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NUCLEAR REGULATION

Challenges Confronting NRC in a Changing Regulatory Environment

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Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to discuss the challenges that the Nuclear Regulatory Commission (NRC) faces as it moves from its traditional regulatory approach, which was largely developed without the benefit of quantitative estimates of risk, to a risk-informed, performance-based approach. Under this approach, NRC will use risk assessment findings, engineering analysis, and performance history to focus attention on the most important safety-related activities, establish objective criteria to evaluate performance, develop measures to assess licensee performance, and focus on results as the primary basis for making regulatory decisions.

NRC is responsible for ensuring that those who use radioactive material—in generating electricity, for experiments in universities, and for such medical uses as treating cancer—do so in a manner that protects the public, the environment, and workers. NRC has issued licenses to 103 operating commercial nuclear power plants and 10 facilities that produce fuel for these plants. In addition, NRC, or the 32 states that have agreements with NRC, regulate almost 21,000 entities that use nuclear materials (nuclear material licensees).[1] In the medical field alone, licensees annually perform an estimated 10 to 12 million diagnostic and therapeutic procedures involving radioactive material.

Our testimony discusses the challenges that NRC faces to (1) implement a risk-informed regulatory approach for commercial nuclear power plants, (2) overcome the inherent difficulties in applying a risk-informed regulatory approach to nuclear material licensees, (3) ensure that the public is confident that safety will be maintained under NRC's risk-informed approach, and (4) hire and retain staff. NRC is aware of the complexities involved and the long-term nature of these types of challenges and has initiated a number of activities to address them. Its performance in addressing them will significantly shape its ability to ensure that commercial nuclear power plants and other licensees operate safely and ultimately that workers, the public, and the environment are adequately protected.

[1]Currently, NRC has agreements with 32 states that they, rather than NRC, regulate such entities as universities and hospitals that handle nuclear material.

In summary, we found the following:

- NRC's implementation of a risk-informed approach for commercial nuclear power plants is a complex, multiyear undertaking that requires basic changes to the regulations and processes it uses to ensure the safe operation of these plants. NRC faces a number of challenges to develop and implement this new approach. For example, just developing a "roadmap" to guide the agency through this complex process is a challenge. We recommended such a "roadmap" in March 1999. We suggested that a clearly defined strategy that would describe the regulatory activities NRC planned to change to a risk-informed approach, the actions needed to accomplish this transformation, and the schedule and resources needed to make these changes would help guide the regulatory transformation. While NRC developed the Risk-Informed Regulation Implementation Plan to address our recommendation, we believe the plan could be more comprehensive to cover such areas as activities that cut across the agency, resources, performance measures, or how various activities are interrelated.
- NRC needs to overcome a number of inherent difficulties as it seeks to apply a risk-informed regulatory approach to nuclear material licensees. Of most importance, the sheer number of licensees—almost 21,000—and the diversity of activities they conduct—converting uranium, transporting radioactive material, and using radioactive material for industrial, medical, or academic purposes—increase the complexity of developing a risk-informed regulatory approach for material licensees. In addition, NRC will be challenged to define its role as an increasing number of states assume responsibility for regulating nuclear material users within their borders. The decisions that NRC ultimately makes on these fronts could have budgetary and other implications for the agency.
- Another challenge for NRC will be to demonstrate that it is meeting one of its performance goals under the Government Performance and Results Act—increasing public confidence in NRC as an effective regulator. This is because NRC has not defined the "public" that it is targeting and does not have a baseline by which to measure the "increase". To address this performance goal, NRC instituted an 18-month pilot effort to use feedback forms at the conclusion of public meetings. The feedback forms will provide information on the extent that the public was aware of the meeting and the clarity, completeness, and thoroughness of the information that NRC provided at the meetings. It is not clear, however, how NRC will use this type of information to demonstrate that public confidence in NRC as a regulator has increased.
- Like other federal agencies, NRC faces challenges in human capital management, such as replacing a large percentage of its technical staff and

senior managers who are eligible to retire. The loss of its staff is compounded by the tight labor market for experienced professionals, the workload projected by the industry to extend the operating licenses of existing plants and transfer the ownership of others, and the declining university enrollment in nuclear engineering studies and other fields related to nuclear safety. NRC has developed a 5-year plan to identify and maintain the core competencies it needs and has identified legislative options, such as allowing the rehire of retired staff without jeopardizing their pension payments, to help resolve its aging staff issue. To assess how existing human capital approaches support an agency's mission, goals, and other organizational needs, we developed a human capital framework, which identified a number of elements and underlying values that are common to high-performing organizations.[2] NRC's 5-year plan generally includes the human capital elements that we suggested.

NRC Faces Challenges to Implement a Risk-Informed Regulatory Approach for Commercial Nuclear Power Plants

NRC's implementation of a risk-informed, performance-based regulatory approach for commercial nuclear power plants is complex and will require many years to fully implement. It requires basic changes to the regulations and NRC's processes to ensure the safe operation of these plants. NRC faces a number of challenges to develop and to implement this process. For example, because of the complexity of this change, the agency needs a strategy to guide its development and implementation. We recommended such a strategy in March 1999. We suggested that a clearly defined strategy would help guide the regulatory transformation if it described the regulatory activities NRC planned to change to a risk-informed approach, the actions needed to accomplish this transformation, and the schedule and resources needed to make these changes.[3] NRC initially agreed that it needed a comprehensive strategy, but it has not developed one. As one NRC Commissioner said in March 2000, "we really are . . . inventing this as we go along [and] given how much things are changing, it's very hard to plan even 4 months from now, let alone years from now." NRC did develop the Risk-Informed Regulation Implementation Plan, which includes guidelines to identify, set priorities for, and implement risk-informed changes to regulatory processes. The plan also identifies specific tasks and projected milestones.

[2] *Human Capital: A Self-Assessment Checklist for Agency Leaders* (GAO/OCG-00-14G, Sept. 2000).

[3] *Nuclear Regulation: Strategy Needed to Regulate Safety Using Information on Risk* (GAO/RCED-99-95, Mar. 19, 1999).

The Risk-Informed Regulation Implementation Plan is not as comprehensive as it needs to be, because it does not identify performance measures, the items that are critical to achieving its objectives, activities that cut across its major offices, resources, or the relationships among the more than 40 separate activities (25 of which pertain to nuclear plants). For example, risk-informing NRC's regulations will be a formidable task because they are interrelated. Amending one regulation can potentially affect other regulations governing other aspects of nuclear plant operations. NRC found this to be the case when it identified over 20 regulations that would need to be made consistent as it developed a risk-informed approach for one regulation. NRC expects that its efforts to change its regulations applicable to nuclear power plants to focus more on relative risk will take 5 to 8 years.

NRC has compounded the complexity of moving to a new regulatory approach by deciding that compliance with such an approach will be voluntary. As a result, NRC will be regulating with two different systems—one for those utilities that choose to comply with a risk-informed approach and another for those that choose to stay with the existing regulatory approach. It is not clear how this dual system will be implemented.

One part of the new risk-informed approach that has been implemented is a new safety oversight process for nuclear power plants. It was implemented in April 2000; and since then, NRC's challenge has been to demonstrate that the new approach meets its goal of maintaining the same level of safety as the old approach, while being more predictable and consistent. The nuclear industry, states, public interest groups, and NRC staff have raised questions about various aspects of the process. For example, the industry has expressed concern about some of the performance indicators selected. Some NRC staff are concerned that that the process does not track all inspections issues and NRC will not have the information available, should the public later demand accountability from the agency. Furthermore, it is very difficult under the new process to assess those activities that cut across all aspects of plant operations—problem identification and resolution, human performance, and safety conscious work environment. In June 2001, NRC staff expect to report to the Commission on the first year of implementation of the new process and recommend changes, where warranted.

NRC Needs to Overcome Inherent Difficulties to Apply a Risk-Informed Approach to Nuclear Material Licensees

NRC is facing a number of difficulties inherent in applying a risk-informed regulatory approach for nuclear material licensees. The sheer number of licensees—almost 21,000—and the diversity of the activities they conduct—converting uranium, decommissioning nuclear plants, transporting radioactive materials, and using radioactive material for industrial, medical, or academic purposes—increase the complexity of developing a risk-informed approach that would adequately cover all types of licensees. For example, the diversity of licensees results in varying levels of analytical sophistication; different experience in using risk-informed methods, such as risk assessments and other methods; and uneven knowledge about the analytical methods that would be useful to them. Because material licensees will be using different risk-informed methods, NRC has grouped them by the type of material used and the regulatory requirements for that material. For example, licensees that manufacture casks to store spent reactor fuel could be required to use formal analytical methods, such as a risk assessment. Other licensees, such as those that use nuclear material in industrial and medical applications, would not be expected to conduct risk assessments. In these cases, NRC staff said that they would use other methods to determine those aspects of the licensees' operations that have significant risk, using an approach that considers the hazards (type, form, and quantity of material) and the barriers or physical and administrative controls that prevent or reduce exposure to these hazards.

Another challenge associated with applying a risk-informed approach to material licensees is how NRC will implement a new risk-informed safety and safeguards oversight process for fuel cycle facilities. Unlike commercial nuclear power plants, which have a number of design similarities, most of the 10 facilities that prepare fuel for nuclear reactors perform separate and unique functions. For example, one facility converts uranium to a gas for use in the enrichment process, two facilities enrich or increase the amount of uranium-235 in the gas, and five facilities fabricate the uranium into fuel for commercial nuclear power plants. These facilities possess large quantities of materials that are potentially hazardous (i.e., explosive, radioactive, toxic, and/or combustible) to workers. The facilities' diverse activities makes it particularly challenging for NRC to design a "one size fits all" safety oversight process and to develop indicators and thresholds of performance. In its recently proposed new risk-informed safety oversight process for material licensees, NRC has yet to resolve such issues as the structure of the problem identification, resolution, and corrective action program; the mechanics of the risk-significance determination process; and the regulatory responses that NRC would take when changes in performance occur. NRC had planned to pilot

test the new fuel cycle facility safety oversight process in fiscal year 2001, but staff told us that this schedule could slip.

NRC also faces challenges in redefining its role in a changing regulatory environment. As the number of agreement states increases beyond the existing 32, NRC must continue to ensure the adequacy and consistency of the states' programs as well as its own effectiveness and efficiency in overseeing licensees that are not regulated by the agreement states. NRC has been working with the Conference of Radiation Control Program Directors (primarily state officials) and the Organization of Agreement States to address these challenges. However, NRC has yet to address the following questions: (1) Would NRC continue to need staff in all four of its regional offices as the number of agreement states increases? (2) What are the appropriate number, type, and skills for headquarters staff? and (3) What should NRC's role be in the future? Later this month, a NRC/state working group expects to provide the Commission with its recommended options for the materials program of the future. NRC wants to be in a position to plan for needed changes because in 2003, it anticipates that 35 states will have agreements with NRC and that the states will oversee more than 85 percent of all material licensees.

NRC Faces Challenges in Demonstrating Increased Levels of Public Confidence—One of Its Goals Under the Government Performance and Results Act

Another challenge NRC faces is to demonstrate that it is meeting one of its performance goals under the Government Performance and Results Act—increasing public confidence in NRC as an effective regulator. [4] There are three reasons why this will be difficult. First, to ensure its independence, NRC cannot promote nuclear power, and it must walk a fine line when communicating with the public. Second, NRC has not defined the "public" that it wants to target in achieving this goal. Third, NRC has not established a baseline to measure the "increase" in its performance goal. In March 2000, the Commission rejected a staff proposal to conduct a survey to establish a baseline. Instead, in October 2000, NRC began an 18-month pilot effort to use feedback forms at the conclusion of public meetings. Twice a year, NRC expects to evaluate the information received on the forms to enhance its public outreach efforts. The feedback forms that NRC currently plans to use will provide information on the extent to which the public was aware of the meeting and the clarity, completeness, and

[4] NRC's four performance goals are to maintain safety, increase public confidence, reduce unnecessary regulatory burden, and enhance the effectiveness and efficiency of its activities and decisions.

thoroughness of the information provided by NRC at the meetings. Over time, the information from the forms may show that the public better understands the issues of concern or interest for a particular plant. It is not clear, however, how this information will show that public confidence in NRC as a regulator has increased. This performance measure is particularly important to bolster public confidence as the industry decides whether to submit a license application for one or more new nuclear power plants. The public has a long history with the traditional regulatory approach and may not fully understand the reasons for implementing a risk-informed approach and the relationship of that approach to maintaining plant safety.

NRC Faces Human Capital Difficulties

In a highly technical and complex industry, NRC is facing the loss of a significant percentage of its senior managers and technical staff. For example, in fiscal year 2001, about 16 percent of NRC staff are eligible to retire, and by the end of fiscal year 2005, about 33 percent will be eligible. The problem is more acute at the individual office level. For example, within the Office of Nuclear Reactor Regulation, about 42 percent of the technical staff and 77 percent of senior executive service staff are eligible for retirement.[5] During this period of potentially very high attrition, NRC will need to rely on that staff to address the nuclear industry's increasing demands to extend the operating licenses of existing plants and transfer the ownership of others. Likewise, in the Office of Nuclear Regulatory Research, 49 percent of the staff are eligible to retire at the same time that the nuclear industry is considering building new plants. Since that Office plays a key role in reviewing any new plants, if that Office looses some of its highly-skilled, well-recognized research specialists to retirement, NRC will be challenged to make decisions about new plants in a timely way, particularly if the plant is an untested design.

In its fiscal year 2000 performance plan, NRC identified the need to maintain core competencies and staff as an issue that could affect its ability to achieve its performance goals. NRC noted that maintaining the correct balance of knowledge, skills, and abilities is critical to accomplishing its mission and is affected by various factors. These factors include the tight labor market for experienced professionals, the workload as projected by the nuclear industry to transfer and extend the licenses of

[5]The Office of Nuclear Reactor Regulation is responsible for ensuring that commercial nuclear power plants operate safely and do not endanger the public or the environment.

existing plants, and the declining university enrollment in nuclear engineering studies and other fields related to nuclear safety. In October 2000, NRC's Chairman requested the staff to develop a plan to assess the scientific, engineering, and technical core competencies that NRC needs and propose specific strategies to ensure that the agency maintains that competency. The Chairman noted that maintaining technical competency may be the biggest challenge confronting NRC.

In January 2001, NRC staff provided a suggested action plan for maintaining core competencies to the Commission. The staff proposed to begin the 5-year effort in February 2001 at an estimated cost of $2.4 million, including the costs to purchase software that will be used to identify the knowledge and skills needed by NRC. To assess how existing human capital approaches support an agency's mission, goals, and other organizational needs, we developed a human capital framework, which identified a number of elements and underlying values that are common to high-performing organizations. NRC's 5-year plan appears to generally include the human capital elements that we suggested. In this regard, NRC has taken the initiative and identified options to attract new employees with critical skills, developed training programs to meets its changing needs, and identified legislative options to help resolve its aging staff issue. The options include allowing NRC to rehire retired staff without jeopardizing their pension payments and to provide salaries comparable to those paid in the private sector. In addition, for nuclear reactor and nuclear material safety, NRC expects to implement an intern program in fiscal year 2002 to attract and retain individuals with scientific, engineering, and other technical competencies. It has established a tuition assistance program, relocation bonuses, and other inducements to encourage qualified individuals not only to accept but also to continue their employment with the agency. NRC staff say that the agency is doing the best that it can with the tools available to hire and retain staff. Continued oversight of NRC's multiyear effort is needed to ensure that it is being properly implemented and is effective in achieving its goals.

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

Contacts and Acknowledgements

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