



# NRC NEWS

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## **Excellence in Nuclear Safety in Today's Regulatory Environment**

### **A Status Report and a Look Toward the Future at the NRC**

**Remarks by Chairman Richard A. Meserve  
U.S. Nuclear Regulatory Commission**

**at the Institute for Nuclear Power Operations Conference  
Atlanta, GA, November 2, 2000**

Some of you may recall that I spoke briefly with you at last year's conference. At the time, I had been the Chairman for less than one week and that meeting was my first opportunity to interact with many of you. I would like to spend a moment reflecting on the events of the past year.

As all of you are aware, this year has been a period of remarkable change. We are today in a period of transition in several dimensions, probably experiencing more rapid change than in any other period in the history of civilian nuclear power, certainly since Three Mile Island. As economic deregulation of electric utilities proceeds, we are seeing significant restructuring among our licensees and the start of the consolidation of nuclear generating capacity among a smaller group of operating companies. This has no doubt brought significant alterations to the lives of many of you here today.

Even more striking than industry consolidation is the changing attitude, principally in the business world, toward nuclear power. Only a short time ago, pundits claimed that the deregulation of electricity prices would result in the premature shutdown of many nuclear plants. Now, in striking contrast, attention is focused on reactor license renewal. In fact, we now expect that as much as 85 percent of the current fleet will be the subject of applications for license renewal. If these are successful, nuclear energy will contribute to our Nation's energy security well into this century. In the last few months, there has even been the first stirring of interest in the possibility of new construction in the U.S. In short, in the period of a single year, we have seen a remarkable change in the attitude toward and future prospects for nuclear power in the United States.

The credit for this change must go to an industry that has achieved remarkable gains in both economic and safety performance over the past decade and thus could seize the opportunity presented by electricity price deregulation. I hope nonetheless that the NRC has helped to set the stage by its efforts to establish a regulatory system that is technically sound, that is fair, that is predictable, and that reaches decisions with reasonable dispatch.

As I reflect on my first year on the Commission, I have several impressions that I would like to share with you. First, I am very impressed by the dedication of the industry -- and our other stakeholders -- not only to ensuring safety, but also to helping to improve the NRC's ability to achieve its mission efficiently and effectively. You and other stakeholders have dedicated time, energy, and resources in a most productive and helpful way in pursuit of our common goal of assuring public health and safety. My colleagues on the Commission and I appreciate your efforts.

Second, I am very impressed by the skills, professionalism and commitment of the NRC staff. It is clear to me that the staff is an under-appreciated national resource. Strong efforts to maintain and enhance its competence are warranted. Our capacity to provide a regulatory system that serves both our licensees and the public interest is dependent on the skills and dedication of our staff.

Third, I am very impressed by my colleagues on the Commission. I find that all of my fellow Commissioners are hard-working and knowledgeable. They explore the issues in a conscientious effort to ensure that our decisions are sound. Moreover, I believe that we are working well together and respect each other's views. I am sure that this synergy results in Commission decisions that are better than those that any one of us could have reached alone. I am thus particularly pleased that two of my colleagues, Nils Diaz and Jeffrey Merrifield, are also attending this conference.

Nonetheless, I believe that all of us -- the nuclear industry, the staff, the Commission -- will be severely challenged in the years ahead. Today, I will try to characterize the current environment, indicating along the way the status of our progress in important areas of interest, and to frame several issues that I believe are critical for the maintenance of the NRC's capacities to work with you to assure nuclear safety into the future.

## **The Current Landscape**

Let me start by surveying some of the current landscape.

### License Transfers

One of the more immediate results of the economic deregulation of the electric power industry has been the development of a market for nuclear power plants as capital assets themselves. As a result, the Commission has seen a significant increase in the number of requests for approval of license transfers. These requests increased from an historical average of about two or three per year, to an average of 15 in calendar year 1998 and 1999. So far this year, the staff has reviewed and approved six applications involving a total of 16 reactors.

The NRC is working hard to review license transfer applications efficiently. These reviews sometimes require a significant expenditure of talent and energy by our staff to insure a high quality and timely result. So far, I believe that our record is very good. For example, in CY 2000, we have reviewed and approved transfers in periods ranging from four to eight months, depending on the

complexity of the applications. The Commission will strive to continue to perform at this level of proficiency even in the face of the anticipated increased demand.

### License Renewals

Another result of the new economic conditions is an increasing interest in plant life extension beyond the original 40-year term. That term, which was established in the Atomic Energy Act, did not reflect a limitation that was determined by engineering or scientific considerations, but rather was based on financial and anti-trust concerns. We now have experience on which to base judgments about the potential useful life and safe operation of facilities and have been turning to the question of extensions beyond the original 40-year term.

The focus of our review of applications is on maintaining plant safety, with the primary concern directed at the effects of aging on important systems, structures, and components. Applicants must demonstrate that they have identified and can manage the effects of aging so as to maintain an acceptable level of safety during the period of extended operation.

We have now renewed the licenses of two plants, Calvert Cliffs and Oconee, comprising a total of 5 units.<sup>1</sup> The reviews of these licenses were completed ahead of schedule, which is testament to the care exercised by licensees in the preparation of the applications and the dedication of staff. Applications from three additional plants -- Hatch, ANO-1, and Turkey Point -- are currently under review. And, as I indicated earlier, we anticipate many more applications for renewal in the coming years.

Although we have met our projected schedules for the first reviews, we would like the renewal process to become as effective and efficient as possible. The extent to which we are able to sustain or improve on our performance depends on the rate at which applications are actually received, the quality of the applications, and our ability to staff the review effort. We recognize the importance of license renewal and are committed to provide high-priority attention to this effort. As you know, we encourage licensees to notify us well in advance of their intentions to seek renewals and to establish a queue for applications so as not to create unmanageable demands on staff resources.

### Risk-Informed Regulation and Oversight

We also are in a period of dynamic change on the safety regulatory front as we move from a prescriptive, deterministic approach to a risk-informed and performance-based paradigm. This initiative is extraordinarily ambitious, because it involves both rethinking the entire regulatory structure and changing attitudes. Nonetheless, we need to make this change to take advantage of what we have learned over the past 40 years, employing that knowledge both to focus on concerns that are truly significant for safety and to reduce needless regulatory burdens. I am pleased to acknowledge the support and active participation of our stakeholders in this effort.

Perhaps the most visible aspect of our efforts to risk-inform our regulatory system is our new reactor oversight process. The process was initiated on a pilot basis last year and fully implemented this past April. The new process was developed to focus our inspection effort on those areas involving greater risk to the plant and thus to workers and the public, while simultaneously providing a more objective and transparent process. Although we continue to work with our stakeholders to assess the effectiveness of the revised oversight process, the feedback we are receiving from the industry and the public is quite favorable.

Nonetheless, the Commission is committed to continued improvement of the overall process. An example of this work is the effort to improve Performance Indicators (PIs). The NRC staff and an industry group are working on revising two PIs that deal with scrams so as to ensure that concern about PIs does not cause operators to hesitate to take necessary actions. Similarly, we will review the PI addressing unplanned power changes to reduce the potential for unintended consequences. Finally the review process has uncovered inconsistencies in the ways in which the “unavailability” of safety systems is assessed in the Maintenance Rule, the Performance Indicator, and the counterpart WANO indicator. We are working with an industry group organized by NEI to address these problems.

I am encouraged by the success of the oversight effort, and believe that we have implemented a program that is appropriately focused to support our overall performance objectives. However, we have established a review panel, including both NRC staff and external stakeholders, to evaluate the initial implementation. We see the oversight program as a work-in-progress, and I fully expect that it will continue to change and evolve as our experience increases.

Other efforts to improve the substance of our regulations using risk insights are also underway. We have proceeded thus far along two tracks that eventually will converge. The first track involves a focus on selected activities for which the opportunities are clear. For example, consideration of risk is used to modify the allowed outage times in technical specifications for safety-related equipment. Similar approaches are used in other areas, such as quality assurance and in-service inspection and testing. We also have extended this approach to modifications of existing regulations. For example, the rule governing plant changes and testing, 10 CFR 50.59, was modified to provide for greater flexibility when the risk consequences are minimal. The Maintenance Rule, 10 CFR 50.65, also was modified to require assessment of the risk associated with maintenance activities.

The second track involves a more comprehensive and systematic examination of the body of reactor regulations in 10 CFR Part 50. For example, we have launched an examination of special treatment requirements. With the insights provided by probabilistic risk assessments, we now realize that some equipment that has been categorized as safety-related, and thus subjected to special restrictions, in fact can be shown to have limited contribution to risk. Conversely, other equipment that was not previously categorized as safety-related is now understood to have safety significance. We are engaged in an extensive process to rethink the regulatory requirements that bear on these categories of equipment. The other major effort includes the examination of the technical requirements in 10 CFR Part 50. The pilot rule for this effort is 10 CFR 50.44, standards for combustible gas control systems. The next rule to be included in this effort is 10 CFR 50.46, which delineates the acceptance criteria for Emergency Core Cooling Systems. This latter rulemaking presents a considerable challenge since conceptually it would allow fundamental changes to the design basis and safety analysis for light-water reactors. Other risk-informed initiatives are underway in the areas of fire protection and reactor pressure vessel integrity.

It is completely clear that we have taken only the first steps in our efforts to risk-inform our regulatory system. In a series of studies conducted in 1993, the National Academy of Engineering found that it took the Environmental Protection Agency an average of 15 years to modify its standards after scientific consensus had been reached on a better understanding of the underlying risks. I intend for the NRC to do better. Nonetheless, we have a long and difficult road ahead of us for which we will require informed input from the industry and other stakeholders.

Security and Safeguards

An area of continuing importance is the security and safeguards of nuclear facilities and materials. Physical protection against the threat of radiological sabotage or theft of nuclear material is a fundamental obligation of all licensees. To understand the significance of maintaining a robust security program, we need only consider the ramifications, both locally and worldwide, that would result from the success of a saboteur who directs his efforts toward a nuclear facility.

I am aware that the NRC's policy on security matters has not been transparent and that we have not been consistent in our requirements. Although the design-basis threat defined in our regulations has been fairly stable over time, in the past the adversary characteristics that define the details were revealed to licensees only in the context of a drill using mock adversaries -- an Operational Safeguards Response Evaluation (OSRE). We now recognize that the adversary characteristics utilized during OSREs have varied over time and from site to site. In short, we have not had a disciplined process to define the adversary characteristics and we have not clearly and consistently communicated our expectations.

The program for conducting OSREs has been improved. For example, the staff has developed and shared with the industry the specific list of characteristics of adversaries that form the basis for these exercises. Based on early feedback, we believe that we have taken an important first step in both clarifying our expectations and improving communications in this area. To improve the process further, NRC staff has been working diligently with its stakeholders to enable the agency's endorsement of an acceptable Safeguards Performance Assessment Program, which could eventually replace the OSRE program.

The dynamic nature of potential threats means, however, that ensuring nuclear plant security and safeguards requires continuing examination. As a result, the Commission is assessing our fundamental policies in the area of security requirements. For example, the Commission is working with the staff in developing a process for the systematic evaluation of the design basis threat and the adversary characteristics to which our licensees are expected to respond. I expect that the Commission will devote considerable effort in this area in the future.

## Funding

I could discuss many other current activities, but I hope that this brief tour of some of the highlights has given you a sense of a Commission that is working hard and effectively to address important issues. Before leaving this survey of our current activities, however, I want to say a few words about funding.

I know that our licensees have a legitimate and direct interest in our expenditures because, except for certain activities supported from the Nuclear Waste fund, the NRC is a fee-based agency. I understand, appreciate, and accept the general principle that caused Congress to adopt this approach -- namely, that licensees, who directly benefit from our work, should pay for it. However, I also agree with the corollary -- namely, that licensees should not be required to pay for activities that do not directly benefit them. As a result, my colleagues and I have been working to modify budgetary policy regarding the NRC's status as a fee-based agency. Our goal is to ensure that an appropriate portion of the agency's budget is funded from general revenues rather than fees. The FY01 Energy and Water Development Appropriations Act, recently signed by the President, provides for phasing in general revenue funding, eventually to reach 10 percent of the total NRC budget. I know that the industry has strongly supported federal funding of at least some of NRC's budget and I appreciate that, through our mutual efforts, we have been able to achieve this important goal.

## Looking to the Future

Let me now shift gears. The topics I have just been addressing represent, I believe, various arenas in which the NRC and industry are both working hard and are on the right track. There is much still to do, but the goals are clear and achieving them is within NRC's authority and ability. Our stakeholders are vitally interested in progress in these areas and, as a general rule, support our efforts.

I want to turn now to several issues for which the path is somewhat less clear. My purpose today is to frame the issues in the hope that we can start a dialog that will lead to consensus on the nature of the problems and on the avenues most likely to lead to progress toward solutions.

### Maintaining NRC's Core Competence

First, let me address the need to ensure NRC's core technical competence. I believe that it is in both the public interest and the regulated industries' interest that the NRC is able to reach sound technical judgments in an efficient manner. To be able to respond to changing environments – not just in the nuclear power industry, but in other civilian uses of radioactive materials, such as in nuclear medicine – the NRC has to be both knowledgeable and agile.

Most of your operations are subject to NRC regulations and, in turn, depend on our ability to write technically sound, risk-informed rules; to make sound licensing decisions without undue delay; and to conduct fair, meaningful oversight. The efficiency and effectiveness of the implementation of our regulations, of our licensing reviews, and of our oversight and inspections are a direct reflection of the core technical capabilities of our staff. Moreover, the Commission relies on the sound, independent technical judgment of the NRC staff. As our experience with risk-informing our regulatory processes shows, the ability of the agency to address new and emerging issues depends on a staff that can understand, analyze, and use scientific and technical information at the cutting edge.

Finally, the staff's reputation for technical competence is a crucial element in building public confidence and trust. In order to establish this confidence, we must be -- and must be perceived to be -- scientifically and technically knowledgeable and able. This fact is reinforced when I consider the varying degrees of public trust that are afforded federal regulatory agencies concerned with public health and safety -- such as the EPA, the Food and Drug Administration, or the Consumer Product Safety Commission. Each agency strives to have clear principles, fair processes, and strategies for open communications. What distinguishes one from another on the scale of public trust, I believe, is each agency's scientific and technical reputation. I am therefore convinced that for NRC to continue to be effective and efficient into the future, we must ensure the agency's core competence.

Why am I concerned? Two demographic trends raise questions about our future. One trend reflects the aging of the NRC staff. The ratio of NRC employees who are over 60 years of age to those under 30 is 6:1. The same ratio at NASA, for comparison, is 2:1. Moreover, seventeen percent of NRC's engineers are already eligible for retirement and another four percent of the current workforce of engineers will become eligible for retirement each year for the next few years. Twenty-five percent of the employees in the Office of Nuclear Regulatory Research and twenty percent of the employees in the Office of Nuclear Reactor Regulation are eligible for retirement today.

Despite our efforts to hire new engineers, we have experienced a net loss of engineers over the past five years. That loss is equivalent to roughly eight percent of our engineering workforce. The bottom line is that we are losing expertise and, along with it, valuable institutional knowledge.

The demographics of our workforce are the result of several intersecting factors. First, we have experienced declining real budgets over a number of years (until the slight upturn in FY2001). We have lost technically skilled personnel not only because of reductions in Full Time Equivalents (FTEs) in the budget process, but also because budgetary retrenchment adversely affects morale. And the government is increasingly challenged in recruiting the best and brightest.

The second trend, not unrelated to the first, is in the supply of new graduates from nuclear engineering programs. Student interest in nuclear engineering declined sharply during the 1990s. In fact, by the late 1990s undergraduate enrollments in nuclear engineering programs were only about 40 percent of the average for the second half of the 1980s. Similarly, undergraduate degrees in the field were only two-thirds the average number for that reference period.<sup>2</sup> Another recent study indicated that the current annual average supply of nuclear engineers with B.S. and M.S. degrees is about 160 new graduates, whereas the annual demand for new engineers is estimated to be at least 300 and possibly as high as 600.<sup>3</sup>

The combination of these long-term trends raises a red flag: how will NRC be able to maintain its core technical competence into the future? We need to plan for turnover and retirements, as any employer would, but we also need to judge carefully what expertise we must have among our employees. I recently asked our Executive Director for Operations (EDO) to begin the process of developing such a plan. I am raising this issue with you because the current situation deserves careful attention and you should be aware of it.

### Research in the NRC

My second concern relates to the support of research at the NRC. This subject is important because such research is both central to our regulatory functions and vital for maintaining core technical competence.

In the parlance of science policy, there are at least two kinds of research. One is described as curiosity-driven, inquiry-based fundamental research. Its objective is to advance scientific or technical understanding without specific applications in mind. The National Science Foundation, for example, funds this kind of research.

The other type of research is need-driven, problem-solving research. It has specific applications in mind. This work is intended to be very practical -- in industry it might be called applied research and development. Government supports such research for a number of reasons. For example, for years the government has funded research on both coal and nuclear technologies to promote the development of those industries in the national interest because individual firms do not have the financial resources for that purpose.

The NRC undertakes the second type of research. Such need-driven work is undertaken to support the independent evaluations of safety that we must provide. Better understanding of – and reduced uncertainties about – risk and safety margins are prerequisite to both enhancing safety and reducing unwarranted conservatism in our regulations. I believe that some of our licensees may not

recognize the benefits that our past research effort has provided. Let me give a few examples that reflect the fruits from our past efforts:

- the revised source term, which has the potential for substantial cost savings for licensees;
- license renewal, for which the results of the NRC's nuclear plant aging research program have proven indispensable;
- new guidelines on burnup credit in spent fuel storage, which can reduce the number of casks needed for storage or transportation;
- and, of course, risk-informed regulation, with its promise for both improving safety and reducing unnecessary burden, which owes its existence to AEC- and NRC-sponsored research in probabilistic risk assessment.

Similarly, our current research efforts will provide the foundation for many other on-going initiatives, including:

- revisions to the pressurized thermal shock rule;
- review of advanced digital instrumentation and control systems;
- utilization of fuel to higher burnups;
- and advanced, best-estimate thermal-hydraulic analysis codes, which provide the technical bases for evaluation of power uprates, longer operating cycles, advanced fuel designs, and other similar industry activities.

Given these accomplishments and our continuing efforts, you may well ask why I have mentioned concern about the research program. My concern arises from the fact that our research program has been subject to a steady decline in funding and scope for nearly two decades. The NRC's funding of research activities declined from nearly \$200 million in 1981 to roughly \$43 million today - without any adjustment for the corrosive effects of inflation. The striking magnitude of the change - and the commensurate impact that the reductions have had on the relevant staff - raises the question as to whether we are adequately supporting the research that will enable the Commission to respond to future regulatory needs.

Recently our Office of Nuclear Regulatory Research organized a panel of experts from our stakeholder communities to provide it with insights about the role, direction and scope of research in NRC. I have read the draft report of the first phase of this activity and found many thoughtful and helpful comments in it. We will also benefit later this year with a report from the Advisory Committee on Reactor Safeguards on this subject. Guided by these reviews, it is my aim, with the help of my fellow Commissioners, to ensure that we have a research program that is sufficient to our needs and that is appropriate in scope.

In this connection, let me hasten to add that we are conscious of the need to be cost-efficient in all of our programs, including the research program. We recognize that we must explore further means to collaborate with industry, with DOE, and with our international partners in a way that conserves resources, but does not compromise our independence. I would like to strengthen these collaborations not only because more research can be conducted through cooperation, but also because we need these interactions to ensure that we benefit from other perspectives in assessing priorities.

It is our aim to ensure that our research effort is adequate to the challenges that confront us and that we are allocating the right resources, undertaking the right work, and employing the right research



performers. In short, we want to ensure that our research program is technically sound, is efficient, and is agile. My colleagues on the Commission and I welcome your suggestions and advice.

### New Reactors

Let me turn to another area in which developments over the past months have raised an emerging challenge for the agency. I started this talk with a reference to reports that new reactors may be constructed in the United States in the not too distant future. The NRC must watch these developments so that our processes do not serve as a needless impediment.

The NRC has certified three standardized plant designs and has recently begun a review of Westinghouse AP1000 design for possible certification. Moreover, we have been following DOE's work on new reactor approaches so that we can develop familiarity with potential advanced reactor concepts that may be of commercial interest. Nonetheless, there are many challenges for the NRC if the early discussions of construction result in real projects. It has been many years since our staff has had regulatory responsibility for a reactor construction project and old skills will have to be revitalized. Moreover, our current reactor regulations may not translate well to the licensing of new reactor designs, particularly if the new designs are not water-cooled. Our efforts to risk-inform our regulations may be somewhat helpful in the certification or licensing of new designs, but in some cases, the best approach may well be to start with a clean sheet of paper.

My colleagues and I are following developments in this area with great interest because, if construction is to commence, we will have to prepare for it.

### International

One other challenge that I must mention is a continuing one, and one that is not directly subject to NRC control. The hard reality is that, like it or not, our Nation's nuclear program is interconnected with and dependent on nuclear activities elsewhere. The incident last year at Tokaimura reminds us that a nuclear-related event anywhere in the world will cause heightened concern about nuclear enterprises everywhere. A serious accident might dissolve the emerging optimism about nuclear power that is developing in the U.S.

This vulnerability reinforces the need for NRC to continue to work with our counterparts abroad to advance nuclear safety throughout the world. We benefit not merely because domestic nuclear enterprises are linked in the public consciousness with activities elsewhere, but also because we all gain from sharing experiences and insights with our colleagues in other countries. In helping others, we help ourselves.

My fellow Commissioners and I have sought through our international interactions to advance the cause of global nuclear safety. Indeed, my colleague Greta Dicus is not here today because she is representing the Commission at the Pacific Basin Conference in South Korea. I can offer no easy solutions to the risk that affects our licensees as a result of events that may occur abroad. But the Commission is seeking to do what it can to address safety through cooperation with our regulatory counterparts around the globe. I urge our licensees to use their international contacts to pursue the same goal.

### Public Confidence

Let me turn to a final issue that must be an abiding concern for us all. Perhaps the key issue for the future of the nuclear industry is the establishment and maintenance of public confidence that nuclear energy is acceptably safe. You, through your actions, obviously must play the central role: you have to demonstrate excellence in nuclear safety in every hour of every day.

I recognize, however, that the NRC also has important obligations to seek to maintain public confidence as well. We must be, and be seen, as a rigorous, independent, and capable regulator. In this connection, I have previously mentioned the need to maintain the core competence of the staff. Moreover, in order to maintain public confidence, we must provide open processes so that the public has the opportunity to raise concerns and to observe that those concerns have been weighed and fairly evaluated. We cannot hope that everyone will agree with our decisions, but we can aspire to show that no legitimate concern has been ignored.

The significance that the Commission places on its obligations in this regard is reflected in the fact that we have identified public confidence as one of our four performance goals in our strategic planning. We have sought wide participation in our meetings, encouraged the staff's efforts to hold public meetings in affected communities, and sought to harness the Internet, including even web-casting our meetings, as a vehicle for providing the public with the opportunity to observe and participate in our processes.

I mention public confidence as a future challenge because continuing efforts are required. The renewed interest in nuclear energy that is now emerging will not be sustained without public confidence. A continuing willingness to engage the public, and the search for new means to facilitate that engagement, will be a continuing task for us all.

### **Conclusion**

Let me now conclude by returning to where I started. We are in a period of remarkable change and challenge and I hope that my talk has revealed some of the many dimensions by which we all are affected. I believe we are at a moment of great opportunity.

It is human nature to seek to resist change and organizational settings only exacerbate that tendency. But those of us here in this room have the responsibility to embrace change, to manage change, and to prepare for the future. We should seek to encourage the attitude among our colleagues and the public that change offers opportunities for improvement.

That means that we -- all of us -- must accept the responsibility not only of maintaining our institutional capacities to meet current needs, but also of building the capabilities to meet the changing needs of a dynamic environment. My colleagues and I on the Nuclear Regulatory Commission take this responsibility very seriously. The NRC not only must be effective and efficient as a regulator, but also must respond to the changes in the communities that it regulates. We recognize this obligation and are committed to meeting it.

Thank you again for the opportunity to share my views with you. I will be happy to take questions and comments.

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1. The review of the Calvert Cliffs application for renewal took 23 months; that for Oconee, 22 months.

2. Friedberg, J.P. (1999). Nuclear engineering in transition: a vision for the 21<sup>st</sup> century. In Nuclear News, June, p.50.

3. Was, G.S., T. Quinn, and D. Miller (1999) Manpower Supply and Demand in the Nuclear Industry. Presented at the American Nuclear Society 1999 Winter Meeting. Long Beach, CA.