TESTIMONY OF

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IDAHO NATIONAL LABORATORY

BEFORE THE

U.S. HOUSE COMMITTEE ON ENERGY AND COMMERCE

SUBCOMMITTEE ON ENERGY

"DOE Modernization: Advancing the Economic and National Security Benefits of America's Nuclear Infrastructure."

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U.S. House Committee on Energy and Commerce, Subcommittee on Energy

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Good morning. I want to thank Chairman Upton, Ranking Member Rush, and Vice Chairman Olson for scheduling this important hearing and for the opportunity to participate. I would also like to thank all of the members of the committee for being here today.

My name is Mark Peters. I am the director of Idaho National Laboratory (INL). INL is the nation's lead nuclear energy research and development laboratory, the place where 52 original nuclear reactors were designed, constructed, and operated.

It is our mission to provide the research, development, and demonstration foundation to extend the lives of the current operating reactor fleet, develop the next generation of nuclear reactors, and provide integrated nuclear fuel cycle solutions.

Nuclear energy is a vital component of America's energy system. It reliably produces nearly 20 percent of our electricity, has a remarkable safety record, and is clean, secure, and resilient. Advanced nuclear energy technologies provide an opportunity for the U.S. to meet future electricity demands while benefiting our economy, environment, and national security.

The United States invented nuclear energy technologies for peaceful uses, and we are the world's largest producer, accounting for more than 30 percent of worldwide generation of nuclear electricity. The U.S. remains in a position of strength. The future, however, is not guaranteed.

A variety of factors – high capital costs of nuclear technologies, the long time frame between licensing to construction to operation, subsidies for other forms of electricity generation, the low cost of natural gas, and our inability to provide a permanent solution to nuclear waste and used nuclear fuel management – has led to an erosion of the role of nuclear energy in the domestic energy system and of our international nuclear leadership.

Meanwhile, countries around the world are constructing new plants. As we struggle to maintain our domestic fleet and international presence, Russia and China are accelerating nuclear power plant builds in their own nations and across the globe. To this point, Russia and China are involved in 78 percent of new reactors being built around the world. Russia and China are catching up, and threatening our historic and hard-earned advantage in commercial nuclear energy production and international leadership in the civil nuclear energy sector. If we continue along this path, our 30 percent market share could be drastically reduced by 2050.

We are at a critical juncture, a turning point. Decisions made today will determine if the U.S. continues to lead the world in civil nuclear energy innovation and production, or if we are destined to fall back into the pack.

Still, I remain optimistic. I remain optimistic because of the science and innovation coming out of our national laboratories, universities, and the private sector, companies such as NuScale Power, Oklo, and TerraPower, just to name a few. We have the finest research, development, and demonstration facilities, the most developed capabilities, and the best minds. I remain optimistic because of our history. America has a historic role in inventing and commercializing many energy technologies in use around the world, from the lightbulb to the nuclear reactor. I remain optimistic because the historic partnership between the federal government and industry has laid the foundation for our successes. We know what it will take because we have done it before. And I remain optimistic because the stakes are so high. Continued erosion of America's commercial nuclear energy industry and not taking advantage of our nuclear energy science and innovation advantage threatens our economy, environment, and national security.

America has always risen to the challenge. We can – and should – view this moment not with apprehension, but excitement. Before us is a grand opportunity to preserve our global nuclear energy leadership position and employ our advantages to usher in a new era of prosperity, security, reliability, and safety in the U.S. and across the globe.

Think of that for a moment. Because the U.S. created the commercial nuclear energy industry, the vast majority of reactors around the world are based on American technologies. Our

nonproliferation and safety approaches are the world's standards. That's comforting because our Nuclear Regulatory Commission – working with an industry that has a demonstrated record of learning from its mistakes and implementing meaningful changes – is the gold standard. One need only look at decades of safe, secure, and reliable electricity generation by the U.S. commercial nuclear fleet to understand how well-run this industry is.

But when the U.S. domestic nuclear energy industry languishes, our international leadership role diminishes. Losing the capability to influence how nuclear energy is used globally threatens our ability to prevent the spread of nuclear materials that can be used for malicious purposes.

Russia and China are aggressively expanding their nuclear capabilities. Those nations, with their state-sponsored nuclear industries, enjoy tremendous advantages over the private sector in the U.S., and understand the decades-long influence that results from building a nuclear power plant in another country. Given their track records, I do not believe any of us want the Chinese or Russians setting standards for safety and nonproliferation in developing nations. Our continued world leadership role should be seen not just as a national security issue, but also as a moral obligation. Countries developing commercial nuclear power need the United States as a partner to ensure safe and secure expansion of nuclear energy across the globe.

The benefits to our nation's economic competitiveness are also vitally important. We know how important the U.S. nuclear energy industry is to the national economy, and those communities fortunate enough to host power plants. The nuclear energy industry creates more than 100,000 direct jobs with excellent salaries and benefits, and more than 400,000 indirect jobs – a roughly $60 billion annual contributor to the U.S. gross domestic product. A healthy domestic industry allows for a robust export market; billions of dollars available to U.S. firms who supply equipment and expertise to that growing body of nations eager to power their futures with clean, safe, and reliable nuclear energy.

National security and economic opportunity. These are powerful motivators to maintain, and eventually build upon, our advantages. So, how do we accomplish this?

First, by making sure we sustain our current nuclear reactor fleet, which supplies nearly 20 percent of this nation's electricity and 60 percent of its carbon-free electricity. The performance of our fleet is nothing short of remarkable. Nuclear energy has proven itself, in the bitter cold and in the midst of devastating hurricanes, to be this country's most reliable and resilient form of energy production. That reliability and resilience deserve consideration. Nuclear power's contribution to grid stability and performance are undeniable, and so I applaud Energy Secretary Rick Perry's effort to properly value resilient and reliable energy sources, including nuclear energy. As Secretary Perry wrote in his letter to the Federal Energy Regulatory Commission (FERC): "America's greatness depends on a reliable, resilient electric grid powered by an 'All of the Above' mix of generation resources."

The Secretary's proposed rule largely concerned our current fleet, the maintenance of which is vital, and part of Idaho National Laboratory's core mission. As part of this effort, INL is working with utilities to modernize control rooms based on decades-old technologies. That includes digital instrumentation and controls. The Laboratory also is supporting utilities in the license renewal process, in the area of material aging and degradation. This effort has helped three utilities determine they will seek "Subsequent Licensing Renewal," which extends the life of a power plant beyond 60 years. Finally, we have transitioned INL's Light Water Reactor Sustainability (LWRS) Program from one concerned primarily with licensing to include helping utilities reduce operating costs. We realized that plants who get relicensed will struggle to continue operating if they are not economically sustainable. That is a snapshot of what we are doing to extend the lives of the current fleet.

But if we are to maintain our historic advantages, we must enable the private-public partnerships necessary to develop and deploy the next generation of nuclear reactors. As the nation's lead nuclear research and development laboratory, INL is at the forefront of this effort, a proud partner with other national labs, our colleges and universities, and an industry eager to embrace innovation. New reactor technologies will no doubt improve the world if they make it into the commercial mainstream, but those first steps, as has been this nation's electricity

generation history, must be guided by federally-funded research and development and robust private-public partnerships.

Building a first-of-its-kind reactor is expensive and risky. Our national laboratories are ideal places to do the research and development and partner with industry to demonstrate new technologies. A current example is the emergence of light-water small modular reactors (SMRs). It's great news for the American nuclear energy industry, and the nation as a whole, that the NuScale Power SMR continues to work its way through the NRC process.

INL has been involved with NuScale Power from the beginning, providing technical support and guidance. And NuScale's first SMR is planned for the INL Site. A public-private partnership has been vital to the project's success, and will continue after the SMR begins producing electricity for the Utah Associated Municipal Power Systems (UAMPS) in 2026. Eventually, up to two of NuScale's 12 50-megawatt modules might also be dedicated to research and development. The Joint Use Modular Plant (JUMP) program would allow INL to use the modules to develop and demonstrate other energy system processes, such as thermal energy storage and hydrogen production. Working with our industry partners, we will examine how we can use energy differently in the future, and create more integrated systems. Also, through JUMP, we would demonstrate safe, secure, and resilient micro-grid systems.

INL and our partner national laboratories are excited to continue to partner with U.S. companies to accelerate innovation on SMRs, working not only with NuScale and UAMPS, but also Oak Ridge National Laboratory and the Tennessee Valley Authority. SMRs are a potential game-changer for the U.S. nuclear industry – smaller, safer, cheaper to build, easier to license, and a window into a lucrative and influential export market.

INL also is working on advanced reactor designs, including high-temperature gas reactors cooled by molten salt or helium gas, liquid metal reactors cooled by sodium, and reactors that feature liquid fuel dissolved in fissile and fertile materials with molten salt coolant. These advanced technologies will not only further the role of nuclear energy in the production of clean, reliable, resilient, and affordable electricity, but also take advantage of other attributes,

like nuclear process heat, to transform the transportation and manufacturing sectors. This will require continued research and development investments and robust private-public partnerships.

In the next few years, for example, we are excited to work with the private sector to develop and demonstrate microreactor technologies. Think of the possibilities: powering remote communities and military bases around the world, as well as the ability to react quickly to natural disasters such as the hurricane that devastated Puerto Rico's electricity generation system, and rebuild systems that are more reliable and resilient to future threats.

Key to these advanced reactor technologies, INL and our partner laboratories are working to develop advanced nuclear fuels and new cladding materials to operate at higher temperatures, extract more energy from the fuel, tolerate a wider range of operating and abnormal conditions, and reduce waste generation. Developing new materials and fuels for nuclear energy systems requires world-leading test reactors and post-irradiation examination and fuel science capabilities, like the Advanced Test Reactor (ATR) and Transient Test Reactor (TREAT) at INL, High Flux Isotope Reactor (HFIR) at ORNL, and Materials and Fuels Complex (MFC) at INL. To further U.S. leadership in the science and technology of advanced nuclear energy systems, we are also embarking on the development and design of a Versatile Fast Neutron Source (VFNS) within a decade. The irradiation capabilities of the VFNS will foster further innovations by our industry for many decades to come.

This R&D is vital. But so is achieving results. Accelerating innovation and getting ideas into the marketplace is a necessary part of realizing nuclear energy's enormous potential and maintaining the United States' historic leadership. That is why DOE established the Gateway for Accelerated Innovation in Nuclear (GAIN) program. This collaborative effort between the private sector, INL, Oak Ridge National Laboratory, and Argonne National Laboratory provides the nuclear community with access to the technical, regulatory, and financial support necessary to move innovative nuclear energy technologies toward commercialization. GAIN provides an opportunity for the private and public sectors to share expertise, reduce barriers, successfully

develop innovative technologies, and make sure our nation continues to benefit from nuclear energy.

Finally, as the nation's lead nuclear R&D laboratory, INL has a responsibility to propose options for the nation to safely and securely manage nuclear waste and used nuclear fuel. This involves developing technical solutions for used fuel storage, transport, and disposal as part of the current open (direct disposal) fuel cycle. A further objective is to improve resource utilization, maximize energy generation, reduce waste, and limit the risk of proliferation, as part of potential future advanced fuel cycles.

Research and development is key to rebuilding our domestic commercial nuclear industry and maintaining our national security and international civil nuclear energy leadership. But we must act now. This will require a combination of elements: the facilities and capabilities of our national laboratories, the energy and ideas emanating from the scientists and engineers at our universities and national laboratories, and a sound civil nuclear energy policy.

Let us remain the world leader and tone setter. Our national labs and universities give us a tremendous technical advantage over our competitors across the globe. Let us approach this great opportunity with urgency, and a collective desire to achieve results. And, from the perspective of the nation's lead nuclear R&D laboratory and in the spirit that created 52 nuclear reactors at INL and launched an industry that has helped power U.S. prosperity, we will continue to partner with industry to innovate. We at INL are committed to seeing these tasks through to a successful conclusion. We are at a turning point for clean, safe and reliable nuclear energy. For the good of our economy, our environment, and our national security, let us embrace this challenge.

I am happy to answer any questions you may have.