NRC NEWS

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"Future Challenges for the Nuclear Science and Engineering Community"
Remarks by NRC Chairman Dale E. Klein

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Thank you. I am pleased to see that this year's ICONE conference is being jointly sponsored by the Japanese Society of Mechanical Engineers and the Chinese Nuclear Society, along with the American Society of Mechanical Engineers. I had the opportunity to visit Japan last year, and China earlier this year, and I was very impressed on both trips. Many people point to a so-called Renaissance, or rebirth, of nuclear power in the United States, but as these trips reminded me, many nations never stopped building nuclear power plants. So these visits reinforced a point that I have often made to industry representatives in the U.S.—namely, that international cooperation is essential because there is much that each of our nations can learn from the others.

I will say more about that in a moment. But for now let me congratulate the organizers of this conference for helping to bring so many engineers together from different nations to promote nuclear safety around the world.

I would like to speak today about two significant challenges that we face. But before you decide that you have already heard this speech, let me assure you that I am not going to talk about quality assurance over the global nuclear supply chain, or the need to develop the human capital of the future—at least not today. Those issues are still relevant, but what I would like to address today are two future issues specifically of interest to the nuclear science and engineering communities. The first is the technical challenges presented by the aging of the current nuclear reactor fleet. The second is whether—or perhaps when—commercial nuclear power in the United States will begin to move beyond Gen III-plus, passive-design, light water reactors and what we need to do to prepare for that possibility. Obviously, these two issues are closely intertwined. In fact, I think that addressing the first challenge will begin to help us solve some of the issues raised by the second.

Let me begin with the current fleet of nuclear power plants, and the issue of life extensions. As many of you know, about half the current U.S. fleet has received or is in the process of applying for a 20-year license renewal. Many—perhaps most—of today's commercial

nuclear plants, therefore, could have another 20 years of operation. But then what do we do? One of the most challenging projects under way at the NRC right now is asking whether these plants could continue to operate safely from 60 years until… well, we don't actually know what the technical operating limits of these plants are. And that is the point. In February, the NRC co-sponsored a conference with the Department of Energy to begin figuring out what questions we would need to answer to consider life extensions for plants beyond 60 years.

We are only in the early stages, but so far we have determined that there are several areas that we need to closely examine. These include:

- Neutron Embrittlement
- Annealing/Analysis of Reactor Vessel
- Thermal Fatigue
- Environmental Qualification of Components
- Chemical control programs; and
- Transition to Digital I&C

No doubt, we will learn as we go along, and perhaps add other issues to that list as we move forward. But I think this list gives you an indication of how complex this issue is—and at least to me, fascinating. As I said, we are only beginning this process, but I do want to add one other point. No matter what the science ultimately leads us to conclude about the feasibility of life extensions beyond 60 years—and I certainly have no intention of prejudging the issue—we will accumulate a vast amount of extremely important information. The data we collect, and the scientific and engineering questions we answer, will contribute to the NRC's ongoing efforts to implement a risk-informed and performance-based approach to licensing and regulation. Refining and improving our probabilistic risk assessments will enable us to understand, license, and regulate the plants of the future that much more effectively.

The NRC's approach to risk and regulation isn't always well-understood—even by nuclear engineers. So let me say a few words about this subject. Many of you probably saw the massive media coverage a few weeks ago of the FAA's heightened inspection scrutiny, leading some airlines to ground hundreds of planes. This has led many people to reflect on how to properly assess and regulate risks. At the NRC, we have used risk assessment to inform our regulatory approach for a long time, to focus attention on areas that are the most risk-significant.

What this means in terms of enforcement is that we do not treat all violations equally, but rather weigh the safety significance implications through an assessment program. While compliance with NRC requirements plays an important role in giving NRC confidence that safety is being maintained, the NRC may exercise discretion to permit continued operations—despite a noncompliance—if the noncompliance is not significant from a risk perspective and does not pose an undue risk to public health and safety.

In addition, the NRC Enforcement Policy provides incentives for our licensees to engage in self-reporting and self-correcting actions—to resolve any potential issue quickly and effectively. In short, we don't use our regulatory authority in a strictly deterministic way, but rather deploy a variety of tools and technologies to address changing and complex issues.

Now, moving from the current operating fleet to the fleet of the future, let me say a few words about the Next Generation Nuclear Plant project, or NGNP. As you may know, the Energy Policy Act of 2005 initiated the NGNP to demonstrate hydrogen production through high-temperature processes using an advanced gas-cooled reactor design.

The NRC is working with the U.S. Department of Energy to develop a licensing framework to meet this unique licensing need, and we are currently on target to deliver the licensing strategy to Congress by August of this year, as required by the Energy Policy Act of 2005. However, DOE is still in the process of receiving submissions in response to two Solicitations of Interest it issued just a few weeks ago; so I am unable to share too much more information with you at this point. I can say that it has been many years since the NRC licensed a gas-cooled reactor, and many of the staff who performed these licensing reviews have retired. This fact—combined with advances in materials science, technology, and code development that have been made during that time—means that we must re-learn the applicable science, and re-acquire the necessary expertise needed to perform our safety reviews.

It seems to me that the need to prepare today for next-generation reactors is similar to the NRC's planning for passive design reactors back in the 1980s. In fact, I would say that it is only because the NRC has been consistently forward looking that an effective and reliable process is in place for license renewals, and that significant steps are underway to implement Digital I&C. Let me add that our commitment to keeping up with technology is also part of our effort to attract the best and brightest talent into our ranks.

Beyond NGNP, we also need to think about the challenges that might be involved with recycling of spent fuel. Other nations have chosen to recycle their spent fuel and if the United States decides at some point to resume recycling, the NRC needs to be prepared for that possibility.

One of the long-term priorities for our agency, therefore, is to begin the preparations to determine how these facilities will be licensed, and how we will maintain high standards of safety and security, while also promoting a strong non-proliferation agenda. Our challenge will be to (1) develop a regulatory framework for commercial facilities, (2) provide guidance to applicants, (3) develop qualified NRC staff to support a timely NRC licensing review, and (4) maintain an effective inspection program.

Certainly, we must engage with regulators in other advanced nuclear nations that have continued to reprocess spent fuel, as well as international organizations, to develop these capabilities if we take the path of recycling. The NRC would benefit greatly from drawing on the regulatory experiences of facilities in Britain, France, and Japan. American utilities are not, at present, placing orders for fast reactors, but we know that many nations have already made political and financial commitments to do so. Even if the United States is not yet proceeding down this path, I believe that it is important for the NRC to keep its "place at the table" in order to participate in establishing international norms and standards.

On that note—and in light of the co-sponsorship of this conference by the nuclear engineering organizations from China and Japan—let me reiterate that the NRC greatly values its interactions with our international colleagues. Our goal is not only to share information and learn about best-practices, but also to be a responsible partner in advancing nuclear safety and security.

If the so-called Nuclear Renaissance that is occurring in the U.S. succeeds, it will require regulators and plant owners and operators to look ahead to the future, but also to remain closely focused on ensuring the safety and security of existing nuclear facilities. I believe that a strong regulatory framework, constructive cooperation abroad, and careful planning at home, will help us assure sound oversight of nuclear power.

Thank you again for your kind invitation to join you today, and allowing me to share a few thoughts with you.