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STEPPING UP TO THE CHALLENGES
WITH SAFETY AND SOUND ECONOMICS
BY
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INTRODUCTION

Good morning everyone, and thank you for your warm welcome. I am delighted to be able to address this annual meeting of the American Nuclear Society (ANS).

I am often asked, "What is your vision for the NRC?" "Can there be a vision?"--given that no new nuclear plants are being built in the U.S. (with none on the immediate horizon), and given that the major rulemakings on streamlined licensing of new plants (Part 52) and plant license extension (Part 54) are complete. The question of vision, when posed this way, overlooks the fact that we regulate more than reactors, and is predicated on the assumption that original licensing is our main regulatory activity and that only rulemaking that involves this original licensing is important. Licensing of reactors, and other facilities and activities, is a critical part of what a regulatory body such as ours must do. Licensing has the important role of building in safety--in the design, construction, and initial operation of a new nuclear facility or nuclear activity. The equally critical and perhaps more important part of our regulatory oversight (including continuing licensing activity) has to do with operational safety and has many aspects, including conservatism in operations, managerial engagement, and the guarantee that equipment, especially the most safety significant equipment, is appropriately monitored and maintained during a time of economic and structural challenge for the nuclear industry.

My prior experience has made clear the regulatory challenge of our oversight responsibilities in this regard and has made it strikingly clear that the environment within which both U.S. and international nuclear industries conduct their activities is rapidly changing. In the United States, change is being driven largely by market forces and competitive pressures to which individual utilities and the NRC in its role as independent safety regulator are reacting. Internationally, similar changes are occurring and are affecting an international nuclear community in pursuit of the same nuclear safety objectives as the U.S. In the countries of the former Soviet Union and those on

the Pacific Rim, efforts are being made either to strengthen the safety focus of existing nuclear programs, or to ensure that public health and safety is a foundation for newly emerging nuclear programs. Although the character of the responses may differ between countries, the objectives are largely the same everywhere: enhanced safety consciousness in operations, improved nuclear power plant operating performance resulting in improved economic performance, and establishment of strong independent nuclear regulatory bodies. Other issues affecting nuclear industry activities worldwide include aging of nuclear power plants, decommissioning, and waste storage and disposal. In light of these changes, I want to share with you my impressions of the challenges facing the nuclear industries and the NRC, the NRC's response, and possible new initiatives.

CHALLENGES FACING THE NUCLEAR INDUSTRY AND NRC

Domestic

The NRC faces and needs to be poised to respond to a changing environment, which may affect the scope and focus of major NRC programmatic activities and may lead to new areas of NRC regulatory responsibility. One area of potential change is one of the most important facing the nuclear industry worldwide--that is, nuclear waste storage and disposal. Without satisfactory resolution of this issue, the role of nuclear energy in this nation's overall energy mix in the future will be severely constrained.

The NRC 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. The responsibility for constructing and operating this facility rests with the Department of Energy. Based on what we know today, we are confident that we 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 we receive a high-quality application from DOE; (2) that our requirements are met; and (3) that we can maintain our technical capabilities for licensing a deep geologic repository in the face of budget constraints.

In spite of budgetary challenges, 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, federally-funded, research and development center, the Center for Nuclear Waste Regulatory Analyses in San Antonio, Texas. The Center is providing technical assistance and conducting research in areas important for developing our technical abilities and for supporting the development of our regulatory tools for reviewing a license application from DOE for a high-level waste repository. It is

the future of this center that is at stake if we sustain the budget cut in the high-level waste program area that we apparently are facing.

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 for the United States. The NRC has taken the position that the proposed legislation contains the necessary basic elements of an integrated high-level waste management plan, with three fundamental elements: first, interim on-site storage; second, centralized interim off-site storage; and, third, deep geologic disposal of high-level nuclear waste, primarily spent fuel. On the recently debated vexing issue of location of the site for interim storage--a key, but controversial feature, of H.R. 1020 as currently drafted--NRC has taken no position on where a centralized interim storage facility should be located. We have already initiated actions to examine our existing licensing capabilities and staff resources if we were called upon to license an interim centralized storage facility. The NRC has issued Certificates of Compliance for several spent fuel storage casks which could be considered in the design of such a facility. I am confident that we can carry out the mandate of Congress for the licensing of an interim centralized storage facility in a timely fashion if reasonable schedules are established. What is important now is that a decision be made as soon as possible on the direction of the Nation's high-level waste program so that utilities and the NRC can plan accordingly.

The disposal of low-level radioactive waste is also important. As many of you are probably aware, the Low-Level Radioactive Waste Policy Act of 1980 and its subsequent amendments of 1985 gave the responsibility for identifying sites and developing disposal facilities in the United States to the States and authorized them to enter into compacts for the establishment and operation of regional disposal facilities for low-level wastes. The NRC or, as appropriate, Agreement States are responsible for licensing these facilities. At the present time, it appears that most, if not all, low-level waste disposal facilities will be licensed by Agreement States. Although we are presently re-examining the focus of our low-level waste program, NRC continues to provide technical support and guidance to these Agreement States, and must maintain some minimal level of licensing capability in case we are called upon in the future to license a low-level radioactive waste disposal facility. For now, facilities in South Carolina, Washington, and Utah are open for disposal of such waste.

Another area in which the scope and focus of NRC efforts may change is in our medical regulatory program. We have implemented a medical management plan to guide our licensing, inspections, and rulemaking improvements. Our objective is to ensure that public health and safety are protected in the medical use of

radionuclides without undue interference by us in the practice of medicine. To help us evaluate the effectiveness of our regulation of this area, we have drawn on the expertise and experience of our Advisory Committee on the Medical Uses of Isotopes, Agreement States, professional organizations, other regulatory agencies, and the medical community. We have also asked the National Academy of Sciences to conduct an independent review of our regulation of the medical use of byproduct material. The Academy expects to issue their final report in early 1996. The Commission intends to consider the findings of this report as we evaluate possible changes to our program.

As for new missions, as many of you know, a committee formed by the Department of Energy is currently examining and will make a recommendation late this year on external regulation of DOE facilities. NRC is one of the agencies being considered to assume this role. If this responsibility is assigned to the NRC, it would add significantly to NRC's current nuclear regulatory responsibilities, would require agency restructuring, and would require significant additional NRC resources.

The U.S. electric utility industry also faces substantial challenges that could change utility business practices. At the present time, the industry is restructuring in an effort to stay competitive, to lower electric rates to consumers, and to respond to Federal and State regulatory initiatives. Policy decisions of the State Public Utility Commissions (PUCs) and the Federal Energy Regulatory Commission are the source of much of this activity, and different states are approaching the new possibilities in quite different ways. Rate deregulation and competition will pose unique challenges to U.S. utilities and possibly NRC that, as of today, are not completely defined. In the end, whatever changes occur, meeting them will be inextricably linked to excellence by addressing a recurring challenge for the nuclear power industry-- the need to avoid complacency and inattentiveness in operations, especially since the nuclear industry's safety performance in the United States and Western Europe has improved during the 1980's and 1990's in the aftermath of the Three Mile Island accident. I can speak of the U.S. experience. Overall safety performance, reliability, and availability for U.S. power reactors during the 1990's have been good and generally continue to improve slowly. This is demonstrated by the key operational safety indicators monitored by the NRC. Improved management of operational safety has been accompanied by decreases in average plant operation and maintenance costs and increased plant availability. The industry could find it difficult to maintain a proper focus on safety if good performance begins to be taken for granted.

There is room for improvement in the interaction between regulators and the regulated. I maintain that we, at NRC, should believe in our own regulatory framework, and that licensees should live within its requirements. However, I recognize that

there is need for refinement in NRC's regulatory framework, as well as a need for industry to take advantage of tools that are in place to make changes where that framework may be outdated, no longer makes sense, or is unduly burdensome.

An issue that both the industry and the NRC confront is aging, which affects all plant structures, systems, and components to varying degrees and can affect operations and safety if its effects are not controlled. The challenge is to detect, assess, and monitor age-related degradation through effective inspection and testing programs, and to mitigate it, as necessary, through maintenance and replacement. In addition, there are a number of known, specific aging problems that need to be addressed both here and abroad, if plants are to continue to operate safely. Two that are of great importance are reactor pressure vessel embrittlement and steam generator tube degradation. Both of these issues could cause aging plants to be shut down, as was the case with Yankee Atomic Electric Company's (Yankee Rowe) and Portland General Electric Company's (Trojan). These utilities elected premature shutdown and early decommissioning of these plants when adversely affected by the economics of competing power sources and by degradation of the reactor vessel and steam generators, respectively.

A final domestic issue in this changing environment is the continuing budget constraints affecting all U.S. government agencies. The NRC itself is facing a probable ten percent budget cut just for fiscal year 1996. All indications from Congress are that, in subsequent fiscal years, we would expect a continuing downward trend in available funding. Within this tighter fiscal environment, it becomes more critical to prioritize our activities, while working to help the Congress and the Office of Management and Budget to understand our core mission and all the essential elements of that mission.

International

Another challenge to which the NRC must respond is the international dimension of nuclear safety. As this audience knows well, the development of nuclear power has always been an international undertaking, with extensive technology transfer between nations. It is becoming increasingly more so. However, this development has been uneven, with different states placing disparate emphasis on the kind of safety culture--both on the operational and regulatory side --necessary to reduce the risks of radiological accidents to the lowest achievable level. Most recently, the NRC has worked with others, both inside the United States and in other nations, to strengthen nuclear safety worldwide, with particular emphasis on certain reactors of Soviet design. NRC's role has focused primarily on the need to strengthen regulatory bodies in the new states of the former Soviet Union and Eastern Europe, as well as in nations in other parts of the world, particularly in Asia, who are beginning

ambitious nuclear power programs. NRC has conducted a major program, funded through the U.S. Agency for International Development, to train regulators from nations who have embarked on the creation or strengthening of their regulatory capabilities. The Czech Republic is an example.

We have had extensive relationships with Gosatomnadzor (GAN) in the Russian Federation and the regulatory agency in Ukraine. NRC has provided training in a variety of regulatory areas, including safety assessments, computer codes, fire protection, seismic design, and many others. We expect to continue this effort, although reduced resources for this program will require us to be more creative in providing needed help.

Since the 1992 Munich Summit of the seven western industrial states, NRC has also worked to assist the program of near-term safety upgrades to the least safe reactors of Soviet design. Much of this work has been carried out under the aegis of the Department of Energy, through private U.S. companies and contractors. In this light, we have all struggled with the issue of third party liability protection to cover this assistance. Some interim approaches have been developed, but the only real solution is the enactment of satisfactory domestic legislation in the recipient countries and adherence to relevant international liability conventions. We will continue to work on helping these nations adopt more satisfactory liability arrangements.

One of the goals identified by the G-7 heads of state in Munich, and reaffirmed in subsequent summit meetings in Tokyo, Naples, and Halifax, is the effort to secure early closure of the least safe reactors of Soviet design. We recognize that this is a complex issue, which poses difficult questions for the nations where these facilities are sited. In this regard, it is clear that the issue of enhancing safety, and closing the least safe plants must be approached on a comprehensive basis. Important aspects here are replacement power and the extent to which former east bloc countries can reform their energy sectors--and especially their electric power sectors--to reflect market principles.

While some safety upgrades are possible on certain units, we hope these countries will implement concrete plans for early closure of the least safe of these reactors. Last July I attended the fifth meeting of the "Gore-Chernomyrdin Commission." One of its accomplishments was the completion of a Joint Electric Power Alternatives Study of the Russian Energy Sector. It is significant that the rationale for this study was the U.S. view that improvement in nuclear safety can be effected only within the context of a comprehensive look at and possible restructuring of the Russian energy sector. This is equally true for Ukraine. Only by restructuring their economies along market lines, and insisting on adequate and reliable payment for electricity used, will these countries be able to maintain and upgrade their

plants, build new capacity and attract the types of investments needed to build a safe, world-class nuclear industry. The same will be true for any country seeking to use nuclear energy for commercial electric power generation.

The G-7 is continuing its dialogue with Ukraine to develop a comprehensive approach to closure of the most symbolic of the Soviet-design reactors--those at Chernobyl. In only six short months, we will commemorate the tenth anniversary of this worst reactor accident in the history of civilian nuclear power. It is hoped that, by that time, we will have reached a solution to the Chernobyl issue which reflects international concerns and recognizes the needs of Ukraine.

In the nuclear safeguards area, the challenge for any government is to ensure public health and safety and to prevent theft or misuse of dangerous materials through effective materials protection, control and accountability (MPC&A) programs and a strong and effective regulatory program. One of the most critical issues facing the U.S. and Europe is the danger of misuse of fissionable materials in the countries of the former Soviet Union. The NRC, along with the Department of Energy and the State Department, is working closely with counterpart organizations in Russia and Ukraine, as well as with Kazakstan and Belarus, to guard against the diversion of fissionable materials. The most important checks on illicit trafficking in nuclear materials are adequate materials protection, control, and accounting procedures at all commercial, scientific, and military facilities in these countries. One of the U.S. government priorities under the Gore-Chernomyrdin Commission is to assist the Russian government in developing these procedures, and in acquiring relevant technology. The NRC has been working closely with both Russian and Ukrainian regulators, and with the Russian government at the highest levels, to assure that their regulatory bodies have the requisite authority and access to protect their nuclear materials properly.

Another long-standing international activity of the NRC has been in the area of regulatory research-- an area likely to assume even greater significance in the future. NRC has extensive research agreements with organizations in many foreign countries. Some of the research is conducted here, with the participation of others; much is conducted elsewhere with NRC's participation, like the Halden Project's fuel behavior work, the International Piping Integrity Review Group, the high-burnup fuel tests in the French CABRI reactor, and the containment integrity program with NUPEC in Japan. This cooperative approach not only makes good economic sense--through the pooling of increasingly scarce resources--but recognizes the inherently international character of the nuclear business. No country or agency has a monopoly on good ideas. A diversity of perspectives and viewpoints on complex technical issues can only improve our understanding of how best to assure the public health and safety. We are anxious

to continue the positive working relationships we have had in the research area in the future.

We regard NRC's international role as an integral part of what we do and how we do it. Our regulation of the domestic U.S. nuclear industry benefits tremendously from the information and insights we are able to gather from both regulators and operators in foreign countries. To cut ourselves off from such insights would be extremely imprudent. Although our focus must remain primarily on regulation of the U.S. nuclear industry, we also recognize that our decisions can have a significant impact on the programs of other countries. The international reaction to the NRC's proposed new rule on the siting of nuclear plants was a useful reminder that we can no longer act--if we ever could--as if our decisions affect only the domestic U.S. program.

NRC RESPONSE TO THE CHANGING ENVIRONMENT

Response to Industry Restructuring

Since our primary focus must remain on the safety of U.S. nuclear industries, we must keep abreast of how rate deregulation, competition, and economic constraints affect reactor licensees. The concern that I have, as a regulator, is, in a competitive market, that nuclear electric generators continue to maintain high safety standards, with sufficient resources devoted to nuclear operations, and that decommissioning funding assurance be maintained. Because of my concerns in this area, I have asked the NRC staff to examine this changing business environment carefully in order to determine whether our current regulatory requirements are fully adequate. The NRC staff has proposed that the Commission initiate a rulemaking to amend the Commission's regulation to provide adequate assurance of decommissioning funds for those power reactor licensees which no longer have their rates regulated. We are having a public meeting on December 14 at our Rockville Headquarters to discuss these issues and others related to economic competition and restructuring in the electric utility industry with leaders from the Federal and State regulatory community, as well as experts from the financial sector and the nuclear industry itself.

Response to Aging Issues

From an operational safety perspective, as operating plants age, an important step in ensuring that licensees continue to focus on safety-important plant equipment is NRC's Maintenance Rule, which will become effective next July. This rule is both risk-informed and performance-based. Under the rule, licensees establish their own maintenance programs determining the risk-significant SSCs for the specific plants. The performance-based aspects of the rule require that licensees: 1) establish equipment 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. Through inspection, the NRC will monitor performance against the licensee's program.

A follow-on to this is that as nuclear power plants age, we must examine the standards and operating procedures that have been imposed on critical components to assure ourselves and the public that an adequate safety margin still exists.

The integrity of the reactor pressure vessel is essential to ensuring the long-term safe operation of nuclear power plants. Reactor pressure vessels become embrittled over time due to the combined effects of neutron fluence and chemical composition. Some U.S. reactor pressure vessels may exceed pressurized thermal shock screening criteria before the end of their licensed terms. If so, licensees will have to shut down their reactors unless the embrittlement of the reactor pressure vessel can be mitigated.

Thermal annealing has the potential to restore the ductility and toughness of the vessel steel to very near the original, unirradiated condition, thereby increasing 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., although the Russians have had considerable success with their annealing procedures. For this reason, part of our cooperative safety program with Russia includes annealing technology. Annealing involves significant engineering issues and financial risk to utilities. The Commission has recently considered the regulatory framework within which the NRC could assess reactor pressure vessel integrity following annealing. The Department of Energy is planning to conduct two annealing demonstrations using two different heating techniques, including the Russian technique which utilizes electrical heat. We will carefully observe and evaluate these tests to inform our regulatory process in this area. These are not academic exercises. The Palisades Nuclear Plant in the United States is seriously considering annealing its pressure vessel and will put our regulatory framework and technical bases to the test.

In another critical component area, steam generator tube failures represent a failure of one of the principal fission product boundaries in a pressurized water reactor. 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.

Vision

Although I believe that the NRC has earned its reputation as the foremost nuclear regulatory body in the world, we still need to be guided by a strategic vision. The strategic vision embodies an awareness of our mission and the mandatory bases of our mission, an ability to respond to a changing environment, including assumption of possible new elements of our mission, and continuing and enhancing effectiveness in our regulatory activities - with a firm health and safety basis. This strategic vision undergirds our regulatory approach, allows us to develop and maintain appropriate programmatic focus and to conduct appropriate resource planning including personnel, technology and budget.

Regulatory reform legislation, the National Performance Review, and other initiatives are being undertaken or considered by government. I believe the objectives of all of these initiatives can be summed up, for the NRC, by "regulatory effectiveness." What does this mean? 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 consistency both internal and contextual, its consistency with other applicable statutes and regulations, its fairness, and how well the regulation fits into the entire existing regulatory program--all while keeping our primary focus on protecting public health and safety.

A part of this is the use of risk insights. I prefer the phraseology "risk-informed, performance-based regulation"--which allows those who operate and own facilities to focus their resources in a way to address the pressures they face and still meet safety standards in the most efficient and economic way possible. Risk-informed, performance-based regulation, in turn, allows the NRC to focus on the most safety-significant aspects of reactor operations and other licensee activities. A risk-informed approach, however, is a two-edged sword. If properly applied, it tends to relieve regulatory "burden" by focusing 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 should help everyone.

We have some regulatory initiatives which embody this approach--including amendments to containment leakage testing, the maintenance rule (as discussed earlier), and a draft proposed reliability data rule. These rules assume the use of Probabilistic Risk Assessments (PRAs) to risk-inform both regulation and licensee activity. The extent to which PRAs must be refined depends on the role they are expected to play as a

tool to keep the focus on safety and reliability. PRAs still have significant limitations which deserve focus, if industry uses PRAs for operating plants within the existing regulatory framework, and especially if industry desires regulatory changes and decisions based on risk insights. The risk analysis methodology needs further improvement to address such issues as human reliability and organizational factors, management oversight, and the cumulative effect of equipment degradation. Further, in order for the NRC to use PRA as a basis for regulatory decisions and rulemaking, the industry and the NRC must narrow the gap not only on PRA methodology but also on assumptions, consistency, level of detail, and reliability data; and there is a need for changes to the Standard Review Plan to include evaluation of the PRA for specific applications. Earlier this year, the Commission issued a PRA policy statement and related implementation plan, in part to foster consistency in the use of PRA in NRC decisionmaking. The staff has been tasked to develop a basic structure for a risk-informed, performance-based regulatory framework, including standards development. This is an area I intend to push strongly.

The ultimate goal of regulatory effectiveness and the changes it may drive is not only to maintain safety while improving efficiency in implementation, but once reform has taken place, to virtually not need to compensate for outdated, unnecessarily restrictive requirements by issuing blanket exemptions from the regulations or, for reactor licensees, to limit the need for exercising enforcement discretion in the face of deviations from operating technical specifications. With regard to our regulations, I have requested the staff to examine closely those regulations for which we have granted multiple exemptions and to determine whether we need to move to change the regulations. Preliminary statistics indicate that 70 percent of the exemptions granted by NRC are associated with six rules (fire protection, containment testing, property insurance, emergency planning, general design criteria, and physical protection). We have already amended the regulation pertaining to containment leakage testing and are going to take a hard look at all of our regulations.

For technical specifications, the NRC has implemented an improvement program that eliminates unnecessary license constraints, thereby substantially reducing the regulatory burden on licensees. Improved standard technical specifications are available for adoption by licensees. In addition, line item improvement provisions exist whereby a licensee may request that only a portion of the standard technical specification be implemented. Eight percent of operating units have converted to the improved standard technical specifications, and although there is substantial up-front cost in conversion, savings for completed conversions are estimated to be between \$150K to \$1M per unit per year, allowing cost recovery in a reasonably short time frame. What is left to be done is for licensees to apply to

NRC to make the conversion to the improved standard technical specifications or to make line item improvements, and for NRC to review and approve these submittals in a timely manner. As of October 1 of this year, more than half of the operating units have converted or intend to convert to the improved standard technical specifications. I would encourage those nuclear operators that have not decided to convert to improved standard technical specifications to seriously consider doing so.

Related to the technical specification issue is the staff's use of enforcement discretion. The Notice of Enforcement Discretion (NOED) process provides a mechanism for addressing very limited situations, where exercising enforcement discretion may avoid transients and challenges to safety systems, or delays in startup without safety benefit. However, because of the potential for abuse of this process and the lack of up-front public notice and participation necessitated by the promptness of the staff's actions, staff guidance is being revised. As a result of the Commission's concern and the review and revision of this process, we would expect to see a drop in start-up and weather-related enforcement discretion, and a higher threshold for enforcement discretion where licensees have not taken advantage of improved standard technical specifications and line-item improvements.

Strategic Assessment/Rebaselining

In line with the elements of the strategic vision, I have initiated a strategic assessment and rebaselining at NRC for domestic and international activities. This initiative does not have as its primary objective the achievement of a preferred "numbers" outcome. The resource "numbers" are being driven by the Office of Management and Budget (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 the NRC mission and 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 establish programs to implement a specific aspect of our mission. 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 decision making points to be addressed by the Commission.

The subsequent phases--rebaselining and strategic planning--will address what our programmatic needs are and what resource levels should be assigned to them. The first phase drives and provides input to the following phases and ultimately to budget and human

resource planning, which is the final phase. This review is necessary to position us to meet effectively the challenges we face and to guide intelligently our activities and decision-making in the future.

NEW INITIATIVES AND CHALLENGES

I have already spoken of the importance of addressing aging effects in operating reactors, especially relating to reactor pressure vessels.

In the past 30 years, researchers have made good progress in understanding the important variables that affect neutron radiation embrittlement of the reactor pressure vessel, and more recently, in understanding the mechanisms that cause it.

However, from my perspective, we have not made significant progress in measuring embrittlement changes in operating reactor vessels and relating those changes to microscopic models which give a stronger predictive capability, and allow an assessment of post-annealing properties.

The surveillance programs used by licensees for determining changes in toughness properties in the vessel materials of operating reactors have a number of shortcomings, especially for older plants. These programs use a simple, but indirect, conservative method that does not utilize improvements in fracture toughness technology. The surveillance programs have a limited number of specimens, provide for a limited number of tests, require extrapolation of measurements, and in some cases do not cover the limiting material from the reactor vessel. The results tend to have significant variability which make the assessment of plant specific reactor integrity more difficult.

To improve this situation, I believe we should pursue the use of advanced nondestructive examination techniques in measurement of embrittlement of irradiated reactor vessels involving direct monitoring, and not be restricted by a limited number of test specimens. The existing surveillance programs would be supplemented, as needed, and measurements could be taken at the vessel locations of maximum interest. Several techniques, which may have some promise, have been proposed for such measurement. These include magnetic, ultrasonic, and hardness measurement techniques. Advanced techniques will become increasingly important during the later stages of reactor operation when toughness properties are approaching safety limits.

Although the development of new nondestructive methods for measuring radiation embrittlement is a formidable task, I believe it would be clearly beneficial to supplement current practices. The nuclear industry and the NRC should be proactive in this regard, and I challenge the industry to evaluate new techniques and to determine what more can be done on this issue.

A number of the important research areas associated with aging possess elements common to reactors in all of the countries relying on nuclear power. Countries already share the results of their reactor research and in some specific technical areas, a number of countries have joined together to address issues of common concern and interest. We need to be certain that our collaborative research projects recognize and build upon the unique areas of specialization and particular expertise each of us has. Through existing institutions, such as the Committee on the Safety of Nuclear Installations of the OECD Nuclear Energy Agency, we must more diligently focus our attention to the planning and integration of our research efforts. At the same time, we should hold these institutions to high performance and efficiency standards so that value is achieved from our investments in them. But, I would like to propose that we go much further. At the NRC's 23rd Annual Water Reactor Safety Meeting, I suggested that we should consider an international reactor research program focused on aging and risk assessment methodologies in which we seek to integrate the regulatory research activities of various countries within the context of a formal, structured, international research program. Each country could specialize in areas of its particular expertise. This would avoid duplication of effort and meet the common challenges which we are encountering and address the common downward pressures on our various regulatory research budgets. In certain areas of mutual interest, this kind of coordinated international research activity has occurred, with excellent outcome. However, this is meant to be a more direct and focused research program than generally exists internationally. If it can be accomplished with appropriate planning, focus, and coordination under the aegis of the existing multilateral structures, then it should happen that way. If not, other mechanisms should be considered. The task that I propose may be difficult to achieve, but I think that it at least should be carefully considered and explored. Consideration of such an activity will be part of the ongoing NRC strategic assessment and rebaselining.

Having offered some ideas on how the research needs of nuclear regulators and operators might benefit from focused coordination among several nations, let me keep the focus--for a moment--on the international level. In the wake of the TMI and Chernobyl accidents, nuclear operators recognized the imperative of combining their national efforts in the cause of enhanced safety. Creation of INPO and WANO provided a welcome impetus to improvements which have made the nuclear industry not only safer but more economical. I believe the world's nuclear regulators might learn from this experience and consider establishing a better mechanism for coordinating their own efforts, which could provide a more regular forum for the exchange of relevant information and views on topics of mutual interest. I know that significant exchanges already take place on an ad hoc basis and sometimes in the context of meetings at the IAEA in Vienna or the NEA in Paris. However, these efforts do not always reflect the

needs of regulators or their priorities. I am not suggesting a "heavy" or bureaucratic organization with a secretariat and headquarters--we do not need a multilateral nuclear regulatory organization. Nuclear safety must remain the responsibility of the nations in which the technology is utilized. However, a more formal organization of nuclear regulators on the international level might identify common themes and approaches and provide greater support for safety. It is an idea I will be exploring with my regulatory colleagues in other nations in the near future, and with our government.

Because I know the industry and Congress have raised concerns and these concerns have been reflected in Congressional reports on NRC funding, I just want to reassure you that I am not proposing any expansion in NRC resources. What I am proposing is to use the leverage of NRC's programs and recognized leadership to increase the efficiency of our programs dedicated to U.S. reactors, and thus the regulatory costs should remain the same or optimistically may even decrease.

CONCLUSION

I hope my remarks have given you some insight into why I believe both the international and the U.S. nuclear industries are facing a series of interrelated challenges that, taken together, could change substantially how they continue to operate and how they will be regulated. How we--that is the U.S. industry and the NRC--solve today's challenges can, and will, affect the role that nuclear energy will play in the U.S. energy mix in the future, and how nuclear material will be used in this country, as well as serve as a model for responding to change in the international arena. Our mutual goal should be to view our challenges as opportunities, and to address them proactively rather than reactively. To that end I have challenged the nuclear utility industry to evaluate new techniques and to determine what more can be done to improve measurement of embrittlement changes in operating reactor vessels, and I have proposed a focused international reactor research program and a coordinating mechanism for regulators that will draw upon the knowledge and the talent available in the international nuclear community to address the challenges we face head-on. Nevertheless, the single most important--indeed, the most 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 would be pleased to answer any questions that you might have at this time.