes in the development and implementation of its regulations for commercial nuclear plants through a risk-informed approach. Under such an approach, NRC and the utilities would give more emphasis to those structures, systems, and components deemed more significant to safety. To respond to past criticisms about the lack of a consistent, objective, and transparent method to assess the overall performance of nuclear power plants, in January 1999, NRC proposed a new risk-informed oversight process. Within the new oversight process, NRC developed a new inspection program, developed performance indicators, and established clearly defined, objective thresholds for making decisions about a plant's performance. NRC tested the new oversight process at 13 plants between May and November 1999 and expects to implement it industrywide in April 2000.

NRC has also been examining various approaches to consider risk for other regulatory activities. This includes overseeing facilities that produce fuel for nuclear power plants; entities that use nuclear materials in medical, academic, and industrial applications (materials licensees); and DOE's proposed high-level nuclear waste repository in Yucca Mountain, Nevada.

Staff Say They Are Committed to Safety but Are Concerned About Their Limited Involvement in Changes at the Agency

Although our survey showed that the vast majority of NRC staff feel their work contributes to protecting public health and safety, their views on NRC's efforts to change its regulatory approach were less favorable. In particular, the staff had concerns about management and their involvement in change, the move to risk-informed regulation, and the new nuclear power plant oversight process.

Staff Are Concerned About Management of and Their Involvement in Change

Our survey results suggest that senior management may not be providing the leadership necessary to facilitate change and that staff believe they have not been involved in many of

NRC's recent initiatives.[5] As might be expected, the survey results for some questions showed statistically significant differences between the views of management and staff with management's views being significantly more positive.[6] For example, 46 percent of the NRC managers who responded agree or strongly agree that senior management is receptive to suggestions for change, compared with 23 percent of the staff who agree or strongly agree. Similarly, 34 percent of the NRC managers agree or strongly agree that senior management solicits ideas and opinions from staff before making changes that affect their work, compared with 17 percent of the staff.

The results of our survey are consistent with those of a survey conducted in the latter part of 1998 by NRC's Office of Inspector General on the agency's safety culture and climate. The Inspector General noted that the issue of management trust was of particular concern to NRC staff. The results of the Inspector General's survey showed that NRC staff did not believe that higher management levels trusted their judgment and that 53 percent of the staff did not believe that the management style at NRC encourages them to give their best. More recently, the Inspector General reported that the large number of staff who work within the offices of the Chairman and the Commissioners can be viewed as a lack of reliance on and trust of the agency's staff by senior management.[7] In addition, in October 1999, Arthur Andersen and Company reported that leaders across NRC work more as a group of individuals than as a team.

NRC Staff Have Mixed Views on Risk-Informed Regulation

Our survey results also showed that staff had mixed views about NRC's move to risk-informed regulation. Although 48 percent believe that risk-informed regulation has had a positive effect on nuclear safety, about 20 percent believe it has had a mostly negative effect. In addition, only 27 percent of the staff agree or strongly agree that the new risk-informed approach has been accepted by NRC staff. NRC managers said that these data are not surprising. They said that staff will be skeptical about moving to a risk-informed approach until they see how the approach is implemented.

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[5]For the purpose of the survey, senior management referred to managers at the Deputy Office Director/Deputy Regional Administrator level and above, including the Chairman, Commissioners, and Executive Council, and mid-level management refers to section chiefs, team leaders, assistant branch chiefs, branch chiefs, and deputy and division directors.

[6]The percentage of management agreeing with the statement is significantly different from the percentage of staff at $p < 05$. This means that 95 times out of 100, a difference this large would not occur by chance.

NRC Staff Are Skeptical About the New Oversight Process

Of the NRC staff who answered questions about a central aspect of risk-informed regulation--the development and implementation of the process for overseeing safety at nuclear power plants--[8] our survey results show that

- 75 percent agree or strongly agree that utilities and industry groups had too much input/influence in developing the process,
- 60 percent agree or strongly agree that the process will reduce safety margins, and
- 86 percent agree or strongly agree that as time passes, subjectivity will creep into the process.

According to NRC managers, the agency has recognized these potential problems, has monitored them during the pilot project at 13 plants, and will consider them as it develops the final oversight process. NRC also said that the survey results reflect the staff's knowledge and views at a particular point in time; but as the new process continues to develop and more staff receive training, the agency expects an increase in the staff's level of knowledge and confidence about the new oversight process.

We agree with NRC that our survey results reflect the staff's knowledge and views at a particular point in time. More recently, however, NRC surveyed 94 regional office staff, including inspectors and others who participated in the new oversight process pilot project, which ended in November 1999. NRC found that less than half agree or strongly agree that the new oversight process provides adequate assurance that plants are being operated safely and about half agree or strongly agree that the new inspection program will appropriately identify risk-significant issues. NRC also found that

- 36 percent agree or strongly agree that the new process provides sufficient regulatory attention to licensees with performance problems,
- 31 percent agree or strongly agree that the new inspection report format adequately communicates relevant information to the licensee and public, and
- 19 percent agree or strongly agree that the new process allows for the identification of declining performance before safety margins are significantly reduced.

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[7] Special Evaluation of the Role and Structure of the NRC's Commission (OIG/99E-09, Dec. 23, 1999).
[8] About 33 percent of the NRC staff who responded to the survey neither agreed nor disagreed, did not know or had no basis to judge, or provided no answer to the questions.

In addition to the issues NRC identified through the pilot project, NEI, utility and state officials, and representatives of public interest groups identified 27 issues they believed should be resolved before NRC implements the new process in April 2000. The issues, identified during a recent workshop on the oversight process, included the need for guidance for NRC staff and the industry on the enforcement actions that NRC would take when utilities report inaccurate plant performance data and inspection issues that cut across all aspects of plant operations (like human performance). The need for performance indicators for the security of nuclear power plants were also identified. The workshop participants identified another 22 issues that NRC should resolve during or after the first year of implementing the new process.

Despite these unresolved issues, NRC staff, NEI officials, and other stakeholders, such as the Union of Concerned Scientists, believe that the new oversight process provides a more objective and clear approach that is fundamentally more sound and will produce better overall results than NRC's prior process to assess overall plant performance. However, during the pilot project at 13 plants, NRC found that about 99 percent—or nearly all—of the performance indicators were acceptable and only three inspection findings were not. Two members of NRC's Advisory Committee on Reactor Safeguards, reacting to this information, believe that the performance indicators are not sensitive enough to identify degrading plant performance.[9] In addition, 70 percent of the NRC staff who provided opinions to an agency survey indicated that the new process will not allow for the identification of declining safety performance. When taken together, the question arises: How good is a process that tells NRC, the utility, and the public that overall plant performance is acceptable but cannot tell NRC when performance starts to decline? This overall question was raised by some members of the Advisory Committee on Reactor Safeguards at a recent meeting with NRC staff. In responding to the Advisory Committee, NRC staff said that the oversight process is not "set in stone" and will continue to evolve during its initial implementation. NRC staff expect to evaluate the process by June 2001 and provide the Commission with recommendations to improve it.

NRC Is Developing a Strategy to Implement a Risk-Informed Regulatory Approach

[9]The Advisory Committee on Reactor Safeguards is a statutory committee established to advise the Commission on safety aspects of proposed and existing nuclear facilities, as well as to perform other duties as the Commission may request.

NRC agreed with the recommendation in our March 1999 report on risk-informed regulation that it should develop a comprehensive strategy to implement a risk-informed regulatory approach. The staff expect to have a draft strategy for the Commission's consideration by March 10, 2000. However, NRC will not finalize the strategy until it obtains and addresses public comments on it, which could take another year. NRC staff did provide the Commission with a memorandum on January 13, 2000, describing their proposal for the development of a comprehensive risk-informed strategy. The outline mentions many of the issues that we raised in previous reports and testimony—it discusses the need for goals, objectives, performance measures, timelines, and training for staff. NRC staff and other stakeholders, including NEI and the Union of Concerned Scientists, will meet with the Commission at the end of this month to provide their views on the draft strategy.

NRC and EPA Disagree on Radiation Standards

NRC and EPA disagree on the level of residual radiation that can safely remain at a nuclear power plant site after utilities complete their decommissioning. EPA has authority for establishing radiation standards for all aspects of decommissioning, including acceptable levels of residual radiation. To date, EPA has not issued such standards. In the absence of EPA's standards, in 1997, NRC issued standards that utilities must meet to decommission nuclear plant sites and terminate their NRC licenses.

We previously reported that EPA does not agree with NRC's residual radiation standard.[10] NRC's standard sets a dose limit of no more than 25 millirem per year from all sources, including groundwater.[11] To put this standard in perspective, the average level of natural background radiation in the United States is about 300 millirem per year. In fact, the disagreement between the two agencies has been characterized by both its length and its acrimony. EPA started to develop residual radiation standards in 1984 but has not yet finalized them. Nevertheless, EPA's position is that NRC's licensees should be required to decontaminate nuclear plant sites to a level of 15 millirems of residual radioactivity per year and to clean up groundwater to the same limit as drinking water standards. EPA's Administrator has stated that the agency may apply the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 to sites that

[10]Nuclear Regulation: Better Oversight Needed to Ensure Accumulation of Funds to Decommission Nuclear Power Plants (GAO/RCED-99-75, May 3, 1999).
[11]Rem is a unit of measurement of the effect of radiation doses to human beings. A millirem is one thousandth of a rem.

have been or are being decommissioned if NRC and EPA do not reach an agreement on the applicable standards.

Currently, NRC's licensees are using NRC's regulations and related guidance to plan for or to decommission their nuclear power plants and related facilities. However, if NRC's licensees are ultimately required to comply with the stricter EPA standards, they may have to perform additional cleanup activities and incur additional costs. Neither NRC staff nor EPA officials could estimate the amount of additional cost, but both said it could be very high. To ensure that NRC's licensees do not face dual regulation, in 1999, the House Appropriations Committee strongly encouraged EPA and NRC to adopt a memorandum of understanding, which is being developed, to clarify EPA's involvement at NRC sites and to report to the Committees on Appropriations by May 2000 on their progress. Although the nuclear industry was encouraged by the directive to resolve the stalemate through a memorandum of understanding, NEI has said that the industry is uncertain given EPA's history whether the memorandum will be completed and/or resolve the problem. NEI also stated that the Congress may need to intervene to resolve the conflict between the two agencies.

NRC and EPA also disagree on the radiation standards that would apply to DOE's high-level waste repository at Yucca Mountain, Nevada. The Nuclear Waste Policy Act of 1982 made NRC responsible for licensing the construction and operation of DOE's repository for high-level radioactive waste on the basis of general environmental standards to be issued by EPA. The Nuclear Waste Policy Amendments Act of 1987 directed DOE to investigate a site at Yucca Mountain, Nevada; and the Energy Policy Act of 1992 directed EPA to develop a specific health standard for the Yucca Mountain site. In August 1999, EPA issued a proposed rule in the Federal Register on the environmental radiation protection standards for Yucca Mountain. In the standards, EPA proposes that DOE not only limit exposure to an individual from radioactive material to 15 millirems per year from all sources but also protect groundwater to drinking water standards. In commenting on EPA's proposal, NRC noted that EPA has not demonstrated a need for a separate groundwater limit or that the 15 millirems limit was necessary to protect public health and safety and the environment.

NRC is not alone in its objection to EPA's proposed requirement for a separate groundwater standard—NEI, the National Academy of Sciences, and others have also raised concerns. For example, NEI noted that far from enhancing public health and safety, a separate EPA

groundwater standard could result in a repository design that is actually less protective of public health and safety. NEI noted that meeting a separate groundwater standard would require smaller waste containers in more tunnels, spread over a larger area which would require more ventilation systems. NEI said that a larger, more open repository would release more naturally occurring radon during excavation and the repository's operations, thereby increasing the total radiation dose. Likewise, the National Academy of Sciences' Board of Radioactive Waste Management commented that the separate groundwater standard appears to duplicate the protection provided by the 15-millirem-per-year standard. The Academy also said that a separate groundwater limit may greatly complicate the licensing process and have a negligible impact on the protection of the public. It further noted that the Academy does not believe that a scientific basis exists for establishing a separate limit.

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Mr. Chairman and Members of the Subcommittee, this concludes our statement. We would be pleased to respond to any questions you may have.

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