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**Prepared Remarks of NRC Chairman Allison M. Macfarlane
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Good afternoon. It's a pleasure to be here today to reflect on what lies ahead for nuclear safety in the next quarter century. I'm honored to join this esteemed group of panelists and I'm looking forward to our discussion. Today, I'd like to offer my thoughts on the events and lessons that have shaped our current perspectives on nuclear safety and on how best to keep a bright spotlight on safety in the years ahead.

The annual ANS Winter Meeting always brings together a diverse audience, including students from a number of disciplines. Many of you are engaged in research and in generating knowledge that might advance the use of nuclear technologies for global benefit in the coming years. As a scientist, I know well the excitement and sense of fulfillment that comes from knowing that your contributions are adding to human understanding of the world around us.

This is a significant time for all of us in the nuclear field. Next month marks 60 years since President Eisenhower delivered his iconic "Atoms for Peace" speech at the United Nations. In the decades that have followed, there have been substantial advances in energy, medicine, and industry as a result of nuclear technology.

We're now at a juncture where further expansion of civilian nuclear power to non-nuclear countries is poised to occur. As the nuclear power landscape changes, the international community must remain vigilant to protect against potential hazards and malicious uses posed by nuclear technology without effective regulation. Use of nuclear power requires a strong regulatory regime to ensure that the power of the atom is put to beneficial use and to protect against misuse and/or complacency that opens the door to unacceptable risk of potentially devastating consequences.

Fukushima's Ongoing Lessons

The Fukushima-Daiichi accident nearly three years ago challenged us to revisit established assumptions and regulatory priorities. As the accident unfolded, it became clear that we should consider the possibility of multiple units at the same facility experiencing an accident. We also realized that in some cases, we may not have sufficiently addressed the threats that some natural disasters could pose.

As the international community began to come together in the ensuing months, it was affirming to see that we were reaching similar technical conclusions about where safety enhancements were necessary. As a result, despite the diversity of nuclear power programs worldwide in terms of size,

scope, design, and other factors, we've been able to collaborate closely and benefit from one another's experiences.

Our work to address lessons learned from the accident continues. We're reassessing our licensees' ability to mitigate seismic and flooding events and requiring them to ensure adequate emergency response training and communication to cope with prolonged accident conditions. They're strategically placing backup equipment on-site to help maintain reactor cooling in the event of a loss of power. We've also required enhanced instrumentation to better measure the water level in spent fuel pools. While many of these activities are well on their way to completion, we'll need to address some items through rulemaking at our agency. This can be time-consuming, but provides the benefit of codifying lessons we've learned with opportunities for public participation throughout the rulemaking process.

Worldwide Nuclear Energy Pursuits

The Fukushima accident halted the course of future nuclear energy development in some countries, but others are moving ahead with their plans, including some new players. The community of countries operating or developing nuclear power programs is becoming more diverse. Some of these are developed countries that have an interest in diversifying their energy portfolios. Others are still grappling with developing basic infrastructure. It's possible that new developments in small modular reactor technology in future years may further broaden the range of countries seeking to pursue nuclear power.

In some respects, the prospect of initiating a new nuclear power program from the ground up could be seen as a positive opportunity. These "newcomer" countries have a chance to reflect on the decades of lessons others have learned – sometimes the hard way. They can establish a competent, well-funded regulator; promote a healthy safety culture; consider the ultimate disposal of nuclear waste before any is generated; and communicate clearly with the public on each new step in the process. I think that the possibilities, at least in a philosophical sense, appear broad and encouraging.

But of course, I note that there are often competing external pressures contributing to the desire to establish a civilian nuclear power program. There are urgent economic and energy needs. There's political prestige. There's the consideration of a country's sovereign right to pursue nuclear technology for peaceful purposes. And, in rare cases, there's a desire among some to leverage the technology for geopolitical purposes by pursuing a nuclear weapons program. We've seen these factors contribute to the establishment of high-level policies that put nuclear power programs on a fast track. From a regulatory standpoint, however, a strong focus on nuclear safety and security should be the ultimate objective. I believe there's a need to balance the right to possess nuclear technology with the responsibilities that come with it. Nuclear safety is a global obligation – there cannot be a vibrant nuclear power industry without a global commitment to safety. And an essential component of that commitment is the presence of a strong, independent regulatory body.

Why a Strong Regulator?

The role of the nuclear regulator has evolved and expanded over time – the United States is no exception. The creation of the Nuclear Regulatory Commission in 1974 was the result of a pivotal realization that regulation of an industry would never be sufficiently effective if it was linked

organizationally to the promotion of that industry. But I would be remiss if I oversimplified this point. Establishing an effective, independent regulatory structure is not a one-step process, nor does it remain static. The NRC has continued to hone its independent regulatory model in the 35-plus years since our agency was established. On a global level, the NRC and our counterparts in other countries routinely engage in discussions about what regulatory independence means, and there's not always universal agreement about its definition.

It's clear that a regulator's organizational independence will vary depending on the overall political structure of the country – and since there's no fixed model for the latter, it's impossible to have a one-size-fits-all approach to nuclear regulation. But while our experiences may differ, one resounding lesson is that safety must transcend all else. To be effective, a regulator must be independent of any political, economic, or other policy interest whose outside influence could coerce the regulatory body to make decisions that aren't in safety's best interest. The regulator must have sufficient, sustainable funding to ensure that it can effectively do its job and attract the best and the brightest. I believe that, for a regulator to have the trust and support of the public, it must be committed to openness and transparency – providing information about its work in terms the public can understand, and affording the public opportunities for input into its processes. Finally, the independent status of the regulator must have support from government leaders – nuclear safety must factor into national decision-making.

I think that the Fukushima accident provided a clear example of the importance of an independent, well-funded regulator as a critical foundation for any nuclear program, regardless of its size or scope. In the initial months, an independent commission of high-level officials appointed by the Japanese Diet took a hard look at the potential causes of the accident. The Kurokawa Commission, as it was known, released a candid report that concluded that the accident was “manmade,” a result in part of “regulatory capture,” in which the industry had too great an influence over the regulator. The report also coined the phrase “nuclear safety myth” to characterize an unfortunate overconfidence that low-probability, high-risk events would simply not occur.

Obviously, the Fukushima accident has prompted all of us, even the most developed countries with the most well-established programs, to reassess how we do things and see where enhancements may be necessary. It's clear that any type of nuclear accident anywhere in the world has global consequences. The response to this accident plainly demonstrates the need for a continued global commitment to preventing future incidents.

You may have seen media coverage over the past year about counterfeit and fraudulent parts making their way into nuclear construction sites, or of greater concern, being discovered at operating reactors. This concern is not unique to the nuclear industry, and general advances in technology have prompted new worries about hard-to-spot fake computer chips and circuit boards. Today's nuclear industry relies on a global supply chain, and new reactors being designed and constructed around the world have all digital operating systems. Taken together, these factors clearly point to the need for a global regulatory commitment to rigorous quality control, irrespective of a problem's country of origin. It is unwise, and potentially dangerous, for a country to embark on nuclear construction without a vigilant vendor inspection program.

There's also been discussion about a “build-own-operate” model for new nuclear power plants in countries without established nuclear programs. The objective would be to rely on vendors and contractors from an experienced nuclear power country to handle all aspects of the new country's

program, from the construction to the day-to-day operation, and even the regulation. In some cases, this model presupposes virtually no indigenous nuclear engineering capability or regulatory structure. I believe this would be problematic for several reasons.

First, it would make the host country fully reliant on foreign inspectors to maintain the plant, identify safety concerns, and quickly address them. In a worst-case scenario, I find it worrisome to consider a sovereign country counting on a foreign entity, potentially thousands of miles away, to oversee the response to a nuclear accident. Second, as an open, transparent regulator, the NRC regularly communicates with other federal, state, and local government agencies, interest groups, the media, and members of the public. This communication happens on a routine basis – not just in the event of an incident. If a country chooses to place its nuclear program in the hands of a foreign regulator, that country would relinquish its ability to ensure that it is adequately informing its own citizens about that program.

Regulators also have an important role to play in upholding non-proliferation commitments. Regulatory controls on nuclear materials help ensure that these materials are kept out of the hands of malicious actors and ensure safeguards measures are enforced. The Nuclear Non-proliferation Treaty was carefully crafted to create a balance between the right to develop nuclear technology and the responsibility to safeguard this technology to ensure its exclusively peaceful use. The regulator is integral to the efforts to uphold this balance by establishing clear requirements for the safe and secure use of the technology. Effective regulatory requirements demonstrate a country's commitment to peaceful use, which, in my view, should facilitate access to the technology, rather than being perceived as a bureaucratic obstacle.

A regulator's non-proliferation role extends to any country that uses nuclear materials for any reason, even if the country never intends to establish a civilian nuclear power program. A robust regulatory infrastructure is necessary to ensure safety and security in authorizing these materials to move from place to place and overseeing their storage and use once at their destinations. There's also an economic benefit – these types of controls actually enhance efficiency of movement of these materials across the marketplace by ensuring a clear destination, thereby minimizing delays.

Putting it into Practice

The NRC is working continuously to put these regulatory ideals into practice. At home, we have a rigorous safety and security oversight program. Our resident inspectors are a daily presence at our licensed facilities, helping to ensure that identified issues are promptly addressed. I should note that, during our recent government shutdown, all of these inspectors remained on the job. We take more than 1,000 licensing actions each year, all publicly available, following well-established, well-documented procedures. We work closely with the 37 Agreement States, which regulate tens of thousands of nuclear materials licensees throughout the country to ensure that our collective approach is effective. We license all imports and exports of civilian nuclear materials. We're committed to openness and transparency, and our processes provide documented opportunities for public involvement. While I believe there's always room for improvement, we're certainly practicing the kind of competent, independent regulation that we advocate.

The NRC is also engaged internationally, both bilaterally and with multilateral organizations like the International Atomic Energy Agency. We work closely with our regulatory counterparts to

address safety and security issues of mutual interest. We also provide assistance to countries with new or small nuclear programs. We share insights about establishing a sound regulatory infrastructure, offer workshops on the development of laws and regulations, and participate in international peer review missions assessing the health of regulatory bodies. With effective use of these principles in our domestic program, we're proud to demonstrate credible leadership in this area.

We also played a critical role in strengthening implementation of the Convention on Nuclear Safety, or CNS, following the Fukushima accident. The U.S. Government, with the NRC in a leadership role, joined other countries in successfully advocating for stronger language about the importance of regulatory independence in the Convention's guidance documents. These documents provide a roadmap for countries to report how they're meeting their obligations under the Convention. Thanks to these enhanced guidance documents, countries will be asked to offer specific information about their regulatory structure at the upcoming Review Meeting next spring. All countries' reports, including ours, will be peer reviewed with the intent of identifying areas for improvement. These upcoming exchanges will give us valuable input to consider.

I just mentioned the NRC's collaboration with other U.S. Government agencies in the CNS context. We also work with our interagency colleagues to provide support and offer regulatory assistance for countries considering U.S. technology. It's important for me to emphasize that the NRC doesn't promote nuclear energy. However, it's become clear that the expertise we can offer in the way of design review and certification, construction oversight and quality assurance checks, and other related areas is of interest to countries considering nuclear power. From a purely regulatory standpoint, we believe this type of focused collaboration contributes positively toward advancing our collective goal of strengthening nuclear safety and security worldwide.

Keeping the Momentum Going

Reflecting once again on the theme of today's discussions, it's safe to say that all aspects of nuclear energy – from how it's generated to how it's regulated – have changed considerably since the technology's initial introduction. Today's approach to nuclear regulation is naturally defined by our experiences. We've sought to identify, share, and advance good practices, and we've used the less positive moments as opportunities to learn and do better. This is an ongoing process. Growing and changing over time is healthy for any organization.

But as we move forward, ready to embrace the lessons of the decades to come, it is imperative that we continue to shine that bright spotlight on safety. Nuclear regulation, like the nuclear industry and most everything in our time, is a global effort – and safety and security are shared responsibilities. The Fukushima accident reinforced this reality in a tragic way, but it didn't introduce it. A global commitment to effective, independent nuclear regulation is an absolute must if we are to prevent future accidents and guard against malicious use of nuclear materials.

The NRC is leading by example. Our regulatory oversight of our licensees is rigorous, independent and open. Our export controls facilitate the safe and secure movement of nuclear materials in and out of the United States, and give us assurance that materials will be properly protected upon reaching their destinations. Our international assistance work enables us to share lessons from our domestic regulatory program to benefit others – whether they are countries pursuing nuclear power for

the first time or seeking to strengthen their oversight of facilities already in operation. I'm proud to lead our agency at this critical time.

It's not possible or appropriate for me to predict where the industry will be in the year 2038 or beyond. We may be looking at how new technological advances, like small modular reactors, have brought nuclear power to regions that could not previously have considered it. We may be reflecting on how the medical isotope production market has changed. We'll have new construction lessons to consider from all over the world, and decommissioning approaches to contrast as other plants shut down. For those of you who will be the stewards of nuclear regulation and the nuclear industry in the coming decades, I cannot emphasize enough the importance of maintaining the momentum on safety. Whatever the future brings, I believe that one thing is certain. If the nuclear industry is going to be operating effectively at any size – if it's going to inspire confidence and public trust – then we must keep our focus on safety.

It's an honor for me to have the opportunity to participate in this important conference, and look forward to hearing from the other panelists and to our discussion. Thank you.