NRC NEWS

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The Role of the NRC in the Deployment of New Nuclear Technologies

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Introduction

Good morning. I am very pleased to have the opportunity meet with you today. The last time I addressed an ANS national meeting was in June 2001. It is perhaps an understatement to say that a great deal has changed since then. The attacks on the World Trade Center and the Pentagon marked a turning point in our history, and have forced a fundamental reexamination of how we, as individuals and as a society, deal with terrorism and potential threats to our safety and security. The use of nuclear technology has been a particular focus of this reexamination, both in terms of assuring the protection of nuclear facilities and related activities, and in taking steps to prevent the diversion and misuse of radioactive and special nuclear materials.

Despite these concerns, however, the U.S.'s 103 nuclear power plants have continued to operate – and, with only a few exceptions, to operate well. We have continued to see interest by our licensees in improving and extending the performance of the current fleet of plants, and, in the longer term, in possibly deploying new reactors. In keeping with the theme of this conference -- strategies for the deployment of new nuclear technologies -- I would like to focus my remarks on the NRC's role in such initiatives.

Basic Responsibilities of the NRC

Although the vast majority of this audience is familiar with the NRC's responsibilities, I must emphasize that the NRC is engaged in assuring the safe use of nuclear technology, not its promotion.

The decision to use nuclear technology is a matter of national policy. Our fundamental responsibility is to ensure that, once such a decision is made, there is adequate protection of public health and safety.

In this connection, I must emphasize that the use of new technology, either in updating existing facilities or in developing of new facilities, can result in a significant reduction in risk. Accordingly, the NRC should encourage the development and deployment of new appropriate technology. This morning I will review regulatory programs already in place to evaluate new technology, discuss initiatives designed to respond to industry efforts in developing new technologies, and examine some of the challenges that will confront the NRC and the industry in the coming years.

Setting the Stage

The interest in deployment of new technologies in the U. S., either for the purpose of updating today's plants or for building new ones, is the result of the vastly improved performance of the current generation of nuclear power plants over the last decade. We have seen industry-average capacity factors increase from 65 percent to nearly 90 percent, and the annual amount of electricity generated by nuclear plants grew by 40 percent with eight fewer plants on line. At the same time, we have seen safety performance improve substantially, with the number of significant events declining by more than an order of magnitude, and other safety-related performance indicators showing similar trends. These factors have combined to reduce the production cost of nuclear-generated electricity to the point where it is, on average, less than that from coal or natural gas.

Generating companies are still looking for ways to increase the economic benefits associated with their nuclear power plants. The two most prominent initiatives for existing plants are power uprates and license renewal, each of which involves the use of new technologies.

Licensees have sought to increase the rated powers of plants since the 1970s. Over the years we have developed sophisticated methods for analyzing the plants, which have demonstrated that large margins were generally incorporated in plant designs. With new analytical methods, more accurate instrumentation, and new fuel designs, it has been possible to increase the power output from existing plants while still maintaining adequate safety margins – in some cases allowing power uprates of as much as 20 percent. Over the last 30 years, the NRC has approved more than 80 applications for power uprates, which have collectively added nearly 4000 megawatts of generating capacity. And taking the applications currently being reviewed together with those that we expect to be submitted over the next 5 years, we expect additional uprates will, if approved, ultimately add more than 2000 megawatts. Thus, past and future uprates may collectively provide the generating capacity of six large power reactors.

License renewal is a more recent program, with the first approval issued in 2000. The program allows the extension of the initial license term of 40 years established in the Atomic Energy Act for an additional 20 years. Roughly half of all operating plant licensees have indicated their intention to pursue license renewal, and we expect that virtually all plants will eventually enter the queue. Here again, there is a link to new technology, though perhaps that link is subtle. Years of research have provided a better understanding of how nuclear plant components and materials behave as they age, permitting licensees to adjust operating conditions to prolong component lifetimes, to conduct nondestructive testing of components, and to replace aging and degraded components, such as steam generators, with new ones fabricated from more robust materials. Such advances in technology make it possible to provide reasonable assurance that a plant's licensing basis can be maintained over a 60-year operating lifetime.

Thus far I have focused on the application of new technologies to operating plants. We are also seeing the first indications of interest in the construction of new plants, so let me now turn to possible future plant licensing and construction.

The NRC has undertaken the establishment of a regulatory approach to streamline the licensing of new plants and to reduce uncertainty in the licensing process. There are three major elements in this approach: the first has already been tested; the second is about to be tested; and the third has yet to be exercised. These are design certification, early site permits, and the issuance of a combined construction permit and operating license.

Design certification is, in essence, regulatory approval of a standardized design through rulemaking. Once a design is certified, it may be referenced in an application for a combined license, without the need for review of any technical issues resolved during the certification process. An early site permit comprises advance approval of a potential site for a nuclear power plant, which may then be banked for future use. Once again, issues resolved in the early site permit review are not re-reviewed in the combined license process. And the combined license folds into one proceeding the two separate reviews – construction permit and operating license – that were required of every plant that is currently operating. Once the license is issued, the plant may be constructed and then proceed to operation, after the NRC finds that the as-built plant conforms to the license conditions. These changes reduce uncertainty by making regulatory decisions as early in the process as feasible.

The NRC has certified three designs: GE's Advanced BWR; Combustion Engineering's System 80+, and Westinghouse's AP600. A fourth design, Westinghouse's AP1000, is currently being reviewed, and we are engaged in pre-certification discussions with vendors representing five other designs. We expect the early site permit process to be tested within the next year, when we receive three applications for such permits. Only the combined license process will remain untested; for that, we must await a licensee who determines that it is time to build a new nuclear plant.

The three designs that have been certified and the one that is currently under review represents relatively modest advances on the technology of operating plants. The ABWR and System 80+ are large light-water reactors that retain many of the features of the newest operating plants. It was, therefore, possible to review these plant designs with relatively little change in the existing approach to reactor regulation. The AP600 and AP1000 are both "passive" PWRs, -- that is, they use safety systems that do not rely on pumps, but operate using either stored energy or natural processes. To support certification of these designs, Westinghouse performed extensive testing to demonstrate the performance of elements of the passive safety systems and to develop data to permit plant performance to be modeled analytically. The NRC also performed confirmatory testing to support development of our own analytical codes and to examine passive system performance beyond the plant's design basis. Since these plants are cooled and moderated by light water, the technical issues can, for the most part, be resolved using our current regulations.

We need to look to a future, however, in which other types of reactors may be brought to us for review. One design that may soon be submitted for certification is the gas-turbine modular helium reactor, or GT-MHR. Although the NRC has reviewed gas-cooled reactor designs in the past, our regulations deal almost exclusively with technical issues arising in water-cooled reactors. This raises two potential problems. First, the performance of the fuel in the GT-MHR is an essential part of the plant's safety case and the NRC has little data on this type of fuel. Second, and even more fundamental, significant modification of our LWR-based regulatory system will be necessary to assess the GT-MHR

design. Thus, the NRC's current efforts extend to the establishment of the technical capability within the agency to evaluate novel reactor designs.

The broad revision of our overall regulatory approach may provide an opportunity to make use of increasingly sophisticated methodologies for the quantitative assessment of risk, as in fact we are doing in our efforts to risk-inform aspects of our current regulations. Ideally, we might seek a regulatory structure that is applicable to any reactor type -- a regulatory system that is "technology-neutral." We are currently undertaking work in developing such a regulatory system.

I do not want to minimize the effort that will be required to build a new risk-informed, technology-neutral regulatory structure. It will take a significant investment of both time and resources. But the payoff, in terms of a consistent approach to the regulation of new technologies, could be substantial, because we could avoid the need to "reinvent" our regulations every time we look at a technology that has not previously been considered.

Challenges for the Future

Before wrapping up my remarks this morning, I would like to look briefly at some of the challenges that the NRC faces as we prepare for the future. As you will see, these challenges are not unique to the NRC; they represent concerns that are common to the nuclear enterprise both in the U.S. and globally.

A major challenge is the need to ensure that our staff will be adequate to carry out the wide range of regulatory programs on the horizon. In 2000, roughly 20 percent of the NRC staff was over 55 years of age, the age at which many career Federal employees become eligible to retire. Despite aggressive hiring of new recruits, the percentage is growing. Approximately 15 percent of NRC's engineers are already eligible for retirement and another 4 percent of the current workforce of engineers will become eligible for retirement in the next few years. At a time when the challenges we face have expanded considerably, we may not have the necessary staff resources to resolve them without significant actions to renew and revitalize our staff. To address this issue, we have made a concerted effort to identify skill gaps, to hire new staff to fill those gaps, and to ensure that essential technical skills are maintained and strengthened. I know that industry both here and abroad faces similar manpower challenges because we all depend on a common pipeline of talent. The limited supply of new people will undoubtedly affect us all for some time to come.

A second challenge is the licensing of a spent fuel repository. The continued use of nuclear power must include the disposal of spent fuel. Everyone here is no doubt aware that earlier this year, a landmark was reached when President Bush accepted the Secretary of Energy's recommendation to proceed with development of the Yucca Mountain repository and the Congress affirmed that decision. The Department of Energy must now develop an application for a license, which the NRC must then review. For the project to proceed, the Commission must find that there is reasonable assurance of adequate protection of public health and safety for a period of 10,000 years – longer than recorded human history. Clearly, this will be an extraordinarily complex and, I expect, contentious process, since the State of Nevada has declared its intention to contest the issue at every opportunity. Although the crucial first steps toward the disposition of spent fuel have been taken, we still have a long road ahead, and many issues – legal, technical, political – to resolve.

The final challenge that I will mention is the increasing need to work together internationally. The nuclear enterprise is now a global endeavor. The GT-MHR is a good example. The fuel

performance data that we would use to establish the technical basis for certifying this design may come from Germany, China, and Japan, as well as from U.S. sources. Technical data may also come from Russia. As a result, we must establish the necessary cooperative arrangements with relevant organizations overseas so as to facilitate the unimpeded flow of critical data. Moreover, we must strive to ensure that if plants built outside the U.S. are to be used to support licensing the technology in this country, there is some degree of consistency in standards to permit confidence in the use of pertinent information. This does not necessarily mean that our regulatory approaches must be the same, but it does argue for transparency in process and good communication among all parties.

Indeed, as the nuclear enterprise continues to grow beyond the industrialized nations, it is imperative that we work to strengthen the regulatory infrastructure in those countries that are just embarking on the use of nuclear power. As I have said on many other occasions, an accident anywhere in the world will affect us all. We must strive to ensure that the deployment of nuclear technology is accomplished with safety as the absolute top priority.

Conclusion

In conclusion, let me summarize my remarks by noting that we are on the threshold of a renaissance for nuclear power in the United States. New nuclear technologies have enabled us to revitalize existing plants and to plan for new construction. The full realization of this future, however, will demand vigilance by all to ensure a primary focus on safety. The NRC plays an essential role in this regard. But the obligation to ensure safety falls on all who are engaged in the nuclear enterprise. I ask for your commitment to fulfill this obligation.

Thank you.