NRC NEWS

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"Conversion and Delivery of Electrical Energy in the 21st Century"
NRC Chairman Dale E. Klein
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The theme of this conference is "Conversion and Delivery of Electrical Energy in the 21st Century"—which would be considered a rather dry subject for a lot of people, assuming they even understood fully what it meant! Of course, everyone here knows that electricity needs to be converted from something—whether a battery, a solar cell, a hydro-electric generator, or some kind of heat source driving a steam turbine at a power plant. Then it has to be delivered through the grid's network of transformers and cables to people's homes and businesses.

But while we all know that, I think it would be useful if the general public sometimes reflected on this too. Because I think most people, most of the time, just turn on their microwaves and their computers without giving a thought to where that seemingly endless supply of electrons comes from. That raises two issues I would like to address today: the first is about some specific challenges we face in the present and near future; and the second concerns some thoughts and ideas about the long-term.

About twenty percent of those electrons I mentioned come from large commercial nuclear power plants. And large, light-water plants—most in the 1,000 megawatt range—will continue to be the focus of our licensing and oversight activities for quite a while. So far, the NRC has received 9 license applications for 15 new nuclear plants. Based on what we are being told by industry, we are expecting to receive 11 more applications for 16 more units by the end of 2009. Clearly, this will present our agency with very significant challenges as we seek to review these license applications in a timely manner.

But while there are challenges, the NRC need not be a stumbling block. Our agency has in place the staff, the expertise, and the policies to oversee a safe expansion in domestic nuclear power—assuming that our high standards for safety and security are fully met. What I am more

concerned about is the very tight global supply chain of equipment and components—and the implications this has for quality assurance. This is something I mention in many of my speeches and I don't think I need to go into that again today.

I am also concerned whether both industry and regulators will have enough trained staff over the next several decades. Specifically, while the current fleet of light water reactors were designed and built in the analog electronics era, the next wave of reactors will likely move away from analog toward a new generation of advanced control systems. So while there will be a growing need for nuclear and mechanical engineers, chemists, and geologists—among others—the need will be even greater in the area of electrical and electronics engineers, computer engineers, and others with training in advanced control systems. If any of you have suggestions for how the nuclear industry and government agencies such as the NRC, Department of Energy, and National Laboratories can improve our outreach and recruitment efforts among electrical engineers, I would certainly welcome your input.

Probably the key concern for us as regulators is understanding how new technologies in digital information and control and human-machine interface will be integrated with the most important priority: safety. Therefore, we need to work together with the utilities and the vendors to understand not only the benefits of these digital systems, but also their possible failure modes, and the means by which these systems can be designed to fulfill the demands of diversity, redundancy, and independence. This includes, of course, significant and continuously evolving challenges in the area of cyber-security.

While the NRC recognizes that Digital I&C and human-machine interface hold great promise for improving efficiency of plant operations, and can be very beneficial for utility owners, our concern as regulators is always safety first. I emphasize that because, as a regulator, my role is not to be an advocate for or against nuclear energy.

But I do think that I can be an advocate, at least on a personal level, for electricity—in part because I have personally experienced the utter transformation electrification brought to the rural Midwest several decades ago, when I was growing up on a farm in Missouri.

And that brings me to the second theme I want to address. While large light-water reactors remain our current focus, several designers of small advanced reactors have contacted the NRC about reviewing their designs. These designers see markets today for small reactors for providing process heat here in the U.S., replacing oil and natural gas as the heat source, and as multi-module reactor facilities for producing electricity. They also see markets today overseas in countries with smaller electrical needs. Let me take a few minutes, then, to talk about my personal views as well as the Commission's policies regarding these small, advanced concept reactors.

Speaking for myself, I believe these reactors may offer some safety enhancements over current large light-water reactor technologies, enable the efficient use of nuclear power where larger reactors may not be appropriate or affordable, and also provide a source of process heat in industrial applications or the production of hydrogen. These smaller reactors, which can be modularized, may be especially valuable in the developing world—where access to reliable

electricity can literally change people's lives. In fact, an economist named Robert Solow won the Nobel Prize for demonstrating that access to reliable energy is the single most important factor for economic growth. And while I recognize that there is not currently an active interest in some of these designs for domestic generation of electricity, I do feel that the NRC as a safety regulator should not be picking winners and losers with respect to advanced reactor designs because of limitations on resources to review those designs. The marketplace should make those decisions.

Let me note that I am not at all bothered by the fact there is no current interest in licensing and operating these reactors here in the U.S. by domestic customers. We have our hands full with the COL applications that we are already receiving, and the last thing I want to do is encourage submittal of additional new designs! But I will say that if and when American utilities become interested in building these reactors, I would encourage a coordinated approach to helping the NRC develop the basis for making safety decisions for these designs. I mentioned this in a speech a few weeks ago, in connection with possible fuel recycling facilities—and encouraged industry to form technical working groups among those who might be interested in building such facilities.

For now, NRC activities in this area are confined to the Next Generation Nuclear Plant, which I will address in a moment, and some requests for pre-application discussions from vendors of four small reactor designs. While these are certainly extremely interesting from a technical point of view, none of these designs is currently aligned with a license application for domestic use. Simply in terms of prioritizing resources, therefore, the review of these designs by NRC staff is considered a low priority at the present time. That does not mean we are ignoring the issue of small reactors. But our priority for non- light water reactors is the licensing activities associated with the Next Generation Nuclear Plant, or NGNP. This is a very-high-temperature, gas-cooled reactor that Congress has mandated for development under the Energy Policy Act of 2005. One pebble bed reactor design and two prismatic core reactor designs are currently under consideration.

We expect to deliver to Congress in August, jointly with DOE, our licensing strategy for the NGNP. This advanced technology presents several technical issues that we will need to address, including:

- Fuel performance,
- Containment functional performance,
- Safety and security issues,
- Material performance under very high temperatures, and
- The use of probabilistic risk assessment in the licensing process.

Clearly, a lot of work needs to be done to understand the technical basis of the non-LWR advanced reactors. But my own view is that these small, advanced designs offer enormous possibilities for providing both electricity and process heat, and for improving the standard of living for people in the developing world in the near future... and perhaps even for people here in the U.S. in the long term.

To summarize: the NRC is facing some challenges with the current influx of COL applications, but we believe we are well-prepared to perform reviews in a timely way. Quality assurance over the supply chain, and especially the need for trained personnel such as electrical engineers, however, are still a concern Over the long-term, the NRC is very interested in keeping up to date with technological developments in small, advanced concept reactors—which hold great promise for smaller markets. But for now, our main licensing focus for non- light water reactors is the Next Generation Nuclear Plant. Overall, there are some challenges, but also significant opportunties. So I would say that the state of nuclear power in the United States could be described as a glass that is half-full rather than half-empty.

Thank you again for inviting me to participate in this conference and share some thoughts with you.