NRC NEWS

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No. S-10-009

Remarks By Dale E. Klein, Commissioner
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at the
International Conference on Human Resource Development for Introducing and Expanding Nuclear Power Programs
Abu Dhabi, United Arab Emirates
March 15, 2010

Thank you and good morning, everyone. I am pleased to be in Abu Dhabi, which I have heard so much about but have never visited before. During my tenure at the U.S. Nuclear Regulatory Commission as Chairman and now as a Commissioner, I have traveled extensively across the globe in support of international nuclear safety and security and visited a number of countries. So, I can say with some experience that this is one of the most impressive examples of modern development that I have encountered anywhere in my travels. I congratulate the UAE for its commitment to national development, to this location, and to the ideal of progress toward a bright future.

The topic of this conference - human resources development and the expansion of nuclear power - is about the commitment and investment in people. The importance of this "human side" of modern technology is sometimes forgotten or assumed to develop on its own once basic educational programs and institutions are put in place. In my view, the development and maintenance of a skilled national workforce is critical to the development of a stable, successful national nuclear power program.

As many of you know, I am on leave from the University of Texas and will soon be returning there. And because of my academic background, I have made the need to expand scientific and engineering education and to promote technological development a recurring theme in my numerous presentations while serving at the U.S. NRC. So I am pleased to participate in this conference today and to share the podium for this keynote address session with my distinguished and honorable colleague from India, Mr. Rajagopala Chidambaram. I also want to commend the International Atomic Energy Agency for convening this special conference on this vital subject.

The subject of highly qualified, nuclear trained people has been a significant theme in my speeches and private conversations. There is little doubt that ensuring there will be enough trained and dedicated staff in the nuclear field is a major challenge around the world.

In 2008, the Nuclear Energy Agency released its long-term energy projections. It predicted that the production of electricity from nuclear energy worldwide in the year 2050 will rise from the current 400 gigawatts to at least 600 gigawatts. That is the low estimate. The high estimate is 1,400 gigawatts. But I doubt, with today's economic conditions, that this high end number will be achieved by 2050. Nonetheless, adding an additional 200 gigawatts while maintaining the safe and efficient operation of the existing installed nuclear fleet is still a significant challenge for both the industry and the regulators.

It is likely that over the next several years, the construction of new reactors around the world will be based mostly on five or six standard designs constructed by a few multinational vendors. This will make for greater standardization and, therefore, make it easier for regulators to share safety information and training practices. However, we have already seen that these international firms are confronted with a number of differing national standards, codes, and regulations regarding the construction of the plants. Equally challenging are the skill levels and capacity of the workforce, their ability to overcome language barriers and communicate critical information and, most importantly, their understanding of safety culture. This applies to all disciplines from skilled crafts workers such as welders and mechanics to reactor operators and even to the top-level managers and Chief Nuclear Officers.

The international competition for these same skill sets will increase exponentially in the near future; moreover, there will be intense competition within each country since the operators of nuclear plants and the regulators that oversee them all need high-quality individuals. As a result, I believe strongly that planning for the development of a skilled work force has to go hand-in-hand with planning the expansion of existing nuclear programs or developing new nuclear programs. We need to be planning for the "human side" of nuclear technology now, not just the equipment.

The task of creating a skilled work force for nuclear power programs consists of two related but distinct aspects – formal education and training programs to provide subject matter skills and second, programs to create and constantly reinforce the development of a culture of safety among individuals employed in the nuclear power sector. Neither of these objectives will be easily achieved.

While each country needs to find its own way to address these human resource issues, I must point out that the U.S. program had at least two distinct advantages when its civilian nuclear power and regulatory programs began in the 1960's. First, the U.S. already had a robust national education infrastructure that provided training and degree programs in engineering and related technical areas needed for the nuclear power program. Early on, several academic institutions embraced this new field of nuclear science and invested in advanced technology programs and, perhaps as importantly, research reactors. I believe that the role of research reactors in building trained cadres is often overlooked or minimized.

Second, the U.S. had a corps of trained individuals with practical, hands-on experience in reactor operations through the U.S. Navy. These highly trained and disciplined sailors and officers were the source of the early skilled workers that staffed both the utility organizations that formed to operate nuclear plants and the early staff of the U.S. NRC as well. Even many of today's senior managers at the NRC began their careers in the Navy.

Despite these early advantages, the Three Mile Island accident in 1979 had a profound effect on the U.S. nuclear program. Construction and new reactor licensing activities slowed or ceased and while industry maintained a skilled worker base, our capacity to grow diminished. Most U.S. universities with nuclear engineering departments began to reduce their programs and decommission their research reactors. The nuclear supply chain that once was a domestic U.S. industry became international and today many of the components needed for maintaining our existing fleet of reactors must be imported.

In the past 10 years, the reemergence of nuclear power in the U.S. has forced us to look at how to rebuild our programs needed to develop the skilled workforce and capacity. It was recognized that to address these concerns requires a concerted long term effort by the government, the industry, and the academic community. In 2008, the U.S. Congress, recognizing the need to prepare the next generation of nuclear engineers and technicians, authorized the NRC to provide an additional $15 million to support education in nuclear science, engineering, and related trades to develop a workforce capable of the design, construction, operation, and regulation of nuclear facilities and the safe handling of nuclear materials.

The nuclear industry and the academic community have also been innovative in supporting work force development. For example, in addition to industry-wide efforts to support academic programs, one U.S. nuclear power plant (San Onofre in California) recently announced a joint program with a local college under which the licensee would offer 48 full-tuition scholarships for qualifying students who enroll in a new Maintenance and Operations Job Preparation Program as well as offering summer internships to the students. And in the academic community, 12 universities, including my institution, the University of Texas, have formed a consortium to foster their nuclear engineering programs. The universities provide their students online nuclear engineering programs that students can, in effect, draw upon the resources of several universities to supplement their education.

The NRC and the industry also maintain ongoing training programs for their own employees. For example, the NRC maintains its own Technical Training Center in Chattanooga, Tenn., that provides technical training, including simulator training, to enable NRC employees to enhance their skills and provide the equivalent of hands-on operating experience. The nuclear industry also invests in training programs for its employees, particularly for reactor operators. In the U.S., operators must be licensed by the NRC and pass periodic qualifying exams conducted by NRC personnel to ensure that they have maintained their skill levels and can respond to various test scenarios designed to evaluate their knowledge of the plant and the interaction of its various components.

These are examples of programs that the NRC has found particularly useful in developing a skilled workforce in the U.S. through formal education and training programs. They may or

may not be applicable to other countries, but they do illustrate the kind of concerted, long-term effort, careful planning, and commitment needed to develop the right skill sets even in a country with a long-established nuclear program. As I noted earlier, however, developing an academically trained and technologically competent workforce is only half the task before us. The other half, development of a strong and effective safety culture, is at least equally important and far more difficult to achieve.

The concept of safety culture is not unique to national nuclear power programs – it applies equally to a whole host of activities ranging from aviation to rail transportation to manufacturing. In all of these activities, we know from experience that accidents can happen, they tend to have multiple causes, even the best equipment can fail under certain conditions, and most importantly, human performance is almost always an issue even when the workforce is well-qualified and superbly trained. And the reason that human performance is so often an issue in accidents is that the beliefs and attitudes of organizations and individuals have a strong impact on safety performance. Unlike technical competence, however, attitudes and beliefs are difficult to identify and hard to measure – we know better when safety culture is deficient than when it is present and operating effectively.

I am convinced that the future of national nuclear power programs rests squarely on the establishment and maintenance of a culture of safety both at individual plant sites and within the national regulatory body. Even in the U.S., where we have questioning attitudes and individual willingness to question decisions, promoting a safety culture is a challenge. It will be even more of a challenge in countries whose traditions have not favored such individual initiative. Nevertheless, the effort must be made, and it is important for all of us to share our experience in this area to improve our understanding of, and ability to deal effectively with, safety culture issues.

I believe strongly in the importance of human capital to the success of new global initiatives to expand or develop nuclear power programs. I also believe that we need to continue to learn from each other, particularly in the area of the "human side" of nuclear technology. I hope that the IAEA will continue to emphasize the importance of these issues and sponsor additional conferences to explore them further. I also hope that my remarks today about the U.S. experience in these areas have been helpful to you.

My final remarks today are to pay a complement to the Government of the United Arab Emirates. Shortly after I became Chairman of the NRC, I heard that the UAE was proposing to build nuclear power plants. I was concerned that they might not appreciate the need for a strong regulatory infrastructure. But early on, the leadership demonstrated that they understood that nuclear was different from other energy sources and would require the government to make changes to laws, and a long-term investment in human capital. As Chairman, I directed my staff to make sure we did everything we could to assist the UAE in establishing their program. When they hired Dr. William Travers, one of the NRC's best senior leaders, to become the Director General of their new nuclear safety authority, I called him and told him he needed to keep a good record of everything his organization did to establish themselves. I told Bill that I thought the UAE was doing it right and they could become a global model for other new entrants.

Once again, my compliments to the UAE and to the leadership in their government, industry, and academia. We all have the need for safe, clean energy and we can all work together to make the world a better place for future generations…. And Bill, don't forget to invite me back when you have finished that book!

Thank you for your attention.