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AN EVENING WITH

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Good evening, ladies and gentlemen. I am delighted to join you at this meeting of the Washington area MIT alumni. Ever since Dr. McIntyre first contacted me about participating in this evening's program, I have been looking forward to this opportunity to renew some of my MIT acquaintances and to meet others of you perhaps for the first time. Whether we know each other well, just in passing, or not at all, we share the common experience of an MIT education that has had much to do with defining who and what we are, and determining the roles we play in the economic, social, and cultural life of our country.

Coincidentally, I have just returned from a trip to New England that included a visit to the MIT campus, not in my usual role of trustee, but as a guest speaker for a seminar in the Nuclear Engineering Department, where I discussed the role of probabilistic risk assessment in nuclear reactor regulation. Nuclear reactor regulation is only one (but major) aspect of the mission of the Nuclear Regulatory Commission (NRC).

By way of background, the Nuclear Regulatory Commission is an independent regulatory agency created by the Congress in 1975 to regulate the civilian uses of nuclear material. Specifically, the NRC is responsible for ensuring that activities associated with the operation of nuclear power plants and fuel cycle plants, and medical, industrial, and research applications, are carried out with adequate protection of the public health and safety, the environment, and national security. At full complement, the NRC has five Commissioners nominated by the President and confirmed by the Senate; the President designates one of the Commissioners as Chairman. Since July 2, I have been the Chairman of the NRC.

Although it is only 20 years old, the NRC's roots go back to the World War II Manhattan Project and the Atomic Energy Commission (AEC), the powerful Federal agency created in 1946 to control the technology of the atomic bomb and to explore potential further military uses for atomic energy. Following President Eisenhower's address, "Atomic Power for Peace," before the United Nations General Assembly in December 1953, the idea of encouraging civilian uses of nuclear energy gained prominence. Congress authorized the AEC to pursue the development and utilization of nuclear technology and materials for peaceful purposes and to develop regulations to protect the public health and safety from radiation hazards. Although the AEC regulatory program grew steadily in the ensuing years, it remained both relatively small and decidedly secondary to the AEC's other priority tasks -- managing the U.S. nuclear weapons program and promoting the development of a nuclear industry within the private sector. By the early 1970's, the number of licensed power reactors increased and public concern about safety rose in tandem. In 1974 the Congress decided to separate the AEC's promotional and regulatory functions and established the NRC as a separate Federal regulatory agency free from the responsibility to encourage the development of a nuclear industry and protect weapons technology, concentrating solely on the regulation of the civilian uses of nuclear material.

For the most part, the NRC's most important responsibility in the 1970's was to continue the power reactor licensing activities of the AEC, albeit devoting greater attention to public health and safety issues than its predecessor agency had. However, a series of incidents, beginning with the fire at the Tennessee Valley Authority's Browns Ferry plant in 1975, the TMI accident in 1979, and the Chernobyl accident in the Ukraine in 1986 increased concerns about the safety of nuclear power generation. This concern, and the rising costs of building a nuclear power plant relative to alternative energy sources, have reduced reactor licensing activity to the point where I think I can safely say that, once the issue of the licensing of TVA's Watts Bar plant is resolved, the NRC is unlikely to issue another new operating license in the 1990's and perhaps for some time into the next century.

In the minds of some, particularly today when criticism of government has become a more prominent feature of our public discourse, regulatory agencies conjure up a negative image of prolonged legal proceedings, tedious and arcane rules, and unreasonable interference with personal and business pursuits that government should avoid. Yet the NRC is in reality a technical agency, a small corner of the Federal Government where science and technology predominate, and where the issues being addressed are not arcane, obscure, and uninteresting, but instead go to the very heart of important national policy issues and are

directly related to the protection of the public health and safety and national security. They are the kind of science and technology-based issues that I find exciting. The opportunity to use a science and technology base for the protection of public health and safety is very important to me. I want to highlight some of NRC's major activities today to show you why I find the Commission such an engrossing place to work.

CURRENT ISSUES NRC AND INDUSTRY FACE

With regard to the current issues, some are unique to NRC while others are the same issues that the nuclear industry must also address. For instance, the NRC needs to be poised to respond to a rapidly changing environment which may affect the scope and focus of major NRC programmatic activities and may lead to new areas of NRC regulatory responsibility. The Congress is currently considering nuclear waste storage and disposal and placing greater emphasis on the development of a centralized interim storage facility rather than deep geologic disposal of high-level nuclear waste. Therefore, NRC must ensure that it is prepared to review a license application for an interim centralized storage facility. We are currently re-examining the focus of our low-level waste program -- since Congress gave responsibility for identifying sites and developing disposal facilities to the States and at the present time, it appears that most, if not all, low-level waste disposal facilities will be licensed by Agreement States. Agreement States are those states with which the NRC has entered into an agreement allowing the State to regulate most uses of radioactive materials with the exception of nuclear reactors.

Another area in which the scope and focus of NRC efforts may change is in our medical regulatory program. We have asked the National Academy of Sciences to conduct an independent review of our regulation of the medical use of byproduct material. The Commission intends to consider their findings, which are expected in early 1996, as we evaluate possible changes to our program.

As for new missions, the NRC is one of the agencies being considered by an advisory committee formed by the Department of Energy which is currently examining and will make a recommendation late this year on external regulation of DOE facilities. If this responsibility is assigned to the NRC, it would add significantly to our current nuclear regulatory responsibilities requiring agency restructuring and significant additional NRC resources.

The U.S. electric industry is restructuring in an effort to stay competitive, to lower electric rates to consumers, and to respond to Federal and State regulatory initiatives. Rate deregulation and competition will pose unique challenges to U.S. nuclear

utilities and to the NRC that, as of today, are not completely defined. In the end, whatever changes occur as a result of competition and economic pressures, it is essential that we continue to ensure continued safe nuclear operations.

An issue that both the nuclear power industry and the NRC confront is aging, which affects all nuclear 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 for the long term. Two that are of great importance are reactor pressure vessel embrittlement and steam generator tube degradation. Both issues could cause older plants to be shut down, as was the case with Yankee Atomic Electric Company's Yankee Rowe plant and Portland General Electric Company's Trojan plant. These utilities elected premature shutdown and early decommissioning of these plants when the economics of competing power sources and degradation of the reactor vessel and steam generators no longer made continued operation a viable option. However, where these issues can be adequately addressed, the NRC has developed a regulatory process that would allow a licensee to extend operation up to 20 additional years beyond the current license limit of 40 years. The industry is also faced with making decisions on new generating capacity. Of course, what will drive the possible selection of a nuclear plant as a new electrical generation source will be the need for the energy, the economics of competing options, public acceptability, and our regulatory process. We have a new streamlined licensing process which we feel is reasonable, protects public health and safety, is less burdensome than the licensing regime for existing nuclear plants, and encourages standard plant designs.

There is always room for improvement in the interaction between the regulator and the regulated. The NRC should believe in its regulatory framework, and licensees should live within its requirements. That is not to say, however, that there is no need for refinement in NRC's regulatory framework. In addition to the NRC's regulatory initiatives, the nuclear industry as well needs to take advantage of tools that are in place to make changes where the regulatory framework may be out-dated, no longer makes sense, or is unduly burdensome, such as reactor licensees moving to improved standard technical specifications

Finally, the NRC is facing a ten percent budget cut just for fiscal year 1996, and 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.

NRC RESPONSE

Response to Industry Restructuring

Now that I have briefly described some of the current issues both NRC and the nuclear industry face, I will describe our response to these issues. Since our primary focus must remain on the safety of the U.S. nuclear industry, we must keep abreast of how rate deregulation, competition, and economic constraints affect reactor licensees. The concern that I have, as a regulator, is that in a competitive market, nuclear electric generators must continue to maintain high safety standards, with sufficient resources devoted to nuclear operations, and maintain decommissioning funding assurance. 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 with regard to funding assurance are fully adequate. The NRC staff has proposed that the Commission initiate a rulemaking to amend the Commission's regulations 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 implementation of 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 systems, structures, and components 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 level of safety still exists.

The integrity of the reactor pressure vessel (mentioned previously) 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 NRC pressurized thermal shock screening criteria before the end of their license 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, which are not academic exercises. The Palisades Nuclear Plant in Michigan 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 their steam generators, as some have done already, in order to continue to operate safely.

License Renewal

Although plants are aging, the NRC recognized that, if aging is addressed properly, it clearly makes sense that the nation should make the most efficient use of its energy resources. In the case of nuclear power, this means creating an effective regulatory environment in which plants still capable of additional years of safe operation may continue to operate. The NRC has recently developed a regulatory process to handle license renewal in Part 54 of its regulations and stands ready to review an application when one is received. Reports from industry groups in support of generic license renewal programs have been received but no license renewal application has yet been filed. I would like to see this process tested during my tenure as Chairman.

New Nuclear Capacity

Although new nuclear capacity does not seem to be on the U.S. nuclear industry's horizon at the moment, standard nuclear power plant designs are available as a source for new generating capacity, and a streamlined licensing process exists. A number of other countries are considering nuclear generating plants as they expand their electric power sector. The NRC has issued final design approvals for two standard reactor designs -- the General Electric Advanced Boiling Water Reactor and the Combustion Engineering System 80+ -- and is in the process of certifying these designs by rulemaking. We expect that the certification of the two standard reactor designs for which we are currently assessing public comments will be completed next year. The NRC's review of two additional revolutionary light water reactor standard design applications that employ passive safety features and greater use of modular construction--the Westinghouse AP600 and the General Electric Simplified Boiling Water Reactor (SBWR) -- will continue.

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 into 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, and 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 internally and with other applicable statutes and regulations, its fairness, and how well the regulation fits into the entire existing regulatory program. All this must be accomplished 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 external 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, and a draft proposed reliability data rule. These rules assume the use of Probabilistic Risk Assessments (PRAs) to risk-inform both regulatory and licensee activities. 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 the 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.

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 common 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 the challenges we face effectively and to guide intelligently our activities and decision-making in the future.

INTERNATIONAL INVOLVEMENT

With regard to NRC involvement internationally, the development of nuclear power has always been a global undertaking, with extensive sharing of information and transfer of technology among nations. However, this development has been uneven, with different countries 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 abroad, 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, and Asia, where ambitious nuclear power programs are beginning. 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.

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 assistance.

Since the 1992 Munich Summit of the seven western industrial countries, 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.

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. It is clear that the issue of enhancing safety and closing the least safe plants must be approached comprehensively. Important aspects here are providing 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 nuclear plants, 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," a bilateral US-Russian body chaired by the Vice President and Prime Minister to enhance cooperation in science and technology. 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 shutting down the Soviet-designed reactors at Chernobyl. In less than six months, we will commemorate the tenth anniversary of this worst reactor accident in the history of civilian nuclear power. I hope 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 accounting (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 undergirding our regulatory program 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 greatly from the information and insights we are able to gather from both regulators and operators in foreign countries. 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, many of whom look to the NRC to establish standards.

CONCLUSION

Although NRC has done a great deal to address the issues that confront the agency and the nuclear industry, we need to do more to ensure that we have positioned ourselves to prepare for changing missions and budget, deal with economic pressures being faced by the electric utility industry, address aging issues, and improve the regulatory framework. In addition to the activities that I have already described to you, I also recently challenged the nuclear industry to evaluate new techniques and to determine what more can be done to improve measurement of embrittlement changes in operating reactor vessels. In addition, I proposed an international reactor safety research program, focused initially in aging and risk assessment methodologies, and a coordinating mechanism for regulators that will draw upon the knowledge and the talent available in the international nuclear community to address the issues we face head-on. By asking the right questions and focusing the NRC staff's and industry's attention on new approaches to the key issues, I believe that I can move the NRC to meet its public health and safety responsibilities more effectively.

Thank you for your attention. I would be pleased to answer any questions that you might have at this time.

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