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The USNRC's Reactor Certification and Licensing Process - Meeting the Challenge?

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I. Introduction and Overview

Good morning. It is a great honor to speak to you here in Sydney, Australia, on behalf of the United States Nuclear Regulatory Commission (NRC).

This is the first time I have been to Sydney, and I greatly appreciate the warm hospitality I've experienced here. Today, representing the NRC, I am extremely pleased to share our perspectives on nuclear regulation in general and our future challenges, given the renewed global interest in nuclear energy.

I would like to focus my remarks on several key topics: the mission of the NRC; how the NRC fulfills its mission in its role as an independent regulator; the importance of public involvement in nuclear regulatory oversight; the regulatory challenges of the increase in global interest in nuclear energy; and nuclear safety research, in particular international research cooperation.

II. The Mission of the United States Nuclear Regulatory Commission

I believe that the outlook for the safe and secure utilization of nuclear energy is very positive in light of the improved state of the technology and the expectations of the world for an improved quality of life and for socio-political stability. But I further believe that this positive outlook will continue only insofar as safe operations continue to be demonstrated.

The viability of nuclear power is inextricably linked to its effective regulation. There is no way, presently and in the foreseeable future, to maintain and to advance the use of nuclear power in free societies without a strong, predictable, and credible regulator. At the NRC, we enhance our strengths,

which include reactor safety oversight, predictability, and credibility, through technically sound regulation and by enabling public participation. In these areas, it is essential that regulatory infrastructures be strong, sound, and safety-focused, with state-of-the-art technology in every important safety aspect. As regulators, we must listen to, respect, and analyze different views from public and private stakeholders, while making and enforcing independent decisions.

The phrase "reactor safety" refers to plant design and operational characteristics that provide protection against both design-basis accidents and severe accidents, and to the training and capability of the human beings at the controls. Reactor safety thus embraces systems, structures, and components; programs, practices, and procedures; and knowledge, skills, and abilities. It also includes a factor not always measurable in numbers, but nevertheless crucially important, and that is safety culture: a fundamental commitment to safety. Reactor safety and its regulation are not only about thinking and processes, but also about conservative actions and measurable performance.

At the NRC, our regulatory standard is the assurance of adequate protection of public health and safety and the environment, and the promotion of the common defense and security. The NRC does not regulate to a standard of zero risk. Technically speaking, zero is not an option. Rather, we are responsible for assuring that the risk is understood, that it is managed, and that it is acceptably low. Today, with risk-informed regulatory tools, we know how to combine deterministic and probabilistic regulation, how to add requirements when necessary, and how to decrease the unnecessary requirements. In other words, we are assessing and quantifying safety and risk.

The NRC's implementation of risk assessment in reactor regulation involves the systematic incorporation of risk insights into the regulatory process, which we now call risk-informed regulation. This regulatory approach takes advantage of the great progress that we have made over the past 30 years in our ability to assess the risks associated with nuclear plant operations. Our knowledge, however, is not perfect; there are still uncertainties and phenomena that are not completely understood. Thus, risk insights are used as one element of regulatory decision-making, but not the only consideration. There is still a need to ensure defense-in-depth and adequate safety margins.

Today, in the United States, reactor safety performance continues to be very sound. Safety measures, including performance indicators and inspection findings, are strong for most plants. But safety measures by themselves are not enough – it is essential that both the companies we regulate, which are our licensees, and the NRC itself maintain a continuous commitment to safety and the technical competence to achieve it. Commitment to safety must also be reflected in each licensee management's vision and expectations for success and in its willingness to place safety ahead of profit. Commitment to safety also means that each licensee, vendor, consultant, and worker in the nuclear field must understand the safety implications of his or her job and have a sense of dedication to do it well.

In my view, nuclear regulation is for the well-being of the people, for the common good, with full consideration of the national interests and of international law and agreements. Nuclear regulation must be a disciplined national tool for establishing predictable safety and security frameworks. It works by establishing and improving technical and legal structures to define the acceptable safety case that serves the public interest by providing for the beneficial safe utilization of nuclear technologies. Although regulations often restrict, regulations should not deter beneficial activities, but frame them and guide them. Thus, regulations should not be unnecessarily burdensome as they establish adequate

margins of safety.

Poor regulation, on the other hand, provides too few or too many controls, focusing more on restricting, limiting, and controlling, losing sight of the common good. This contradicts the fundamentals of a democratic society and the free market. Poor regulation can create the illusion of being "protective" while reducing choices and innovation that may actually benefit safety.

In this regard, I quote the objective stated by the NRC in its current Strategic Plan. Note that this statement begins with the word “enable,” not “promote.” This essential difference guides all our actions. That objective is to:

> Enable the use and management of radioactive materials and nuclear fuels for beneficial civilian purposes in a manner that protects public health and safety and the environment, promotes the security of our nation, and provides for regulatory actions that are open, effective, efficient, realistic, and timely.

I wish to close my remarks on the mission of the NRC and its regulatory objective with a word about the importance of an open, public process. Openness is essential to regulatory strength and stability. In the United States, individual members of the public have an opportunity to comment on regulations the Commission proposes to issue, and the NRC addresses their comments in a public process. In addition, our enabling legislation provides for public hearings in connection with the licensing of new reactors and amendments to existing reactor licenses.

The NRC takes its responsibility for public participation very seriously and strives to communicate all aspects of our regulatory actions to interested members of the public, the regulated community, and government bodies. Of course, not all information should be made public – in particular, information that could impact the security of nuclear materials and nuclear reactors. In those special cases, we strive to balance openness with security. In general, we recognize and understand that public participation in the regulatory process leads to public understanding of the reasons behind our decisions.

When the public has an opportunity to learn about our decisions and participate in our decision-making process, nuclear safety is enhanced and public confidence in the NRC as a fair, stable, and strong nuclear regulator is strengthened. Public confidence in the safety and security of nuclear energy programs is vital to the future of nuclear energy in all nations of the world, and well-informed citizens are essential to an understanding of the operations, risks, and benefits involving the nuclear energy option.

III. The Global Interest in Nuclear Energy

The U.S. Department of Energy recently estimated that the global demand for energy may increase as much as 50 percent by 2025, with more than half of that growth coming from the world’s emerging economies. For electricity, the growth is projected to be particularly steep, increasing more than 75 percent over the next two decades. To begin addressing that challenge today, the President of the United States has stated policy goals that support worldwide expansion of nuclear power.

The reasons for this are clear. Nuclear power is a mature technology with significant potential

to provide large amounts of emissions-free baseload power. Benefits from nuclear power include the abatement of greenhouse gas emissions and air pollution, as well as energy diversity. Other nations have reached a similar conclusion. A 2005 United Nations study clearly revealed the not-surprising correlation between a country's standard of living and its per capita electricity consumption. With more than 20 new nuclear plants under construction worldwide and additional plants planned or under consideration, it is important that nuclear energy expand in a way that supports global safety, security, and the environment.

As we look forward in the United States, we also see the possibility of new nuclear plants being built, despite a 25-year pause in new plant license applications and 10 years since our last new plant startup. We understand that nuclear power is now a global enterprise, and that we all have an abiding interest in seeing that the use of nuclear power is accomplished with a focus, first and foremost, on safety. While nuclear power can be an economic source of energy for many nations, economic considerations can never be allowed to overtake safety as our primary concern.

For nuclear power to occupy a place in the energy portfolio of the world, much work is still needed by both regulators and the industry. Every nuclear operator in every country needs to be committed to safety first and foremost; only through effective safety management can reliability and productivity be achieved. Every nuclear regulator is entrusted with the responsibility of assuring adequate protection of the public and the environment, while enabling the beneficial uses of nuclear energy and radiation.

At the NRC, we are using a new licensing process, involving design certifications, early site permits and combined licenses, developed about 15 years ago. The standard design certification process allows a reactor vendor to submit a design to the NRC for review and certification. The application is independent of a site, and the safety reviews are completed based on an essentially complete design. Certified designs actually become part of our regulations. For that reason, public notice and public comment opportunities apply to the NRC's review of these applications. To date, we have certified four designs.

A combined license authorizes both construction and conditional operation of a nuclear power reactor. To simplify our review process, a combined license application may incorporate by reference either a certified plant design or an approved early site permit or both. After the plant is built, the Commission must find that all necessary inspections, tests, and analyses have been performed and associated acceptance criteria have been met before granting authorization to operate.

The nuclear industry has publicly announced that 19 potential Combined License (COL) applications may be submitted to the NRC starting in late 2007, for a total of up to 27 new nuclear power plants, distributed among the three major reactor vendors now competing for the U. S. marketplace.

To accommodate this extraordinary increase in regulatory review workload, the NRC staff is planning to implement a design-centered approach to facilitate parallel review of multiple standardized combined license applications. This approach is directly dependent upon the industry's commitment to standardize COL applications for a specific reactor design. I believe this approach to licensing is crucial to completing timely reviews for multiple applications. It is based on the principle of "one issue, one review, one position" for multiple COL applications, and it is intended to optimize the

NRC's review effort and the resources needed. The benefits of a design-centered licensing review will be achieved only to the extent that the reactor vendor and the utilities standardize the pertinent sections of the applications.

Moreover, to prepare for the construction of new reactors, a new construction inspection program (CIP) is being developed. This program will cover all aspects of new plant construction from early site preparation work, through construction, to the transition to inspections under our reactor oversight process (ROP) for operating reactors.

Finally, to meet the coming increased regulatory challenges the NRC has started to expand our highly skilled workforce, but our efforts are in competition with the nuclear manufacturing, construction, and operating segments of the industry. As a regulator, the NRC has a strong interest in the overall availability of the people necessary to successfully accomplish a nuclear expansion. I believe this challenge must be met by concerted efforts across all segments of the industry and government, and directed toward every level of education, starting with encouraging more science in elementary schools.

Let me give you a sense of the gravity of the situation in the United States. Nearly half of the current nuclear power plant workers are over 47 years old, and nuclear energy companies could lose as many as 23,000 workers over the next five years, which is about 40 percent of the total jobs in the sector. Key suppliers to the industry, including architect/engineering firms, fuel suppliers and reactor manufacturers, are in a similar situation. Retiring workers must clearly be replaced and the existing workforce augmented if we are to build new plants. Some progress is being made, for example, at NRC: Our average employee age has dropped from a peak of 48.3 years in 2000 to 47.7 in 2006 due to our entry-level hiring emphasis.

The number of four-year nuclear engineering programs in the United States now stands at about 25 nationwide, which is down from 38 in the 1970s. But the potential student interest is clearly there. A recent survey shows that undergraduate enrollment at 23 reporting institutions in nuclear engineering, health physics, and radiological and related fields has increased over 100% since 2001 to a current total of 1,520. Graduate enrollment has risen above 1,000. But we need more scholarships, training centers, recruitment, internships, and mentoring programs as we engage in generational knowledge transfer. We must all work to increase this talent pool to avoid competing for the same small number of candidates. There cannot be winners and losers, because if there are, then we will all lose.

IV. International Cooperation and Nuclear Safety Research

The NRC has a strong interest and commitment to utilizing international collaboration to deal with the realities of the increasing "internationalization" of nuclear technology. We recognize that changes in the marketplace, technology, and regulation have taken place around the world, and international partnerships of industry and international partnerships of independent regulators are the optimum path toward success.

On that note, the NRC appreciates and welcomes our collaboration with Australia and with many of the countries here represented on the implementation of the IAEA Code of Conduct on the Safety and Security of Radioactive Sources and on international safeguards-related implementation issues. We appreciate Australia's international leadership and outreach to assist other countries with

implementation of the Code and support for the Proliferation Security Initiative.

As I mentioned, the NRC is responsible for regulating safety in the design, construction, and operation of commercial nuclear facilities and in the other uses of nuclear materials, such as in medicine and industrial activities. As a key component of nuclear safety, the NRC carries out a nuclear regulatory research program to provide independent information and expertise needed to support the NRC's decision-making process and to identify and characterize technical questions that may become important safety issues in the future. NRC's nuclear regulatory research is designed to improve the agency's knowledge and reduce uncertainties in areas underpinning reactor safety. This development of sound technical bases allows proper focus on safety issues and more realistic decisions.

Led by the NRC's Office of Nuclear Regulatory Research, the NRC's international cooperative research program covers a wide range of activities and technical disciplines: mixed oxide and high burn-up fuel, plant aging and material degradation, digital instrumentation and control, thermal-hydraulic and severe accident analysis, probabilistic risk assessment, fire risk, radiation protection, human performance, seismic risk, spent fuel, and waste management. Through these interests, we participate in major experimental programs using test facilities that are not available in the United States. Access to these facilities expands our knowledge base, efficiently addresses research on high priority safety issues, and helps strengthen international cooperation that in turn strengthens oversight programs around the world.

Data from these programs are used to develop new analytical models and to validate existing models. International cooperative research programs also provide access to operating experience from foreign reactors, which augments our own programs in areas such as fire risk, plant aging and materials degradation, and pressurized thermal shock. Analysis of this experience contributes to our knowledge base and improved assessments of plant risk and to the development of risk-informed approaches to regulation.

In another arena of international collaboration, the NRC is working with international regulators on a multinational program, recently re-titled the "Multinational Design Evaluation Program" (MDEP). The goal is to leverage worldwide nuclear knowledge and operating experience in a cooperative effort to establish common regulatory standards for new reactor designs and to share resources in completing the necessary regulatory reviews. The first stage of the MDEP has already begun. It involves specific cooperation with the regulatory authorities in Finland and France to assist the NRC's design certification review of the US EPR. Stage 2 of the MDEP will consist of the efforts of participating nations (Canada, China, Finland, France, Japan, Russia, South Africa, South Korea, United Kingdom, and United States) to achieve convergence on certain safety codes and standards and other technical matters. A key concept is that while seeking to improve regulatory effectiveness and efficiency, national regulators retain sovereign authority for all licensing and regulatory decisions. Stage 2 is now underway with established Terms of Reference with the Nuclear Energy Agency of the Organization for Economic Co-operation and Development performing the Technical Secretariat function.

V. Conclusion

The title of my talk today is framed as a question: Are the NRC's reactor certification and

licensing processes meeting the challenge? I can confidently answer yes to the challenges we face today in ensuring operating reactor safety. Just as confidently I will answer yes to meeting the challenge of preparing to meet our regulatory responsibilities in the future.

I believe that sound regulation, including sufficient independence of nuclear oversight and public openness, will play an essential role in the success of any expansion of nuclear power. All of us have a common and most important goal to ensure safety, a goal that I am further confident our countries will continue to work toward together. In conclusion, I thank you for the great honor of speaking today on the interest of the NRC in continuing international nuclear safety information exchanges.