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"CHALLENGES AND OPPORTUNITIES IN NUCLEAR ENERGY"

BY

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TO

THE 11TH ANNUAL UTILITY WOMEN'S CONFERENCE
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I. INTRODUCTION

Good morning everyone, and thank you for your warm welcome. I am delighted to address this 11th Annual Utility Women's Conference. Although I had been one of the Directors for this Conference, I am speaking to you today in my capacity as Chairman of the U.S. Nuclear Regulatory Commission. I have, of course, been at the NRC for a little more than five months and Chairman for three. Nevertheless, I am confident that I bring to the task of regulating the U.S. nuclear industry an outlook and an approach that are substantially enhanced by my past affiliations including this one. As many of you already know, I was a member of the board of directors of Public Service Enterprise Group, which is owner or part owner of five nuclear plants, and licensed to operate three of them. I've seen how nuclear operations fit into the overall scheme of an energy company, how economic and state regulatory issues impact utilities, and how all of these issues flow together and intersect with NRC regulations. I also chaired the Nuclear Oversight Committee for Public Service Electric and Gas (PSE&G) Company (subsidiary of Public Service Enterprise Group), and was the liaison to the board on issues with those plants of PSE&G. In this capacity, I got to see nuclear operations within the broader context of a shareholder-owned company and how decisionmaking in one area affects other areas. I believe my prior experience has given me a somewhat different and a broader perspective on trends and events in the nuclear industry than is usually the case for a regulator, a perspective that has made it strikingly clear that the external and internal environment within which the NRC conducts its activities is rapidly changing. A little

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technical, a little policy and how they flow together. Aging, decommissioning, waste storage and disposal, are among the more important, if familiar, issues, while electric power industry restructuring is a totally new issue that could pose significant regulatory challenges. Interestingly, while each of the changing circumstances has its own significance, taken together, the changes pose as great a challenge as the industry and the NRC has had to confront at any time since 1979, the year of the accident at Three Mile Island. In light of the strong impact of these changing circumstances, it seems inevitable that the NRC will have to change as well if we are to carry out our regulatory responsibilities effectively. As a result, I have initiated activities at the NRC to prepare for change.

All of this fits very well with the theme of this Conference, "21st Century Utilities: Innovation, Challenge and Opportunities." As some of you may have heard me say before, I view challenges as opportunities rather than problems. I would prefer to address challenges comprehensively, and in advance, rather than to react piece-meal as they occur. I will tell you more about my efforts to prepare NRC for the future a little later, but, for the moment I want to give you my impressions of the nuclear energy industry and the challenges that lie ahead. An industry which supplies greater than 20 percent of net electrical generation in the U.S. and in many states a larger percentage. I will address what I believe to be the most significant issues confronting the nuclear utilities. The challenges include maintaining safe operations in an era of aging power plants and continuing pressure to improve economic performance, making difficult decisions on license renewal, decommissioning and the need for new capacity, and finally, of course, managing radioactive waste, both high-level and low-level. I will also speak to NRC's regulatory response to these challenges.

II. INDUSTRY CHALLENGES

Maintaining Safe Operation with Aging Power Plants and Pressure to Improve Economic Performance

Clearly the nuclear industry's safety performance in the U.S. has improved during the 1980's in the aftermath of the TMI accident. This is due to both industry initiatives and regulatory standards which address issues such as station blackout and anticipated transients without scram. Overall safety performance, reliability, and availability for U.S. power reactors during the 1990's has been good and is generally continuing to improve slowly. This is demonstrated by the key operational safety indicators monitored by the NRC, which include forced outage rates, automatic scrams while critical, and significant events. Improved management of operational safety has been accompanied by decreases in average plant operations and maintenance costs and increased plant availability. Although overall safety performance is improving, the managerial challenge will be to avoid complacency and inattentiveness in order to sustain safety performance. In addition, the U.S. operating reactors are getting older. Aging affects all reactor structures, systems, and components to varying degrees and can affect operations and safety, if its effects are not controlled. The challenge is to monitor, detect, and mitigate

age degradation through inspection, maintenance, or replacement. The NRC's maintenance rule, which is effective on July 10, 1996, is particularly important to ensure focus on safety-important structures, systems, and components (SSCs) as operating plants age. It is both risk-informed and performance-based. Under the rule, licensees establish their own maintenance programs determining the risk-significant SSCs for their specific plants. The performance-based aspects of the rule require that licensees: 1) establish the performance and condition goals, and the requisite equipment monitoring regimes; 2) modify established goals on the basis of plant or equipment performance; and 3) determine whether to rely on preventive maintenance in lieu of establishing goals and performance or condition tracking. The NRC will monitor performance through inspection against the licensees' programs.

Aging is taking place as the electric utility industry is restructuring in an effort to stay competitive and to lower electric rates to consumers, as well as in response to various state regulatory initiatives. This, too, will pose unique challenges that, as of today, are not completely defined. Notwithstanding these circumstances, it is imperative to maintain the safe operation of U.S. nuclear facilities despite resource constraints. This is also true for the NRC itself. When we look at where the nuclear power industry might be in the 21st century, it is important to recognize that where we end up in the future depends, in large measure, on how we solve problems in the present. If there is one message that I hope each of you who is on the board of a nuclear utility takes away from my talk today, it would be that when you make decisions to meet the industry's challenges, you keep your eyes on the prize - **SAFE AND ECONOMIC NUCLEAR OPERATIONS**. In my view, you cannot have one without the other. Safety and long term economic performance are mutually interdependent and reinforcing because they are both tied to improved reliability. A recent news summary makes this point more strongly than I could. A recent study prepared by Stanford University researchers concludes that standards put into place by Federal and State regulatory agencies and implemented by utilities following the Three Mile Island accident in 1979 have made nuclear power plants more reliable. The study, funded by the National Science Foundation, said the standards had dramatically cut the number of unplanned shutdowns, saving \$5 million to \$6 million annually for the sample of plants studied, which represents less than half of the total U.S. nuclear power plant megawatt capacity. A safe plant is a reliable plant and a reliable plant is an economic plant -- that is certainly one of the key points I try to underscore both here in the U.S. and abroad. Now, that I've given you the bottom line of my message here today, I will discuss further power plant aging and the implications, from the NRC perspective, of electric utility deregulation.

Power Plant Aging

The challenges which confront the industry and the NRC related to aging of nuclear power plants embraces a host of intertwined technical, policy, and legal considerations. The first priority, of course, is to ensure that nuclear plants continue to operate safely. From the standpoint of national energy policy, it is not the role of the NRC to promote

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the use of nuclear power, but it clearly makes sense that the nation makes the most efficient use of our energy resources. In the case of nuclear power plants, this means creating a regulatory environment in which plants which are still capable of additional years of safe operation may continue to operate. The NRC has developed a sound and sensible licensing process to handle plant life extension -- 10 CFR Part 54. But even with this framework, there are a number of technical problems which need to be addressed. Two that are of great importance are (1) reactor pressure vessel embrittlement and (2) steam generator tube integrity.

Let me address reactor pressure vessel embrittlement first. The integrity of the reactor pressure vessel is essential to assuring long term safe operation of nuclear power plants. Reactor pressure vessels become embrittled due to neutron irradiation during operation. Those constructed with materials with high traces of copper and nickel are especially susceptible to this phenomenon. Certain combinations of susceptible materials and the accumulated effect of neutron irradiation can cause a few reactor vessels to reach embrittlement screening criteria set forth in our regulations before the end of their license terms or to limit the possibilities of plant life extension.

Thermal annealing has the potential for restoring the ductility and toughness of the vessel steel to very near the original, unirradiated condition, thus enabling licensees to "reset the clock" on vessel irradiation embrittlement and to increase the safe operating life of the reactor vessel. However, thermal annealing of a reactor vessel is a complex process which has not yet been attempted at a commercial nuclear power plant in the U.S. It involves significant engineering issues and financial risk to utilities. The Commission is currently evaluating and determining the regulatory framework within which the NRC could eventually assess reactor pressure vessel integrity following annealing. It is important that this framework not be unduly burdensome to licensees, but it is equally important that the public is aware and obtains assurance that public health and safety are protected. The Palisades Nuclear Plant in Michigan is seriously considering annealing its pressure vessel. The Department of Energy is currently planning to conduct two annealing tests in conjunction with a coalition which includes the Electric Power Research Institute. The NRC will carefully observe and evaluate these tests to inform our regulatory process in this area.

A second aging issue is steam generator tube degradation. The thin-walled tubing of steam generators comprises more than one-half of the primary coolant system boundary in a pressurized water reactor, and as a result, steam generator tube failures represent a failure of one of the principal fission product boundaries in this type of nuclear power plant. The Commission is now considering a generic approach for dealing with steam generator tube degradation that will reduce plant specific regulatory decisions, yet ensure defense in depth through a balance of protection, inspection, and mitigative measures. Even with this comprehensive approach, steam generator tube integrity will be an issue that will demand increased attention as nuclear plants age. In the end, however, many plants may have to replace the steam generators, and indeed a number have, in order to continue to operate safely.

Implications of Electric Utility Economic Deregulation

As I said earlier, I do not believe that we fully understand all of the implications of economic deregulation and the challenges that this will bring. We are already seeing a number of different business reorganization decisions emerging. In addition, public utility commissions (PUC's) have continued to press for economic performance improvements in the electric utility sector with an objective of controlling electricity rates to consumers and, more recently, for new rate and organizational structures to enhance competition. PUC's and the Federal Energy Regulatory Commission policy decisions will be drivers of much of this activity, and PUC's in different states are approaching the new possibilities in quite different ways. The NRC must keep abreast of how deregulation, economic constraints, and competitive environments affect reactor licensees from a safety standpoint. As utilities consolidate, the NRC will need to pay close attention to ensure that licenses are transferred, as necessary, to new owners of record, and that any new management teams assigned to existing licensed reactors have the requisite safety consciousness and adequate resources to operate nuclear facilities safely. For now, the NRC has enhanced its inspection program to ensure safety focus, monitor performance indicators, and study trends in an attempt to better monitor economic "stress". In addition, the Commission has recognized possible safety impacts of economic performance incentives in a policy statement directed to ensure that programs established by state commissions regulating electricity utilities do not detract from safe nuclear operations. In an effort to get our arms around this rapidly changing landscape, I have specifically requested the NRC staff to examine closely how electric utility restructuring may impact the nuclear operations of the various reactor owners and whether current NRC oversight processes and regulations are adequate to assure continued safe operation of these facilities. As an input to this effort, the Commission is planning a meeting with a panel of high-level representatives from various segments of the electric industry, government agencies, and the financial sector to discuss what they see as the future for the electric utility industry -- with emphasis on the implications for nuclear power. We may only be able to carry out a very broad assessment at this time, but I think it is important to get out ahead of the curve and understand what the impact of deregulation and competition will be.

Industry Facing Difficult Decisions of License Renewal, Decommissioning, and New Capacity

In the context of addressing aging plants, I briefly addressed license renewal and premature plant shutdown. The NRC has developed a sound and sensible regulatory process to handle plant license renewal in 10 CFR Part 54 and stands ready to review an application when one is received. However, despite meetings with industry groups in recent years to discuss generic license renewal programs, no license renewal application has yet been filed. What the NRC is seeing is, that as utilities face major investment decisions, they must evaluate how many more years they plan to operate their plants and whether the investment is worthwhile. In cases where the existing licensed life of the

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plant, or even the potentially extended life of the plant, is not worth the investment, utilities are facing premature shutdown and early decommissioning. Both the Yankee Atomic Electric Company and Portland General Electric Company elected premature shutdown and early decommissioning of Yankee Rowe and Trojan when these plants were affected by the economics of other competing power sources and by degradation of the reactor vessel and steam generators, respectively, the two aging issues I spoke of earlier.

Although new nuclear capacity does not seem to be on the industry's horizon at the moment, the possibility that utilities will consider a standard nuclear power plant as a source for new generating capacity still exists. The NRC has issued two final design approvals for two standard reactor designs and is in the process of certifying these designs by rulemaking. The use of certified standard reactor designs is expected to enhance safety, reduce cost and streamline future licensing of new nuclear generation capacity. We expect that the certification of the two standard reactor designs -- the General Electric Advanced Boiling Water Reactor and the Combustion Engineering System 80+ -- for which public comments are being assessed now, will be completed in FY 1996. The NRC is also reviewing two additional standard design applications for novel light water reactor designs which employ passive safety features and greater use of modular construction--the Westinghouse AP600 and the General Electric Simplified Boiling Water Reactor (SBWR).

Managing Waste

One of the most important matters facing the nuclear industry is nuclear waste storage and disposal. Without satisfactory resolution of this issue, the role of nuclear energy in the nation's overall energy mix in the future will be severely constrained.

The Commission believes that a deep geologic repository is a sound and technically feasible solution to the problem of permanently disposing of spent fuel and other high-level radioactive waste. This responsibility rests with the U.S. Department of Energy. Based on what we know today, we are also confident that the Commission will be able to determine, with reasonable assurance, that spent fuel and other high-level waste can be disposed of safely in a geologic repository provided (1) that NRC receives a high quality application from DOE; (2) that NRC requirements are met; and (3) that NRC can maintain its technical capabilities for licensing a deep geologic repository in the face of budget constraints.

I toured the Yucca Mountain site in Nevada this summer. At the DOE Exploratory Studies Facility there, I had the opportunity to go more than three quarters of a mile into the mountain, and to observe first-hand the tunnel-boring machine that is currently progressing at a rate of about 100 feet per day, depending on geologic conditions. I visited alcoves within the tunnel that are, and will be, used to conduct experiments and to collect site-related data. I saw thermal, hydrologic, and mechanical experiments, and field laboratories that are being used to characterize the site. DOE still confronts many scientific and technical challenges before site characterization is complete, but ensuring that the NRC is prepared to review a DOE license application for a mined geologic repository in a timely manner is one of my priorities. NRC continues to maintain an

independent regulatory research and development center, the Center for Nuclear Waste Regulatory Analysis in San Antonio, Texas. The center is conducting research in areas important for developing our technical abilities and for supporting the development of regulatory tools the NRC will need to review a license application for a high-level waste repository.

Some of you may be aware of proposed legislation (in the House of Representatives, as well as the Senate) that would place greater emphasis on the development of a centralized interim storage facility. The Commission has provided testimony on this legislation (in particular, H.R. 1020), taking the position that it agrees with the fundamental approach of the proposed legislation, which contains the basic elements of an integrated high-level waste management plan. The three fundamental elements of an integrated plan are, first, interim on-site storage; second, centralized interim off-site storage; and, third, deep geologic disposal of high level nuclear waste, primarily spent fuel. The Commission continues to believe that the overall, long-term success of this nation's program to manage spent fuel and other high-level radioactive waste is dependent on developing a permanent repository for this material. However, Congress makes the ultimate decision on how the country will deal with high level waste. What is important now is that this decision be made as soon as possible so that utilities as well as NRC have clear direction on handling high level waste so that we can plan our respective courses of action. For the NRC that means developing appropriate regulatory/licensing processes to review applications for HLW facilities.

The disposal of low level radioactive waste also presents an important issue. As many of you are probably aware, the responsibility for identifying sites and developing disposal facilities rests with the states and compacts. And most, if not all, low-level radioactive waste disposal sites will be licensed by Agreement States, states to which NRC has relinquished under compatibility agreement, oversight of certain nuclear activities. NRC continues to provide technical support and guidance to these Agreement States.

The premature shutdown and decommissioning of nuclear facilities could add, in a compressed time frame, to the already projected quantities of low-level radioactive waste requiring disposal in this country. However, within the last few months, there have been positive signs that some of the concerns with having adequate low-level radioactive waste disposal capacity have subsided. Of course, the Hanford disposal site has been available for low-level waste disposal to the Rocky Mountain Compact and the Northwest Compact for some time now. And, as of July 1, the disposal facility in Barnwell, South Carolina, was reopened and is accepting waste from almost all states. The National Academy of Sciences recently issued a favorable report on the Ward Valley site in California. The report reviewed seven technical issues related to the site, and did not identify any reasons for not proceeding with the site licensing process.

III. NRC APPROACH TO DEALING WITH CHANGE

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Strategic Assessment and Rebaselining

Changes in the regulated industry ultimately affect the regulator, and NRC is no exception. Although I believe that the NRC has earned its reputation as the foremost nuclear regulatory body in the world, we still need to develop a strategic vision that allows us to respond to a changing environment and budgetary constraints, to carry out our regulatory program more effectively, to conduct effective resource planning, and to remain responsive to our customers. Therefore, I have initiated a strategic assessment and rebaselining at NRC. My strategic assessment and rebaselining initiative does not have as its primary objective the achievement of a preferred "numbers" outcome. The "numbers" are being driven, in any event, by OMB and the Congress. The first phase of the initiative, the "strategic assessment," involves identifying and examining the sources of the mandates that make up our regulatory mission - statutes, executive branch directives, and Commission decisions, so that we can establish a mutual understanding of what the NRC missions are - what is required of us. Also included in this phase is a process of looking at agency activities to determine whether they are being conducted in response to a specific mandate or whether these activities have some other rationale for their existence, and whether there are areas where we should have ongoing programs to implement a specific mission, but do not. This phase is, as the title implies, essentially a review, categorization, and assessment. This phase is also meant to begin to surface key strategic issues, questions and decisionmaking points. The subsequent phases -- rebaselining and strategic planning -- will address what our programmatic needs are and should be, and what resource levels should be assigned to them. The first phase provides input to the following phases and ultimately to budget and human resource planning, which is the final phase. I believe that this review is necessary to position us to meet the challenges we face effectively and to intelligently guide our activities and decision-making in the future.

Regulatory Effectiveness and Risk-Informed Performance Based Regulation

Finally, I would like to express my view of how the regulatory environment should be changed. If you read the newspaper or watch TV news, I'm sure you've heard about regulatory reform, the National Performance Review, or other initiatives being undertaken or considered by government. I believe the objectives of all of these initiatives can be summed up, for the NRC, by what I like to refer to as "regulatory effectiveness." What do I mean by "regulatory effectiveness"? It goes to the heart of how we do business: It means looking not only at whether a particular old or new regulation or set of regulations is necessary, but also considering the ease of its implementation, its internal consistency (unitary view), its consistency with other applicable statutes and regulations (contextual view), its fairness, and how well the regulation fits into the entire existing integrated program of regulation. It also reinforces the professionalism with which we do our jobs. Regulatory effectiveness also means keeping our focus on the agency's overall and primary goal -- protecting public health and safety. The concept of "regulatory effectiveness" provides a broader picture of the impacts of regulatory reform, and not just reform for its own sake. In this regard, much has been said about risk-based regulation, I prefer to talk of risk-informed, performance-

based regulatory approaches which should allow those who operate and own facilities to focus their resources in a smart way that helps them deal with the pressures they face, so they can meet safety standards in the most efficient and economic way possible. It, in turn, allows the NRC to focus on the most safety-significant aspects of reactor operations or any nuclear operations. That is also true for the other licensees that we regulate. A risk-informed approach is a two-edged sword. If properly applied, it tends to relieve regulatory "burden" by allowing a focus on those things that have the greatest safety significance. But once one starts on a risk path, there is always a possibility of revealing vulnerabilities. And that, in principle, could result in new requirements. But, on balance, a risk-informed, performance-based approach allows a sharpening of focus and a targeting of attention and resources in a way that ought to help everyone. The NRC has taken some major initiatives to apply risk-informed, performance-based, regulation which include amendments to containment leakage testing, the maintenance rule, and a draft proposed reliability data rule. These rules assure the use of PRAs to risk-inform both regulation and licensee activity. The extent to which Probabilistic Risk Assessments must be refined depends on the role they are expected to play as a tool to keep the focus on safety and reliability. The regulator has less of a role if industry uses PRAs for operating plants within the existing regulatory framework. But if industry desires regulatory changes and decisions based on risk insights, then the industry and the NRC must narrow the gap on such issues as PRA methodology, consistency, level of detail, and reliability data. This is an area where the NRC and industry have been and are working together. This is an area I intend to push strongly.

IV. CONCLUSION

I hope my remarks have given you some insight into why I believe both the nuclear industry and the NRC are facing a series of interrelated challenges that, taken together, could change substantially how the electric power industry continues to develop and how it will be regulated. How we solve today's problems can, and will, affect the role that nuclear energy will play in the nation's energy mix in the future. Our mutual goal should be to view our challenges as opportunities, and to address them proactively rather than reactively. In that context, the most important--indeed, the critical--step that you can take is to ensure that the link between safety and sound economics is clearly understood and that it becomes a key element of the safety consciousness of your respective organizations. Thank you for your attention. I hope you have had and will continue to have an enjoyable and successful conference.

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