Chair Christopher T. Hanson
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Embracing Risk-Informed Thinking at the Nuclear Regulatory Commission

Greeting

Good morning, everyone. I couldn't help but notice that the NCRP is approaching a milestone since its charter in 1964 – 60 years of being leaders in the radiation protection community, promoting the welfare of the nation by developing and sharing standards that the country, and indeed the World, benefit greatly from. Thomas S. Tenforde, the namesake of this lecture and former president of the organization holds a distinguished legacy in this history. And I am honored to have a small role in carrying that legacy forward.

I recently visited Pacific Northwest National Laboratory (PNNL) and learned that Dr. Tenforde was instrumental in development of PNNL's yttrium-90 medical isotope project. Yttrium-90 is used worldwide in cancer treatments, saving countless lives.

A true visionary, Dr. Tenforde was highly regarded by his peers, and considered (quote) "a tireless leader with a commanding knowledge of medical isotope production that inspired staff to excel." Dr. Tenforde's contributions are an incredible reminder of the difference that we can make, as individuals, and through the service-oriented institutions we represent.

Advanced Reactor Landscape

Today, I am going to speak of the work of the Nuclear Regulatory Commission and the role of that work in preparing for the future of nuclear energy. Any opinions I share are my own, not the Commission's as a whole.

I am certain you all are aware of the administration's goals to combat the climate crisis. And the United States is not alone in sensing the importance of carbon-free energy to the future. At the Conference of the Parties 28 in Dubai in December, 22 world leaders, including the United States, signed a declaration to triple nuclear energy by 2050. Alongside climate change - energy independence, national security, human health, and economic development are all drivers for increased global interest.

The nuclear industry is evolving at a fast pace to meet this demand and we are seeing significant interest and investment, particularly in small and advanced reactors. That means that continuing to risk-inform is important to assuring the agency is prepared. I say continuing to

risk-inform because for me it isn't a static concept—we have risk-informed, are risk-informing now, and we will continue to risk-inform into the future. The critical piece is making sure that we keep moving forward.

In the next two years alone, the agency is projecting applications for two combined licenses, one design certification, one standard design approval, one manufacturing license, three operating licenses and nine construction permits. And a partridge in a pear tree.

In the mix are Small Modular Reactors, non-Light Water Reactors, research and test reactors, medical isotope facilities and fuel cycle facilities. Agency workload projections are only increasing.

And while the projections are showing incredible interest and ingenuity, there are some challenges ahead. What I often refer to as chicken and egg problems, such as financing, construction, supply chain for components like reactor vessels, and supply of HALEU for fuel.

Even though many of these challenges facing the nuclear industry are outside of the NRC's purview as a regulator, the NRC's role remains important—providing regulatory stability while ensuring the safe and secure use of nuclear material to protect people and the environment. So, to keep pace with the highly dynamic, innovative nuclear landscape in which the NRC operates, the agency must be prepared to regulate emerging technologies and address novel challenges – and we can do this by leveraging the vast licensing experience we've built over the years.

Advanced Reactor Licensing

Let's start with Vogtle. We learned a lot. A lot about timely issuance of Combined Operating Licenses and the use of Pt 52, a lot about evaluating design changes, a lot about focused construction oversight, and a lot about how to structure efficient reviews for Inspections, Tests, Analyses, and Acceptance Criteria.

We learned a lot from our work on NuScale—the first SMR design certification approved by the NRC. We learned about the importance of robust pre-application engagement in the form of white papers and technical reports and of hands-on project management and stable core team staffing within the agency.

We took all of that experience and applied it to the Kairos Hermes test reactor and then we learned some more. Last December, we issued the construction permit for Hermes—the first non-light water reactor construction permit issued in the U.S. in 56 years. And we completed the safety and environmental reviews ahead of schedule and on-budget. We've got the Hermes 2 construction permit application under review right now on a 14-month schedule and all the reports are positive.

Part of the success story here has been the agency's pre-application reviews, in the form of white papers and topical reports. These types of reviews allow applicants and potential applicants to address major technical areas with the NRC staff ahead of time – saving precious time later in the review. Since 2018, we completed nearly a hundred topical reports and white papers. We have 32 topical reports in house right now and expect dozens more in the next couple of years.

This is an area we are looking at as an opportunity to engage with our international counterparts. Two weeks ago, the U.S., Canada, and the U.K. signed a trilateral agreement to collaborate on technical reviews of advance reactor and small modular reactor technologies. The goal here is to leverage knowledge and experience, learn from one another, and potentially take back opportunities to improve our individual processes.

Leaning into a future of advanced reactor applications on the near horizon, the Commission issued the Staff Requirements Memorandum for the proposed Part 53 advanced reactor rule. This draft proposed rule marks a major evolution in risk-informed regulation. This rulemaking process has been unique, and from the outset the agency recognized the need for transparency during its development. Never before has the agency engaged the public so early and so often.

The proposed rule puts probabilistic risk assessment and risk insights in a leading role, balancing flexibility and predictability while assuring the safety of the public. The rule will give plant designers and plant operators flexibility in determining how their nuclear power plant will meet safety criteria.

With all this emphasis on advanced reactor licensing, it is important to note that our current Part 50 and Part 52 frameworks allow for licensing of advanced nuclear now. The Hermes construction permit applications that I mentioned earlier are being licensed under Part 50, and near-term applicants are interested in using our existing frameworks.

Now, Part 53 gets a lot of attention, but it is just one piece of the NRC's overall effort to address advanced reactor licensing.

Late last year the NRC issued the final Emergency Preparedness Rule, which scales emergency planning. This rule takes a graded approach to emergency planning where the level and extent is commensurate with the radiological risk, source term, and potential hazards. You will hear more on risk informing Emergency Preparedness from Todd Smith of the NRC in the next session.

The agency is also updating siting guidance to account for the safety features of new reactor designs and to allow use of modern methods to estimate design-specific source terms and off-site consequences. Instead of a one-size-fits-all standard of 20 miles, it specifies a dose-based performance criterion for determining the area within which population density should be evaluated.

The limited scope physical security rulemaking being considered by the Commission would provide advanced reactor applicants and licensees the flexibility for alternative approaches to security. The existing framework is based on large light water reactors. New designs being contemplated are wide-ranging and may employ design features that result in low or no offsite dose consequences.

Consideration of alternate physical security requirements is appropriate, provided they are protective of the health and safety of the public. I find this rule, along with the emergency preparedness rule and population-based siting guidance crucial for regulatory clarity as the NRC ensures its readiness to license advanced reactors.

I expect that very soon the Commission will issue a decision on the Advanced Reactor Generic Environmental Impact Statement—which will significantly streamline environmental reviews.

Laying the groundwork for Serial Deployment

Given all of this ongoing work in licensing space, we also need to be looking ahead for emerging needs. With the interest we are seeing in the industry, the time is right to start preparing the agency for what I call “serial deployment” of microreactors and small modular reactors. We are likely to see applications that either have significant similarities, build on one another in an iterative manner, or even seek some form of joint review and approval. The agency has some of the tools in place now but there is more to do. We recognize this and have several important efforts underway.

First, the NRC has embarked on a new initiative focused on standardizing our reviews and giving credit for applicants who standardize their designs and licensing approaches and rely on prior NRC safety and environmental decisions.

Second, NRC has a joint project with the Idaho National Laboratory to look at how small and advanced reactor construction costs intersect with our codes and standards so we can right-size both to better account for the enhanced safety of many designs.

Third, I asked our Office of the General Counsel earlier this year to take a fresh look at uncontested mandatory hearings and provide options for these proceedings going forward. Using the experience we’ve gained from previous hearings and balancing that with efficiency and clarity will be important as we prepare for potential serial deployment. As part of that tasking, I also asked staff to look at whether procedures for mandatory hearings can or should look different for applications that represent “first of a kind” reviews versus “nth of a kind”.

And finally, NRC is also looking at design-centered approaches to conducting construction oversight to improve the efficiency of inspections.

In the context of serial deployment, I want to acknowledge the agency's effort on Fusion. Last April the Commission voted to address fusion energy regulation through the byproduct material framework. Licensing of fusion under a byproduct material framework provides for a technology-neutral, scalable regulatory approach protective of public health and safety that can cover a spectrum of hazards and risks. The Commission recognized the importance of acting promptly on a path forward to support deployment of commercial fusion energy systems as soon as the 2030s that provided as much regulatory certainty as possible.

Given the flexibility of Part 30 to safely regulate a wide range of radioactive material uses with varying degrees of radiological hazards, the NRC staff, with input from Agreement States, is developing a risk-informed draft rule and single guidance document to cover the diversity of fusion system designs currently being considered by commercial fusion companies. The Commission expects to receive the proposed rule this September.

As it does in other areas, the NRC is also engaging internationally to support development of fusion regulatory frameworks. Aligning internationally on fusion-related definitions, characteristics, and criteria for fusion energy will help develop a common understanding among stakeholders that could aid in global deployment.

This is just the beginning for fusion. But we are looking at key issues closely and are laying the groundwork now for success in the future.

Another initiative of particular interest are transportable microreactors. As we speak, microreactor vendors are developing Transportable Nuclear Power Plant Packages. These transportable microreactors could provide clean energy in a variety of conditions and off-grid locations. For its part, the NRC staff is developing a risk informed methodology to approve this first of a kind transportation package for transportable microreactors.

All the efforts that I've just spoken about are focused on appropriately balancing our regulatory footprint while staying grounded in our safety mission as we prepare for deployment of a range of technologies at scale.

Fuel Cycle

But preparing for the future of advanced reactors means we need to be paying attention to fuel as well. From my first days on the Commission, I have made it a priority to ensure that our efforts on the fuel cycle are as aggressive as they are on reactors. Indeed, so much of what we are doing in reactor space relies on all pieces of the fuel cycle seamlessly working together.

In December, NRC issued an amendment authorizing fuel fabrication with up to 8 wt% U-235. This is the first fuel facility amendment authorizing production of accident tolerant fuel with increased enrichment. In the same month, staff approved a transportation package for unirradiated advanced reactor fuel.

As you may know, last year we issued the license amendments necessary for Centrus to produce initial quantities of high-assay low enriched uranium, or HALEU, and we are currently

reviewing a license amendment for enrichment up to 10 wt % U-235. We are not leaving behind any element of the fuel cycle when we apply our experience to risk inform and make process improvements.

Relatedly, NRC is developing a proposed rule which would amend the regulations to facilitate the use of light-water reactor fuel containing uranium enriched to greater than 5 wt% U-235 and less than 20 wt%. One issue the rule addresses is accident source term and control room design criteria. The current control room design criteria of 50 mSv (5 rem) TEDE does not factor use of advanced fuels being contemplated. The NRC is considering a graded, risk-informed method with a range of acceptable control room design criterion that would provide flexibilities for current and future fuel enriched up to but less than 20 wt% U-235.

Culture/ Risk informed thinking

There is a lot of forward momentum at the agency, driven by the interest and innovation we are seeing in nuclear energy. The NRC is an independent agency. But, the agency cannot ignore the significance of its role in the future and its impact on those around us, both domestically and internationally. It is important to maintain a culture that can sustain the momentum while fostering a questioning attitude and risk-informed thinking. Risk-informed thinking is part of our past and drives our present. But I want to advance the concept. The agency continues to learn and grow over time as we build on our expertise – we need to recognize this in ourselves and continue our evolution.

I have discussed my vision for building an environment of high trust and high confidence throughout my tenure. We are facing a lot of changes at the NRC that are influenced by technology, policy, and demographics.

The NRC needs leaders that staff can trust to navigate through this period. And leaders need to trust that the staff will prioritize the agency's health, safety, and security mission; will innovate in new ways; and will get the job done. And finally, staff need to trust each other; they need to see each other as essential in their roles to accomplishing the mission; and they need to know they can rely on each other as the agency's workload grows.

The NRC is approaching its 50th anniversary in January 2025. The agency learned a lot over the last five decades to say the least. The agency has learned what is critical for safety and security. And that body of knowledge gives the agency confidence in technical capabilities at all levels so that we can leverage our vast intellectual capital to make better, smarter, more efficient, and more durable regulatory decisions. As I frequently tell the NRC staff, we need to have confidence in our abilities and confidence in our ability to change.

While confidence in ourselves is important, we also need to build and preserve the confidence of those outside the agency. This starts with maintaining the trust of the public. If the public does not have confidence in our decisions, for whatever reason, then we will ultimately fail. Engaging the public substantively, routinely, and creatively is critical to our position as a trusted regulator.

Further, building external confidence in the agency with stakeholders is important for the NRC's credibility. Confidence that we can uphold our obligations to the public while also building

clear, reliable, and efficient regulatory pathways for not only the variety of technologies under development, but also the volumes at which those technologies may be deployed.

Conclusion

So in sum, what are we doing? Well a lot. We are prepared now to license advanced reactors – and we already have issued licenses in this space. We are continuing to identify opportunities for streamlining our licensing review processes to support efficient licensing of SMRs and advanced reactors – assuring that every area in our regulatory purview is risk-informed and working together. We are evaluating the way we do business, looking for opportunities to leverage the knowledge the agency has gained in its nearly 50 years of public service to do things better. We are looking ahead, anticipating and paying attention to the world around us. Seeing needs and tackling the ones that are within our purview.

And how are we doing this? By building confidence and trust inside the agency; by cultivating and safeguarding confidence and trust outside the agency; by maintaining our independence while reaching out and bringing in information and perspectives necessary for improvement; and finally, by building on all of this to clearly and reliably apply risk insights to every aspect of our mission to better maintain safety and security.

Thank you.