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Fuel Cycle Safety:
One Commissioner's Perspectives

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at the
OECD Nuclear Energy Agency
Fuel Cycle Safety Workshop
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It is an honor to speak to the Fuel Cycle Safety Workshop. I am pleased to share my perspectives today on the role of this Workshop in the renewed global interest in nuclear energy and to discuss some of the U. S. Nuclear Regulatory Commission's (NRC) future challenges in this area.

Many meetings focus on the reactor aspects of any nuclear renaissance. But potential new reactors, as well as the existing reactor fleets, function only when all the elements of the fuel cycle operate safely. This Workshop is not only important to assuring safety of existing facilities, but it is also taking place at a time of significant change in the global outlook of the industry. It is, thus, an excellent opportunity for industry and regulators to explore perspectives on fuel cycle safety that may influence new facilities.

Global cooperation on nuclear safety is important, since nuclear energy can no longer be regarded as a strictly domestic matter for any single country. Nuclear power is now truly international, from the mining of the uranium ore, through nearly all the steps of the fuel cycle. Answers to, or expertise in, all the technical challenges in that complete cycle do not reside totally within any country. We in the United States have a great deal to learn from the international community in areas ranging from construction techniques, to UF6 deconversion, reprocessing and recycling technologies, and operations involving MOX.

I don't mean to imply that the United States does not have much to contribute to the global community in these areas; however, the inescapable truth is that we have much to gain from interactions with the international community in terms of improving the safety of our nation's fuel cycle facilities. Through our global interactions, we exchange regulatory practices and technical information that enable safe operations both here and in other countries.

There are changes on the horizon involving the entire fuel cycle. For example, when the price of uranium fell in the early 1980s, conventional uranium-mining production in the United States dropped precipitously. Many conventional mills ceased operations or closed permanently and began decommissioning and reclamation. But today, although conventional mills will continue to contribute to the supply of uranium, in-situ leach facilities are the predominant source of uranium production in the United States for reasons of both economy and reduced environmental impacts. Based on discussion with the industry, the NRC is preparing to review as many as 12 new applications for uranium recovery facilities in the foreseeable future, which represent a considerable increase in licensing activity. In addition, the international press reports many new mining and milling operations under development.

On October 3, 2007, the NRC received an application from Oklahoma-based Energy Metals Corporation to construct and operate an in-situ uranium recovery facility at Moore Ranch in Campbell County, Wyo. It is the first application for a new uranium recovery facility submitted to the NRC since 1988. The NRC staff is currently reviewing the application to determine whether it contains sufficient information to begin detailed environmental and safety reviews. If the application is deemed acceptable, the Agency will formally docket it and publish a notice of opportunity to request an adjudicatory hearing.

Other examples of changes on the horizon include advanced enrichment technologies at USEC and General Electric (GE). USEC was issued a construction and operating license in April 2007 for its American Centrifuge Plant. GE is evaluating the SILEX or Global Laser Enrichment technology for uranium enrichment and may submit a license application for an enrichment facility in early 2008.

For my presentation today, I plan to offer some perspectives on the safety, future challenges, public transparency, and human capital as related to fuel cycle facilities. I will start with NRC's top priority: SAFETY.

Safety

One aspect of this focus on safety involves the concept of safety culture. The NRC is currently seeking to improve its oversight of this attribute at licensed fuel cycle facilities. We recognize that there may be lessons to be learned from the recent safety culture initiative in our reactor oversight process that apply to other areas of regulatory oversight. While the regulatory framework for fuel cycle facilities is different from that for reactors, an approach to increase NRC oversight of safety culture at certain fuel-cycle-facility licensees will be evaluated through a pilot effort. This pilot will assess the applicability of the reactor safety culture components to certain fuel cycle facilities and examine how to incorporate them into our inspection program.

We are evaluating the role of Agreement States in regulation of fuel cycle facilities. As you may know, the NRC allows the Agreement States to regulate the use of source material and

byproduct material. Currently, 34 states have the status of an Agreement State. Because of the potential increase in the number of fuel cycle facilities, the Commission expressed concern regarding the significant resources required to license and inspect a large fuel facility and its potential impact on an Agreement State program and asked the NRC staff to make a recommendation on the feasibility of the Agency's licensing all large fuel cycle facilities. A Commission decision will be available shortly.

Natural hazards are another area in which knowledge continues to evolve, and we continue to learn from each significant event worldwide. By way of examples, construction of a first-of-its-kind, waste-vitrification plant at Hanford experienced a delay caused by the need to reevaluate seismic and other concerns. The December 2005 tsunami has led to rapid development in the state-of-the-art of prediction, propagation, and early warning systems. The implementation of performance-based, seismic criteria in a recent Early Site Permit also reflected a substantial change from the deterministic perspective of earlier years. In addition, the recent Niigata earthquake in Japan may provide new, important insights for the entire nuclear community.

Future Challenges

In recognition of the increased interest in nuclear power around the world, new approaches to management of the fuel cycle are being proposed that may significantly challenge the NRC. The Department of Energy's (DOE) Global Nuclear Energy Partnership (GNEP) is intended to develop the systems, technologies, and policy regimes to allow recycling of used fuel from light water reactors and, to a large extent, eliminate the actinides in fast-burner reactors in a way that enhances proliferation resistance. The resulting waste streams are envisioned to have characteristics that would lessen the volume and thermal challenges for a geologic repository.

The GNEP initiative could involve several interconnected (and possibly co-located) facilities:

(1) a Consolidated Fuel Treatment Center; (2) an Advanced Burner Reactor; and (3) an Advanced Fuel Cycle Facility. As currently envisioned, NRC would probably be the regulator for the Consolidated Fuel Treatment Center and the Advanced Burner Reactor, as these would be commercial enterprises. In addition, the NRC would need to be involved in development and operations of DOE's research facilities, such as the Advanced Fuel Cycle Facility, to understand issues that may affect its future licensing process. However, as DOE is formulating this program, it is not yet clear at what stage in its evolution the NRC will be participating.

I believe that NRC's regulatory role will depend largely on DOE's and industry's participation and on legislation. The interdependence of the facilities, that is, defining how each facility affects the safety, safeguards, quality, effectiveness, and efficiency of the others, will require involvement of multiple NRC program offices. We must ensure that a stable and reliable regulatory infrastructure is in place well before an application is submitted. Our challenges will be to:

(1) develop a regulatory framework for commercial GNEP 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.

NRC staff has already begun to consider a path forward, including modification of existing guidance and regulations and possible new rulemakings to address the safety and security requirements for these new technologies. Also under consideration is development of specific GNEP regulations applicable to both fuel reprocessing and fast burner reactors. Under a new agreement, DOE will provide technical information on GNEP to the Agency to enable our staff to develop the technological basis for GNEP--while making it clear that NRC will not license the planned DOE fuel-cycle research facility. Under the agreement, DOE will keep the NRC abreast of its work in development of new, proliferation-resistant, reprocessing systems for spent nuclear fuel and new burner reactors.

Whether we modify existing regulations or develop new ones, experience gained in past operations must guide our efforts. We cannot afford to relearn past lessons as we build the next generation of fuel cycle facilities. One such area of experience involves control systems. Just as digital instrumentation and control systems offer advantages in reactor safety, they also offer advantages for the entire fuel cycle. But introduction of digital systems is neither simple nor guaranteed to prevent problems. For example, last summer a scram at Browns Ferry Unit 3 occurred when a digital network controlling the reactor recirculation pumps experienced a "data storm" of excessive traffic due to malfunction of one of the components on the network. It seems there was no 'limiter' designed into the network to ensure that the data flow remained within the capability of the network.

In another example, earlier this summer, the power supply of the digital control system failed at the Honeywell UF6 conversion plant and placed plant components into a start-up configuration while the plant was operating. Operators were able to bypass the failed power supply and restore power to the work stations and communications network. However, when communications were re-established with the plant's controllers, the controllers reinitialized as designed. Unfortunately, that design reconfigured the production equipment for a "cold start," which shut a number of valves. However, because the plant was operating and "hot," the valve closure caused pressure increases in some of the process tanks. The operators noted the increasing pressures and shut the plant down safely.

Another challenge for both industry and the NRC involves management of both high- and low-level wastes (LLW). We face a monumental task to review a license application for a potential Yucca Mountain waste repository whenever DOE submits its license application. LLW issues may also present challenges in the future. Without adequate LLW disposal sites, as highlighted by the recent plans to close Barnwell in 2008 to out-of-compact states, the NRC will be faced, in all probability, with assuring that the absence of disposal capacity for such wastes does not translate into unsafe and insecure storage of the waste by generating organizations.

Another challenge involves a legislative mandate giving the NRC new responsibilities with respect to DOE's military waste management activities for certain material resulting from the reprocessing of spent nuclear fuel. NRC's responsibilities include consulting with DOE in its determination of whether such waste is high-level waste (HLW), as well as monitoring its disposal. The concept behind this so-called "incidental" waste is that some material, resulting from the reprocessing of spent nuclear fuel, does not need to be disposed as HLW in a geologic repository. Such reduced disposal requirements are appropriate only if the residual radioactivity of the material, if properly controlled, is sufficiently low that it does not represent a hazard to public health and safety.

Consequently, incidental waste is considered to be LLW, instead of HLW. DOE's technical analyses are documented in a "waste determination" to evaluate whether waste is incidental or, alternatively, is HLW. Through a consultation process, NRC is mandated to provide to DOE its independent review of these waste determinations.

While this waste determination process currently is only applicable to certain DOE military wastes, depending on details of a future possible implementation of GNEP, similar waste determinations may become appropriate for civilian waste as well.

Public Transparency

In addition to the challenges I've mentioned, we are continuously attempting to seek the appropriate balance to ensure that our regulatory processes are open to the public while maintaining the secure use and management of radioactive materials. But since NRC's Mike Weber discussed this topic in more detail yesterday, my comments on it will be minimal.

As Mike already noted, such policies represent a very delicate balance. As one example, in 2004, in an attempt to maintain the secure use and management of radioactive materials, we limited public access to all information at two of our licensed nuclear fuel cycle facilities. That policy, at the request of the DOE, was initiated in response to post-9/11 concerns that certain publicly available documents might contain security-sensitive information. Recently, the Commission recognized that too much information was being withheld, thus affecting our sharing of information on the recent spill at Nuclear Fuel Services (NFS). As a result, the Commission directed our staff to make many documents publicly available, relating to the Agency's oversight of NFS in Tennessee and BWX Technologies in Virginia, that were previously withheld pursuant to that 2004 policy.

Human Capital

Let me now switch to the subject of human capital. Both the NRC and the industry are facing critical shortages of experienced staff. No nuclear power or fuel cycle facility can operate without trained and dedicated people who have made safety a priority. Of course, regulatory bodies must also have trained and knowledgeable staff. The global growth in nuclear power compels all of us to focus on training the next generation of construction workers, electricians, welders, engineers, operators, managers, and regulators.

While NRC has experts in many of the core technical areas needed for licensing reviews of facilities for a spent fuel recycling program, we need additional expertise in several specialty fields to review the advanced technologies used in such a facility. Specifically, the NRC needs additional chemical engineers (with a detailed knowledge of reprocessing), actinide chemists, plutonium chemists, and radio-chemists. In addition, nuclear engineers with expertise in transmutation are needed to review fuel recycling facilities.

You may be aware that the NRC is engaged in strenuous efforts to increase its staff by a net of 600 people, over 3 years, to handle the increased workload of new plant applications and other nuclear regulatory business. Obviously, we cannot simply hire people off the street and send them out to be regulators the next day. Even when hiring people with substantial experience in the industry, we have found that it takes from 6 months to a year of training before

they are ready to assume regulatory responsibilities. For recent university graduates, it takes 1-2 years.

We have also employed creative approaches to build our staff capabilities. One example is the implementation of NRC's Graduate Fellowship Program for critical skills like corrosion chemistry and human factors. This Program is designed to attract and/or retain highly qualified individuals who aspire to work in areas requiring highly specialized technical knowledge and skills. This developmental program combines an initial period of work at the NRC with subsequent graduate education and a return to an NRC position that utilizes their increased knowledge.

We also want to expand our staff's knowledge base by drawing on the regulatory experiences in similar facilities around the world, such as La Hague, MELOX, and Atalante in France and Rokkasho in Japan. These and other countries have significant operational experience with facilities similar to those proposed now in the United States or which may be proposed in response to the GNEP. The discussions and presentations at this Workshop will be an important addition to the knowledge of our staff.

The NRC considers participation of our staff in these types of workshops to be vital for many reasons. I have already noted that we learn from the experience of others. In addition, it is important that we share information related to our research and regulatory initiatives, get feedback on them, and receive new perspectives from research conducted around the world. By working together, we can provide invaluable guidance on safety issues to these operating and new facilities and help ensure that safety is always the top priority.

Thank you for your attention this morning. I will be happy to take questions.

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