NRC NEWS

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**"The Foundations of Nuclear Regulation in the 21ST Century:
Safety, Security, and Global Communication"**

**Remarks by
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U.S. Nuclear Regulatory Commission**

**For the Forum on "Meeting the Challenges of Returning to Nuclear Energy:
Italian and U.S. Perspectives"
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Good morning, everyone.

I am delighted to be here in Italy once again for this special conference on the future of nuclear power. I must confess that this is the first time I've been to Rome when I have been able to do the things tourists do. The world may think of her as the "Eternal City" but for me it will always be the "City of Engineering Wonders"! At heart, I'm an engineer – in addition to being an academician and a regulator.

I am proud to be on the U.S. Nuclear Regulatory Commission. The NRC is an independent regulatory agency whose purpose is the protection of the health and safety, the environment, and the common defense and security of people. I take no position either for or against nuclear power; as a technical regulatory body, the NRC bases its decisions on science and merit alone, not politics.

As a regulator, my agenda, assumptions, and priorities may differ from those also speaking here today but we all have the same common goal: the continued safe operation of nuclear power plants.

Designing and constructing a new nuclear power plant here in Italy presents many challenges, the first being the need to create public confidence in your nuclear regulatory system.

In my judgment this can only be achieved through an open and transparent regulatory system based on science and technical excellence; indeed this is the way the world must build its future nuclear power programs.

In our two countries, nuclear power stopped growing in the 1970s and 1980s because the public lost confidence in it after the incidents at Three Mile Island and Chernobyl.

Public confidence is, and must remain, one of the most important considerations in any "return to nuclear power." I will talk more about this later, but let me now give you some of my views of what is happening today in the area of nuclear power.

A renewed consideration of nuclear power is underway, fueled by the promise of new reactor designs, by environmental concerns, by the need to lessen the global reliance on fossil fuels, and by the need to meet an increasing demand for electricity.

This increase in interest is a worldwide phenomenon, driven in no small measure by an increase in our knowledge and technical experience that is global in scope. The Nuclear Energy Agency predicts 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, on the low end. The high estimate – 1,400 gigawatts – could only be reached if the world had more than 1,000 operating reactors, which means 600 new reactors would have to come on line over the next 40 years.

I doubt that we will achieve that high projection but the expansion of nuclear power is clearly underway. According to the latest information available to me, there will be 61 new nuclear plants under construction or in operation around the world by 2015, with China alone building 21 of them.

Likewise the supply chain is now also international. It is my understanding that the AP-1000 reactors being built in China have parts supplied by over 20 nations, including Italy. This means that nuclear regulatory authorities across the world must communicate and cooperate to validate the qualifications of vendors, insure the quality of components, and share in lessons learned in construction and operations.

Today's nuclear regulators understand that, while the establishment and oversight of a strong regulatory infrastructure remains a national responsibility, the decisions we make in our own countries have a profound effect on global energy policy. I have said many times that for nuclear power, "an accident anywhere is an accident everywhere," an idea that is even more relevant today than it was in the 1970s or 1980s.

What I hope to do today is to share some insights from my NRC experience that may be helpful to you as Italy considers its "return to nuclear power."

As a regulator, I sometimes think our greatest accomplishments have come as the result of things we most sincerely wish had never happened. I am, of course, referring to the 1979 accident at Pennsylvania's Three Mile Island nuclear power plant, a severe setback for the U.S. nuclear power industry that forced the NRC to reexamine its entire structure. The public criticism of the NRC and the nuclear industry was not only severe it was, in my opinion, justified.

Accidents do play a role in generating improvements in regulatory and industry performance. But they are not worth their cost. It is only now, after three decades, and only after the industry has compiled an extraordinary safety record, that applications for new plants are being submitted once again in the U.S.

The lessons learned from the Three Mile Island accident are relevant, today, and for any regulatory body – not just those involved with nuclear safety. This accident revealed the presence of regulatory and industry weaknesses we now understand are inherent in any regulatory environment: *success breeds complacency*. Complacency is the primary enemy of an effective regulatory program.

Prior to Three Mile Island, the industry posted years of accident-free performance, relying heavily on robust engineered safety features and redundant safety systems. These were good things, they were necessary, and as TMI showed us, they worked as intended. But they also created an environment in which people grew to believe a serious accident was unlikely. The regulator and industry both grew overconfident in the technology and its ability to provide automatic safety. They grew complacent.

As we learned that significant accidents can involve combinations of equipment failures and operator errors, but perhaps most fundamentally, a failure to create a safety culture – a culture that questions, challenges, analyzes, and prepares.

The NRC began to focus more attention on human factors as a result of the accident and responded to Three Mile Island by issuing numerous new regulatory requirements that took years to fully implement. The regulatory emphasis shifted toward maintenance and training, and we sought effective ways to address issues in the safety culture. And then we got smarter, as indeed the industry got smarter.

In the late 1990s, we began to adopt what we called a "risk-informed and performance-based" approach to regulation, focusing our attention on the most safety-significant issues, and we developed a new reactor oversight and performance indicator program.

These programs ensured that the NRC responded to plant performance in ways that recognized the differences and special circumstances of each plant. Therefore, plants that perform well receive normal inspections; those that do not perform to our standards receive additional attention and are subjected to more frequent inspections.

Do our utilities complain when we subject them to more inspections? Yes, even if they do not do it too loudly, because we both know that nuclear power plants with superior safety records

are efficient and reliable. After 40 years, the culture of the industry has changed to the point that shared safety concerns are an incentive to work with the regulators to achieve excellence in operations and safety.

The nuclear industry deserves credit for concluding after Three Mile Island that a safe plant was most likely to be a reliable one when it comes to generating electricity. Ever since 1979, the U.S. nuclear industry has achieved steady improvement in plant performance – from a 60 percent capacity factor to over 90 percent today. This is a remarkable achievement for an industry once considered to have a limited future.

One important measure of the industry's desire to improve was the creation of an organization called the Institute of Nuclear Power Operations, or INPO. This organization is a private entity funded primarily by the nuclear utility owners and operators that promotes excellence and a strong, industry-wide, safety culture.

INPO is an instrument for industry self-regulation that builds on the requirements handed down by the NRC. It relies on peer pressure as its most compelling tool, conducting its own inspections and plant assessments separate from NRC inspections.

I attribute much of the industry's improvement to INPO's efforts, which have had a broad impact on NRC-industry relations, which I now believe are grounded in mutual respect and focused on the common goals of enhancing safety and security.

The NRC and industry cannot eliminate the potential for accidents, but we can analyze, train, and prepare. We have come a long way from 1979, with this kind of relationship potentially applicable to all regulated activities within the nuclear industry.

Another example of how far we have come is the fact that right now the NRC has 18 applications to build 28 new commercial power reactors in the U.S. One of these, the Vogtle Plant in Georgia, has already started major construction activities and we expect two additional sites to begin major work in the next year.

While the economic situation has affected plans, what we see is more of a delay in schedule rather than a reversal in commitment. There continues to be strong support in our Congress for moving forward with nuclear and I am sure that you are all aware of meetings last month between the U.S. Energy Secretary Steven Chu and Minister Claudio Scajola. I think this demonstrates that President Obama expects that nuclear energy will not only be a part of our growing domestic energy program but part of our international energy policy as well.

This brings me to the point to talk about some important international regulatory initiatives. I have always been a strong advocate for encouraging more standardized plant design and construction as a means for improving safety. Standardized design applications are easier to review and help regulators share information and best practices.

To address this, an international movement to harmonize the safety reviews of designs for new nuclear power plants is already being undertaken through the Multinational Design

Evaluation Program, or MDEP. The U.S. and nine other nations have been working to leverage knowledge and experience on nuclear power plant design, and promote global convergence in associated codes, standards, and regulations.

With good communication, and a willingness to cooperate, MDEP has made excellent progress over the last several years. In part, this is because technical convergence is comparatively easy; the truths of chemistry, physics, and engineering do not change from one country to the next.

MDEP is an important resource for any nation considering a return to nuclear power. I would also encourage Italy to take advantage of the extensive and detailed work being done by the NRC in certification of reactor designs as well as the design and safety reviews conduct by other national regulatory authorities.

Of course, every nation possessing nuclear power can and will determine its own final standards for both safety and security. While there may be different approaches to nuclear safety and security, each nation must have the capacity to understand and enforce its own standards.

It is not enough to rely on the design certifications of other regulatory bodies. A national regulator must understand the plant design, its construction, and each safety feature. There must be a certain level of advanced training and skills within each nation's regulatory body. For instance, you are aware that China is building several Westinghouse AP-1000 plants – but they are not relying solely on the NRC's certification of those designs. The NRC has provided the Chinese regulators with training and analytical tools we use in our licensing approach so that they understand the process and not merely the outcome.

This is the path that I recommend Italy should also take. As we learned in our own experience, understanding the process is critical to the creation of a safety culture that may be required to deal with unexpected events and unanticipated outcomes. No regulatory body can rely solely on the assurances given by vendors or regulatory bodies in other nations.

Each nation must develop its own regulatory culture that questions, challenges, analyzes, and prepares.

Let me conclude by taking us back to where I began.

We have come a long way since Three Mile Island but only because the path that we took, while not easy, showed the determination and dedication of the industry and regulators to "get it right."

As an example of how far we have come, of the 104 operating nuclear power plants in the U.S. the one that broke all the records this year for sustained operations was Three Mile Island Unit 1, the sister plant to the one that had the accident thirty years ago. Last week, the NRC granted a license extension to that same plant, allowing it to continue to operate for an additional 20 years beyond its current 40 year permit. To some, this was not a popular decision. For the

NRC this was a technical decision based on safety and performance. There were no politics involved; they earned the result.

Sixty years to operate a nuclear reactor may seem like a very long time, but I will remind you that it was only 70 years ago that Enrico Fermi and his team at Columbia University conducted their first fission experiments. Only 15 years later, in 1954, a small, experimental nuclear reactor in Idaho produced electricity for the first time. What extraordinary engineering and scientific accomplishments!

Fermi said, "It is no good to try to stop knowledge from going forward. Ignorance is *never* better than knowledge." As an engineer, as an academician, and especially as a regulator, I can tell you that these are the words that inspire the nuclear community. They make us want to create a culture that questions, challenges, analyzes, and prepares.

The return to nuclear energy is a challenge to both our countries. Enrico Fermi was a great Italian *and* a great American. Let us meet this challenge together!

Thank you for your attention. Now I would be happy to take your questions.