NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION

Office of Public Affairs Telephone: 301/415-8200

Washington, D.C. 20555-0001 E-mail: opa@nrc.gov

Web Site: http://www.nrc.gov

No. S-07-002

Prepared Remarks by Dale E. Klein
Chairman
U.S. Nuclear Regulatory Commission

at the
Distinguished Lecturer Series
Department of Mechanical Engineering
The Ohio State University
Columbus, Ohio

January 26, 2007

Thank you, Dr. Baeslack. As your introduction indicated, I have spent much more of my career in university lecture halls than I have in Washington. And I must tell you all that I am a good deal more comfortable delivering a lecture here than I am in presiding at Commission meetings or especially – with all due respect to Senator Voinovich - in appearing before Congress.

I left the comforts of academia for the more demanding atmosphere of government because I believe that government service is a duty. And if I was ever tempted to shirk that duty, I have some very good examples around me. One of them obtained a post-graduate degree from this great institution.

I know that many of you – especially those who grew up in Ohio – are familiar with George Voinovich's record of service as mayor of Cleveland, Governor of Ohio and now Senator. His interests and accomplishments are wide-ranging, but from my vantage point, as a public servant charged with protecting the health and safety of the public, he is nothing less than a champion of nuclear safety.

As the budding nuclear engineers among you know, and the rest of you may know, nuclear energy in the U.S. is undergoing a renaissance. The NRC is expecting to receive the first new nuclear reactor license applications in 30 years later this year. We are working hard to reorganize and hire more staff to handle a greatly increased workload.

If we succeed in meeting our staffing and budgetary goals, it will be in no small part due to the efforts of Sen. Voinovich. He has been a great leader in the Senate in supporting the NRC's human capital efforts, and in a broader sense, the issue of science and engineering education nationwide.

Sen. Voinovich played a major role in the inclusion of a nuclear scholarship and fellowship program in the Energy Policy Act of 2005, and also was very supportive of several important nuclear security provisions in the Act. The NRC also has benefitted – even though we don't always admit it – from his attentiveness to our regulatory performance. He consistently holds us accountable for our performance, and we are a better agency for his oversight.

I have another example of devotion to duty before me every day in my fellow Commissioner Ed McGaffigan. Ed has amassed a wonderful record of accomplishment during 31 years of public service. The last 10 of those have been spent as one of five NRC commissioners, and late last year he became the longest-serving commissioner in NRC history.

He has amassed this exemplary record despite a long and valiant struggle against an insidious disease, melanoma.

For a while, he thought he had beaten it, but it has recurred, and now his prognosis is grave. Nevertheless, he continues to come to work each day and make his invaluable contribution to NRC. His courage and dedication are an example to all of us. Last year, at a ceremony honoring him, he said, "As long as I'm here, I'm going to be dedicated to making you all improve." He has, and he will continue to do so.

Ed McGaffigan and the more than 3100 other dedicated employees of NRC have worked to earn it the designation of one of the best places to work in government. I'm not going to try to recruit you – I understand our HR Director, Jim McDermott, has already been here to do that. But I would encourage you to consider government service as an option. Men of the caliber of George Voinovich and Ed McGaffigan clearly demonstrate that government service provides the opportunity to make a positive difference in society.

I have to admit, my position as NRC chairman satisfies more than my sense of duty. For me, it is both exciting and, for a lifelong nuclear professional, extremely rewarding.

For a number of years, NRC chairmen were presumed to be presiding over the waning days of a moribund industry. But to paraphrase a famous native of my home state of Missouri, Mark Twain, reports of the nuclear industry's demise turned out to be highly exaggerated.

Since the early 1990s, U.S. nuclear plants have improved so greatly in efficiency and safety that they are now mainstays of the U.S. electricity generating system – still accounting for 20 percent of U.S. electricity supply even though no new plants have come on line for more than 10 years, and only a handful since 1990. At the same time, economic and environmental questions have arisen about other generating sources such as coal and natural gas. Since demand for electricity is expected to double in 20 years, the country is now showing renewed interest in nuclear energy.

As a result, I am privileged to be presiding over the NRC during the industry's reawakening. As stated earlier, later this year, for the first time in 30 years, the NRC expects to receive an application to license a new nuclear plant. To date, we have received letters of interest from several potential applicants that indicate we may expect that order to be followed by as many as 30 others.

There are a number of potential obstacles to the renewed success of the nuclear industry. I will

leave the economic and political barriers for others to enumerate, and focus on the three that fall in part within my purview as a regulator. Those three are uncertainty, infrastructure and the human element.

Regulatory uncertainty is a factor in the genesis of any new industry – and despite its operating history of more than 40 years, the NRC review of new licenses will be new, by virtue of the fact that 30 years have passed since the last nuclear orders were placed.

When those last nuclear orders were placed, the applicants had to navigate a cumbersome, two-step NRC licensing process that issued separate licenses for construction of a nuclear plant, and operation of the plant. In addition, the construction permit process included a lengthy period of time to determine the suitability of the site. It could, and did, take plants more than a decade to secure both licenses. The regulatory process was just one of a number of factors – others being construction costs, overall inflation and overbuilding of all sorts of electricity generation capacity – that are cited as bringing an end to new nuclear plant orders in the late 1970s.

Now, with the initial plant orders of this new nuclear cycle imminent, uncertainty in part based on that previous experience surrounds the regulatory treatment of the initial plant orders.

I am making it a priority of my chairmanship to reduce that uncertainty by ensuring the clarity of regulatory requirements and the timeliness of NRC review.

In my view, the most important contribution the NRC can make is to be a strong, stable regulator that makes timely regulatory decisions based on good science and high quality engineering practices.

My vision for the NRC is that we will be a strong regulator. We will hold our licensees accountable. We will articulate our requirements clearly. We will be demanding and we will be responsive to their legitimate needs and concerns. All stakeholders in the nuclear industry -- the financial community, and especially the public -- must be made aware of the status and progress of issues of interest to them.

It helps, of course, that the NRC's siting and licensing regulations have improved over the last 30 years -- and that is an understatement.

The improvements, in addition to the combined operating license, include the preapproval of standardized reactor designs and of potential sites for plants. In the past, each reactor design was essentially unique, and required lengthy study. Also, applicants were not allowed to set-aside plant sites for future use. These preapproval and other steps have contributed significantly to the feasibility of new nuclear projects in the U.S. The NRC is continuing to improve our licensing regulations. We recently finalized changes that will further enhance their effectiveness and efficiency in all three facets of licensing.

The improved licensing processes are already proving themselves. The NRC has certified three standard reactor designs and is reviewing more. We also expect to issue decisions in 2007 on applications for early site permits at three locations.

The NRC licenses a nuclear plant to operate for 40 years, and most of the 103 operating nuclear plants are more than halfway through their license periods. Their value is such that almost universally

their owners are planning to extend their licenses. About half of the nation's nuclear reactors have either received NRC approval or applied for 20-year extensions of their licenses, and we expect to get dozens more in the next few years.

Nuclear operators are going to even greater lengths to increase nuclear generating capacity. The Tennessee Valley Authority is seeking NRC approval to restart its Browns Ferry 1 nuclear plant in Alabama later this year, more than 20 years after it was shut down during darker days for the nuclear industry.

Assuming NRC approves restart, the addition of Browns Ferry, along with power uprates at a number of existing plants, should put an additional 1680 megawatts of nuclear-generated power on the grid by this summer.

Both the NRC and the nuclear industry have a lot of work ahead of us in gearing up for new nuclear construction in the U.S. In addition to the work I have already mentioned, the NRC is working to complete or update the design certifications on several advanced reactor designs and two new facilities that will process nuclear fuel.

We could also face a tremendous amount of work in reviewing a license application for the Yucca Mountain waste repository. We are waiting for DOE to submit its application, which is currently scheduled for July 2008.

All that is on top of our regular workload of ensuring that existing reactors continue to operate safely and that thousands of other holders of nuclear material licenses– including university test, research and training reactors – also keep their nuclear materials safe and secure.

In preparation for our expanded workload, the NRC plans to hire about 300 new technical staff a year through 2008. We are also making organizational changes.

We recently created the Office of New Reactors, separate from the Office of Nuclear Reactor Regulation. And since we have indications that potential projects will be concentrated in the Southeastern region of the U.S., we are adding a new construction office to our Region II office in Atlanta, Georgia.

We will also look at some possible procedural changes in the review process in the future. I would like to see the review time required for early site permits and combined operating licenses reduced, with no compromise on safety. That is not an unrealistic goal, if industry does its job at the beginning of the process by submitting high-quality applications for NRC review.

I have already made my expectations very clear to the U.S. nuclear industry.

In my first meeting with a group of industry leaders, I told them, and this is a direct quote, "It's a plain fact that a quality submission, Combined Operating License, license renewal, design certification, or anything else, takes less time to review than a bad one. Show me quality and clarity and the NRC should show you timeliness."

The second potential barrier to the success of nuclear power in the future is in the area of manufacturing infrastructure.

The vast majority of the nuclear technology now in use in the nearly 450 reactors operating around the world was developed in the United States after World War II. The planning, design and construction of the first generation of nuclear facilities was an effort that occupied industrial giants such as Westinghouse and General Electric for decades, at a total cost well up in the hundreds of billions in today's dollars.

In the three decades since the last nuclear plant order, and the two decades since the bulk of the nuclear plant construction was completed in the U.S., the nuclear design, manufacturing, and construction industry in the U.S. has withered on the vine. Many leading U.S. firms have either ceased operation, consolidated or become subsidiaries of non-U.S. parent companies. The companies that remain have survived by performing retrofits and maintenance on the existing U.S. plants and plant construction outside the U.S., where new nuclear construction has continued to flourish.

Now, as we confront the prospect of a major expansion in new nuclear reactor projects within the next decade, the companies that will make those multi-billion-dollar orders must make critically important decisions as to where to buy their systems and components. Clearly, much of the technological capability to supply their needs now rests outside the United States, and I am concerned that the world's remaining nuclear suppliers are operating, in many cases, at capacity.

As the global demand for new nuclear power plants grows, the existing supplier networks will be further stressed.

It is not the job of the Nuclear Regulatory Commission to advise the builders of nuclear plants where to buy their equipment and materials. It <u>is</u> our job, however, to safeguard the American public, and there is a direct linkage between the quality of systems, structures and components and our ability to ensure that our licensees build and operate those facilities safely.

I believe that we can and will develop the rigorous inspection programs needed to ensure the quality and authenticity of the millions of components needed. But in terms of the logistics of quality control and safety inspections, it would be desirable to have as much of the content originate in the U.S. as possible. It is both easier and faster for our inspectors to visit a manufacturing plant in Indiana than in France – or China.

Some of that is already happening.

Areva, one of the world's largest nuclear manufacturers, based in France, last year signed an agreement with BWXT, one of the last U.S. nuclear component manufacturers, to produce nuclear components in the U.S. I visited the BWXT plant in Indiana late last year, and I was highly encouraged by the capabilities of the facility, and the plans for expansion. Restoring the U.S. supplier network needed to provide components – from the steam generators and vessel heads to the thousands of valves, pumps, heat exchangers and other parts used in a nuclear plant – would have advantages. There are now 442 nuclear plants in operation worldwide, and 27 more under construction. The most ambitious construction projects are in China, India and Russia – all of whom have announced plans for further expansions in their nuclear power production capabilities.

There will be global competition for materials and components, and a home-grown manufacturing industry should benefit U.S. nuclear construction projects.

Whatever this country does, it is clear that nuclear power is growing elsewhere in the world. The nation would be well served if our own energy needs serve as a springboard to rebuild U.S. technology and manufacturing capabilities to something approaching the leadership the nation once enjoyed, contributing to foreign markets as well as supporting our own.

That brings me to the third potential barrier I want to discuss today -- the capital needed to operate nuclear plants – not financial, but human capital. I have doubts about our ability to muster the workforce needed to operate nuclear plants – not only those yet to be built but those currently in operation. In my view, this is a potentially enormous problem.

I have asked industry groups these pointed questions: Where are we going to get the educated and skilled workers to run the nuclear plants of the future? What are their educational requirements? What is their training?

As with the quality of materials and components, the NRC has the responsibility of asking these questions, and of determining the adequacy of the answers.

To some degree, the knowledge amassed by the industry in 40 years of operation is institutional, and is transferable to future operations. To a large extent, the knowledge reposes in the minds of older workers. A nuclear industry survey shows that nearly half of current nuclear industry workers are more than 47 years old, and that nuclear energy companies could lose as many as 23,000 workers over the next five years – about 40 percent of the total jobs in the sector.

That is a tremendous brain drain. How do we transfer the knowledge to their replacements – who may form the cadre of workers as the next generation of plants starts up?

At the same time, the key suppliers to the industry – the architect/engineering firms, fuel suppliers and reactor manufacturers, anticipate that 32 percent of their workers will be eligible to retire within the next three years. They clearly must be replaced and their numbers augmented if the nation is to restore its manufacturing capability sufficiently to supply the components for and build the new plants.

To focus on just two of the many categories of scientific and engineering professionals, a 2001 nuclear industry survey estimated that demand for nuclear engineers through the end of the decade would be about 150 percent of supply. The need for radiation protection professionals would outstrip supply by about 160 percent. That survey predated the recent movement toward new reactor planning, and I'm told the next industry survey, due out later this year, will show an even more acute shortage of candidates to fill the waiting jobs.

This is despite the fact that undergraduate enrollment in these areas is growing rapidly. Department of Energy (DOE) surveys show that undergraduate enrollment at 23 reporting institutions in nuclear engineering, health physics, radiological and related fields nationwide has increased from 668 in 2001 to 1,520 in 2005 and that graduate enrollment has risen above 1,000. I'm told that enrollment here at Ohio State is following national trends – up from 19 grad students in 2001 to 32 this year. But demand is rising still faster.

I might add that the government also will be competing for the same nuclear-related skills. As I said earlier, the NRC alone will hire between 300 and 400 professionals a year through 2008 to handle the increased workload of new plant applications and other business, and to replace retirees – for a net staff increase of 200 per year. DOE, national laboratories, NASA and other government agencies also have personnel needs. And I would be willing to speculate that the increased demand for nuclear science and engineering professionals will extend to the faculties and staff of university nuclear programs.

Successfully addressing these needs would seem to require a reversal in a long-term decline that has been distressing to follow. The number of four-year nuclear engineering programs now stands at about 25, nationwide – down from 38 in the 1970s. Any further closures – such as has been recently discussed at the University of Cincinnati -- will exacerbate the situation. I understand that the administration at Cincinnati has received a number of protests from industry and government – including mine – and is reconsidering. But the fact that they were even considering closing their program should remind us all to be as vocal as possible about the urgent need to keep our nuclear educational facilities in operation.

The nuclear industry and the government are working on many fronts to address the problem, and there are many hopeful signs. For example, the National Academy for Nuclear Training, run by the Institute of Nuclear Power Operations provides $850,000 per year in scholarships – a total of $23 million since 1980.

Both DOE and the NRC are authorized by the Energy Policy Act to award fellowships and scholarships. DOE awarded grants totaling $23.5 million in 2005 and $27 million in FY 2006 to develop specialists in nuclear power generation, medicine and scientific research. Unfortunately, Congress has yet to pass a budget for this year, so DOE may be operating for the rest of the fiscal year on a continuing resolution, funding programs at last year's levels. It is unclear what the impact will be on university programs.

The NRC doesn't have anywhere near the budget DOE does, but we do have research needs, and we are directing a total of $5.8 million to research activities at universities.

I would anticipate that our research needs will increase in the future in areas such as reactor component aging, risk-informed regulations, advanced reactors and new technology and security assessments.

Both the nuclear industry and the government have a number of programs under way – including a $125 million grant from the U.S. Department of Labor to 70 community colleges to help channel new workers to high-growth industries, including nuclear energy.

All of this may not be enough, however. I recently attended two nuclear industry gatherings sponsored, respectively, by the Nuclear Energy Institute and the Institute of Nuclear Power Operations. I brought up the issue of workforce development with both groups, and warned them that current efforts "are just nibbling around the edges of this enormous challenge."

I told these groups, "that a major industry effort is necessary, and that it must address every level of education in this country, starting with a commitment to fostering interest in science and engineering at the elementary and middle school level."

I believe that we must have a concentration of effort on women and minorities, who now represent the majority of potential students but remain less than a quarter of the students currently enrolled in nuclear-related undergraduate programs.

When I arrived at the NRC, I was pleased to note the diversity of the professional workforce. That is a trend I intend to continue and encourage.

Scholarships, training centers and recruitment efforts are commendable ways to steer the technically-inclined toward careers in the nuclear field. So are internship programs with meaningful work. And once they are on board, mentoring programs will help to augment training and generational knowledge transfer.

However, the real challenge – and the real solution – is to increase the talent pool, and every segment of the nuclear industry needs to focus on this goal. It may be desirable from the point of view of a university nuclear engineering program to have multiple employers waving money and benefits at each one of your graduates, but ultimately the short supply will not meet our needs. The demand is there, and a goal must be to bring supply and demand toward equilibrium.

As I have told the nuclear groups I have addressed, this is an issue that should be addressed, urgently, at the CEO level at every entity – in both the public and private sectors – with any involvement in the nuclear industry.

In summary, I would say that U.S. nuclear engineering programs such as those at Ohio State have a problem – but it is a good problem. For the foreseeable future, demand for the graduates of your programs and the fruits of your research should exceed supply.

The formula is a simple one, known to faculty everywhere: university administrators value programs that bring in research dollars and students, research dollars flow toward expanding technology segments and students gravitate toward careers that promise fulfillment and financial reward. Follow the money, and success will be yours.

As one who labored through some lean years on campus, I am delighted at the prospect of good times ahead for the nuclear engineering community.

Those of you who will be spending your working lives in the nuclear-related endeavors – industry, government and academia – can be assured that my fellow commissioners and I, and the hard-working and talented staff of the NRC, will do our level best to see that you have long and fulfilling careers in an area that continues to make important contributions to American life.

Thank you, and now I'd be pleased to respond to your questions.