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NUCLEAR SAFETY ASSURANCE IN A GLOBALLY CHANGING ENVIRONMENT

Remarks of
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at the

33rd JAPAN ATOMIC INDUSTRIAL FORUM ANNUAL CONFERENCE

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INTRODUCTION

Thank you, Mr. Chairman. I am pleased to participate in the annual conference of the Japan Atomic Industrial Forum during my first visit to Japan as Chairman of the U.S. Nuclear Regulatory Commission.

In his letter of invitation, Professor Mukaibo asked me to discuss my perspectives on the assurance of nuclear safety for the future, considering the changing environment for the utility industry around the world. The word “environment” in this context has two possible meanings: first, the operating environment in which utility companies—and regulatory agencies—will find themselves in the 21st century. And second, the global environment in which we live, among increasing concerns about toxic emissions, global warming, and the need for energy technologies that do not contribute to these problems. Both of these interpretations of “environment” are relevant to the issue of the future of nuclear power and the assurance of its safety.

Japan is a particularly appropriate place in which to discuss these matters for two reasons. First, with relatively few domestic energy resources, this country must carefully weigh the options available for providing for the current and future energy needs of its people and industries. As the first country to build and operate an Advanced Boiling Water Reactor, Japan is a leader in building a foundation for the future of nuclear power generation. Moreover, Japan has an impressive performance record with

its more traditional nuclear plants. I had the opportunity yesterday to visit the plants at Kashiwazaki-Kariwa, and was impressed with what I saw. Second, the recent tragic events at Tokai-mura have given the world much to consider regarding the subject of nuclear safety assurance. This accident has served to remind us that nuclear technology can be dangerous, and we must always be vigilant when we use it. Although the JCO facility was not a nuclear power plant, the repercussions from the accident have had a major impact on nuclear power issues both in Japan and worldwide.

The international focus of this conference is also appropriate. Nuclear technology is now pervasive throughout the globe. Over 400 nuclear power plants are now operating in more than thirty nations, supplying about one-sixth of the world's electricity. In several countries, nuclear power supplies over 70% of domestic electricity production. New nuclear capacity is planned or is being considered in a range of nations: some with established civil nuclear programs, such as France, Japan and the Republic of Korea; some with mid-size programs, such as India and China; and some that do not currently have nuclear power, such as Turkey, Bangladesh, Vietnam and the Democratic People's Republic of Korea. In the U.S., although new plants are not being built, we have begun to renew plant licenses to permit operation beyond their original 40-year lifetimes. We have heard that up to 85% of our 103 currently-operating plants may ultimately seek license renewal.

Not only is nuclear technology pervasive, but also the nuclear enterprise in each country is integrally connected with those in other countries. Regulators have frequent interactions on policy matters and leverage research money through joint international activities. Construction consortia drawn from multiple countries build the plants. And, foreign ownership of plants, while often limited by national laws, is becoming more common.

These developments show we are engaged in a common enterprise and reinforce the demand for even greater attention to the issue of nuclear safety. As we have all experienced, a nuclear accident can have consequences that transcend national borders and, in any event, will affect public attitudes everywhere. If nuclear power is to continue to make a significant contribution to the world's energy supply in the coming century, we—utilities, vendors, researchers, regulators, and policy makers—must all work together to ensure that those who use the technology have safety as their primary goal. Moreover, we must ensure we have the necessary resources and technical capabilities to achieve that goal.

With that introduction, let me turn to a discussion of the U.S. NRC's approach to nuclear safety assurance, after which I will return to the issue of international cooperation.

THE U.S. NRC'S APPROACH TO NUCLEAR SAFETY ASSURANCE

Under U.S. law, the NRC has the responsibility to protect the health and safety of the public in virtually all aspects of the civilian use of nuclear technology. This includes not only nuclear power plants, but also non-power reactors, nuclear fuel cycle facilities, waste disposal, and the industrial and medical uses of nuclear materials. Although there are only about 40 U.S. companies that own nuclear power plants, the number of licensees in the materials and waste areas is in the thousands. Nonetheless, roughly 65% of the NRC's budget for regulatory activities goes to nuclear reactor safety, and I will focus my remarks primarily on that aspect of our work.

The foundation of the NRC's regulatory philosophy is that our licensees are responsible for the safe use of the technology. Thus, nuclear power plant operators must ensure safe operations. The NRC establishes a regulatory framework; verifies through inspections and other types of reviews that the

framework is being followed; ensures that problems that arise are identified and their “root causes” are established, are corrected, and are kept from recurring; and in those instances in which serious violations of our regulations occur, the NRC takes enforcement action to require licensees to focus on significant problems. In rare instances, the Commission may determine that a licensee’s operation of a plant does not ensure adequate protection of the public, and order the plant to be shut down until remedial measures are taken.

In the last few years, the NRC has begun a fundamental change in the way in which it regulates. We have established a set of four strategic objectives for our regulatory program: (1) maintain safety; (2) increase effectiveness and efficiency; (3) reduce unnecessary regulatory burden; and (4) increase public confidence. The objective of maintaining safety—rather than increasing safety—reflects a recognition of the established safety record and maturity of the nuclear power industry in the United States. The objectives of increasing efficiency and reducing burden respond directly to the deregulated business environment in which some utilities must now operate, and which we expect will become dominant in the next few years. As for the fourth objective, increasing public confidence, I cannot stress too strongly the need for all of us to communicate effectively with the national and international public about nuclear technology. It is the public that will determine the future for nuclear power.

I would like take a moment now to expand on the context for achievement of these objectives. Deregulation of electricity pricing in many parts of the U.S. means that electricity generators must compete in an open market in which the cost of generation will determine what types of plants are built and operated. We recognize that our regulations have an economic impact on our power plant licensees—not only because of the costs of regulatory compliance, but also because, under U.S. law, the costs of NRC’s operations are largely recovered from our licensees. Because in a deregulated electricity market every form of electricity generation must compete with all others, the costs of regulation come directly from the bottom line. As a result, we make every effort not to impose excessive burdens on licensees.

Coupled with the deregulation of electricity prices has come a significant restructuring of the utility sector of the U.S. economy. In contrast to many countries that have only a few nuclear plant operators or one national utility, we have over 40 companies that operate nuclear power plants. Some of those companies own as many as 10 plants, but many own only 1 or 2. In an environment of price deregulation, many utilities are choosing to sell their generating assets and become distribution companies. This has created an active market in “used” nuclear plants as some smaller utilities get out of the nuclear business, and several plants have already been sold at prices far below their original capital costs. We anticipate that further sales will occur, and the consolidation process will result in a few large nuclear operators, which may be either single companies, partnerships, or operating consortia.

The NRC views these developments with cautious optimism. The companies that are acquiring these plants are generally good performers, and we expect that consolidation will bring their good operating practices into more plants. However, we must ensure that, as these large operators acquire more plants, they devote adequate resources to fixing any existing problems and that they do not stretch themselves too thinly by taking on more facilities than management can handle.

Consideration of our strategic objectives is also causing the NRC to change the ways in which we undertake our mission. In the early 1990s, the Commission determined that the science of quantitative risk assessment had matured sufficiently, and that the underlying database on equipment reliability

arising from approximately 2000 reactor-years of operation was sufficiently robust, as to permit the use of probabilistic safety assessment in “risk-informing” our regulations. By “risk-informed,” we mean that risk insights are considered, along with more traditional deterministic assessments, in evaluating licensee performance and proposed actions, such as in-service inspection and technical specification changes. We are also making our regulations more “performance-based,” so that licensees are given more latitude in how they meet regulatory requirements. These new directions have, for example, been applied in the overhaul of our plant oversight process; we now use objective performance indicators (e.g., number of scrams per year) along with risk-informed inspection techniques to provide a better focus on safety. We believe that these changes directly address the goals of maintaining safety and increasing efficiency and effectiveness, by permitting us to focus on the most risk-significant safety issues. However, I must also point out that this new focus on risk has not affected other aspects of our regulatory philosophy, such as the concept of “defense-in-depth,” which is still a fundamental part of the NRC’s approach to safety.

The technical bases for accomplishing our new regulatory approach rest largely on the work of our Office of Research. It might have been difficult to foresee in the early 1970s, but the NRC’s pioneering work in probabilistic risk assessment—the WASH-1400 study—has ultimately led to our capability to incorporate quantitative risk evaluation into our decision-making processes. Our research program is currently preparing to support new agency work in areas such as mixed-oxide and high-burnup fuels; it is providing the basis for adoption of new technology, such as digital instrumentation and control systems; and it is continuing to provide the foundation for risk-informed regulation and our new reactor oversight process. The thermal-hydraulics program, which sponsored development of the widely-used RELAP and TRAC computer codes, is using state-of-the-art techniques to develop new analytical tools that will remove excess conservatism from reactor safety analyses while maintaining adequate safety margins.

The fourth of our strategic objectives, to increase public confidence, may be the most challenging task of all. It is essential that our regulatory actions both be fair and be perceived as fair. This does not mean that outcomes of our actions will be completely satisfactory to all interested parties, but rather that those parties must be confident that their concerns have been heard and taken into consideration as the NRC reaches its conclusions. A key to achieving this perception of fairness is to be open and accessible. New initiatives we have undertaken in this connection include establishing a website on the Internet through which the public may get information about our activities, and increasing our interactions at all levels with our “stakeholders”—those with an interest in the NRC’s activities—through public meetings, workshops, and other outreach efforts.

To summarize, we believe that the NRC’s efforts to apply our strategic objectives, as perhaps best revealed by our efforts to risk-inform our regulations, will serve to focus our regulatory activities on the issues of highest safety significance. In this way, we expect to meet the challenge of the changing economic environment for nuclear power in the U.S. and to assure that our licensees maintain a vigilant approach to nuclear safety. At the same time, our approach to regulation should permit the U.S. to retain nuclear power as a part of its energy strategy, thereby helping to meet the challenges associated with reducing greenhouse gas emissions. It is also important to note that many of the activities underpinning our new regulatory approach are international in scope. We could not accomplish our objectives without the participation of our international partners. This leads me to my other major theme: the role of international cooperation in meeting the challenges of the future.

INTERNATIONAL COOPERATION IN NUCLEAR SAFETY ASSURANCE

Whether or not to use nuclear power; the number, size, and location of plants; and the methods used both by plant operators and regulatory agencies to ensure safe operation and public protection are matters of sovereign concern. But there is a vital need for international cooperation to ensure that safety is *the* fundamental consideration in the use of nuclear technology. As we have seen many times over the years, an accident involving nuclear power or nuclear materials can have psychological impact far beyond the physical consequences of the event. In some instances, such as the Chernobyl accident, the physical consequences were international as well.

When we speak of international exchange and cooperation, the two organizations that usually come to mind first are the International Atomic Energy Agency and the Nuclear Energy Agency of the Organization for Economic Cooperation and Development. Both of these agencies play crucial roles in fostering the exchange of technical information in areas as diverse as safety, safeguards, materials and waste. However, this is just the beginning of the story. As important as the programs of the IAEA and the OECD/NEA are in helping to ensure nuclear and radiation safety, the extent and scope of international cooperation go far beyond the activities of these two bodies.

As I mentioned earlier, nuclear power has clearly become an international business in every aspect: design, construction, operation, and regulation. Most of the major nuclear steam supply system vendors are now multinational corporations or have international partners. Of the vendors operating in the U.S., B&W is owned by Framatome, Westinghouse is owned by BNFL, and Combustion Engineering soon will be a BNFL subsidiary, as well. Outside the U.S., Siemens and Framatome have joined their nuclear businesses. There are French plants operating in China, Canadian plants operating in the Republic of Korea, and the ABWRs in Japan are a product of a cooperative venture between Japan's Toshiba and Hitachi and GE Nuclear Energy from the United States. The deregulation of the utility sectors in the U.S. and in other parts of the world has resulted in numerous acquisitions and joint ventures. One of the most prominent partnerships, Amergen, formed by British Energy and the Philadelphia Electric Company, is actively engaged in buying U.S. nuclear plants.

The nuclear industry has clearly recognized the need for and value of international cooperation and technical information exchange. Organizations such as the World Association of Nuclear Operators (WANO) promote the exchange of information on operating experience to improve nuclear plant operations. The International Nuclear Forum represents international industry interests in such matters as the consideration of nuclear power in contributing to a reduction in greenhouse gases under the Kyoto Protocol. We also see broad international participation in industry organizations based in the U.S. For instance, the Nuclear Procurement Issues Committee, or NUPIC, originally consisting of representatives from all U.S. nuclear utilities, was formed to promote a coordinated approach on oversight of nuclear vendor quality assurance. NUPIC now includes members from Mexico, Brazil, Spain, Slovenia, and Sweden. The Nuclear Energy Institute, based in Washington, D.C., has developed a substantial international membership including more than a dozen countries and international organizations, and is active in international exchanges and cooperation on many levels. The president of NEI is a participant in our conference here today.

Information exchange is also fundamental to the mission of the professional societies in the nuclear field. The American Nuclear Society, the European Nuclear Society, the Atomic Energy Society of Japan, and many other such groups hold numerous international conferences every year covering virtually every aspect of nuclear technology.

In a similar fashion, nuclear regulation has become international in scope. Cooperation among the national regulatory agencies has grown, and it is imperative that this type of cooperation continue and expand. For countries with mature nuclear programs, exchanging information on operating experiences and regulatory issues and approaches helps to promote good safety practices and to discourage poor ones. Information on emerging safety issues with regard to a particular reactor type or design may be relevant to reactors in many different countries as well. Even more important, perhaps, is international cooperation involving countries with small programs, those considering acquiring nuclear plants for the first time, or those with relatively weak or inexperienced regulatory organizations. For these countries, international cooperation can help develop the regulatory infrastructure and strong safety culture that are essential to assuring safe plant operation.

I am firmly committed to continuing the U.S. NRC's role in international cooperative exchanges at all levels. NRC staff members participate in international conferences, such as the professional society meetings that I previously mentioned, and on many international working groups, such as those organized by the IAEA and OECD/NEA. On the Commission level, my fellow Commissioners and I have met with many of our counterparts around the world to discuss perspectives on nuclear regulation and ways in which to promote adherence to the highest degree of safety assurance. The NRC's Office of International Programs coordinates technical information exchange agreements with 34 other nations. One of the most valuable methods for sharing information and experiences is through the assignment of staff to other organizations, and the NRC is proud to have hosted regulatory staff from many other countries who work at the NRC for periods ranging from a few weeks to many months. We have also sent our regulatory staff to other countries, both to provide assistance in building and improving regulatory infrastructure, and to learn from the valuable experiences of our international colleagues. NRC staff have also been key members of U.S. delegations negotiating the instruments composing the international nuclear legal regime.

One other subject in the area of international cooperation deserves special attention: the role of international cooperative research programs. As I mentioned earlier, the contributions of our international research partners are essential to the vitality of the NRC's research program. One challenging aspect of our changing environment—particularly in the United States—is the tightening of the NRC's budget, in general, and of the research budget in particular. In my meetings with representatives from many other countries I have heard that this is the situation almost everywhere. However, the need for research continues: to provide the technical foundation for new regulatory initiatives, such as risk-informed regulation; to position nuclear safety regulators to deal with new technology and new industry initiatives; to develop state-of-the-art analytical tools; and to respond to emerging technical and safety issues as our operating reactors grow older.

The NRC currently maintains 45 bilateral or multilateral cooperative research with more than 25 other countries, and thereby is able to greatly increase the value of the research in which we participate. While I could not possibly list all of the international cooperative programs in which the NRC takes part, some of the more prominent ones include the Halden project in Norway, the Cabri program in France, severe accident-related testing at the Kurchatov Institute in Russia, and the Surtsey program that was conducted in the U.S. I must also mention our very valuable collaboration with the Japan Atomic Energy Research Institute. We have conducted several joint programs with JAERI over the years. One example is the AP600 confirmatory testing program conducted in the ROSA-Large Scale Test Facility at JAERI's Tokai laboratory. This extensive series of tests, simulating design-basis accidents and transients, as well as multiple-failure scenarios, provided valuable data for the validation of the NRC's thermal-hydraulic analysis codes, and provided the NRC staff with insights into the way

in which the AP600's unique passive safety systems would behave during such events. Another program of note is the ongoing testing program on high-burnup fuel in JAERI's Nuclear Safety Research Reactor. I will be visiting JAERI tomorrow, and am looking forward to seeing these facilities—tangible evidence of the tremendous value of international cooperation.

While I have again focused in this portion of my talk on the issue of nuclear power plant safety assurance, I must add that our concerns regarding the safe use of nuclear technology extend beyond nuclear power plants and supporting facilities, such as fuel fabrication plants and waste disposal sites. The use of nuclear materials and sources in industrial and medical applications is growing rapidly, and we have seen the tragic consequences that can occur when these materials are not properly controlled and handled, as was recently the case in Thailand. These types of events can also have international repercussions, as for instance when radioactive material is accidentally incorporated into finished metal products, which are then exported to other countries. International cooperation in dealing with materials and waste issues is also essential to ensure that radioactive materials are handled in a manner that protects worker safety, public safety, and the environment. We must all make our best efforts, both individually and in collaboration, to ensure that these objectives are achieved.

SUMMARY AND CONCLUSIONS

I have tried in these remarks to give you an appreciation for the NRC's perspectives—and my own—on the issue of nuclear safety assurance as we move into the 21st century. In my view, the assurance of safety is our foremost obligation. Increasingly, the achievement of this objective will require international cooperation. I hope that you share this view, and that your members, and the nuclear industry worldwide, will join me in redoubling efforts to enhance nuclear safety in the coming years.

Thank you.