TESTIMONY OF

DR. MARK PETERS, LABORATORY DIRECTOR

IDAHO NATIONAL LABORATORY

BEFORE THE

U.S HOUSE OF REPRESENTATIVES COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

"NATIONAL LABORATORIES: WORLD-LEADING INNOVATION IN SCIENCE"

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Dr. Mark Peters, Idaho National Laboratory Director
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"National Laboratories: World Leading Innovation in Science"

Chairman Smith, Ranking Member Johnson, and members of the committee: Thank you for the opportunity to appear before you today. It is an honor to speak to you about the management, accomplishments, and research goals at our U.S. Department of Energy national laboratories.

My name is Mark Peters, and I am director at Idaho National Laboratory (INL). I am also serving in a one-year term as chairman of the National Laboratory Directors Council (NLDC), an organization created by the directors of the 17 national laboratories.

The value of the national laboratories

A rapidly changing world results in a complex and evolving set of challenges for our nation. Primary among those are:

- Ensuring our national security at home and abroad, and protecting and making more resilient vital infrastructure such as electric grids and transportation systems;
- Increasing the availability of clean, affordable, and reliable energy to meet a growing demand;
- And continuing to enhance U.S. competitiveness in the global market through scientific achievement and innovation.

I am confident in our nation's ability to meet these challenges, in part because the U.S. possesses a unique national asset other nations desperately want to duplicate: our DOE national laboratories.

The national laboratories are among the nation's top science and technology enterprises. This system of 17 laboratories working together to advance science and innovation is uniquely American. 16 of the 17 national laboratories are Federally Funded Research and Development Centers (FFRDCs) and are operated by Management and Operating (M&O) contracts with the Department of Energy.

Our national laboratory system has a rich history of accomplishment that has driven American prosperity. This committee's jurisdiction includes the national laboratories, and I believe that each of you can take a great deal of pride in the system you helped build and support.

The national laboratories exist to promote scientific and technical innovation in the areas of energy, national security, and scientific discovery. By any measure, the national laboratory system has accomplished that mission. I could spend the rest of my time today listing great innovations borne in a DOE national laboratory. I will not do that, but I would point out a few notable achievements:

- **The Internet**
  National laboratory scientists, seeking to share physics information, installed the first web server in North America, jump-starting the development of the World Wide Web.
- **Medical diagnostics and treatment**
  National laboratory researchers helped develop the field of nuclear medicine, producing radioisotopes to diagnose and treat disease, imaging technology to detect cancer, and software to target tumors and spare healthy tissue.
- **Peaceful use of nuclear energy**

I am proud to say that nearly every nuclear energy reactor in use around the globe today can trace its roots to Idaho National Laboratory and its precursors. Our national laboratories are also integral to extending the lives of the U.S. nuclear reactor fleet and developing the next generation of nuclear reactors.

- **Powered NASA spacecraft**
  National laboratories built the nuclear battery that powered the Mars Rover Curiosity and other important NASA space and planetary missions.

Our national laboratories play a critical role in treating and disposing of Cold War nuclear waste and developing advanced technologies, and they are home to state-of-the-art facilities and staff who capably support DOE, the Department of Defense, the Department of Homeland Security, the intelligence community, and our military to provide technical solutions to national security challenges.

Finally, the national laboratories' partnerships with industry and academia drive technology solutions to the marketplace, creating jobs and driving economic growth.

Our national laboratory system is a tremendous asset that gives the U.S. an advantage over the rest of the world. But we can never become complacent, or be unwilling to honestly asses our strengths and weaknesses and work to improve. I would argue that we can – and should – strive to do more.

Improving Efficiency and Effectiveness

In 2014, Congress established the Commission to Review the Effectiveness of the National Laboratories (CRENEL). The commission delivered its first report in October 2015. As a new laboratory director (my first day at INL was Oct. 1, 2015), I took careful note of the contents of that report, specifically the nature of the relationship between DOE and its management and operating contractors, and how that had, according to the commission, eroded over time. "The intended relationship between DOE and the National Energy Laboratories is as trusted partners, working together to carry out critical missions for the Nation," the report said. The erosion of that partnership "resulted in a less-than-optimal working relationship and reduced efficiency."

The 2014 Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise reached the same conclusion, and lamented the loss of a management system that allowed the government to decide what is needed and the M&O contractor to decide how that need is to be met. "The (Federally Funded Research and Development Centers) model for the NNSA labs has been lost," the report concluded. "Historically the Federally Funded Research and Development Centers – the laboratories – have played a key strategic role as trusted advisors in informing the government regarding effective execution of the mission ... the FFRDC role has increasingly been replaced by one whereby the laboratories are perceived as contractors rather than as partners who are relied upon to help resolve issues and successfully deliver the mission."

I can tell you that my colleagues and I take these findings seriously, and we understand that our vital mission to serve the American taxpayer is best served by embracing reform. I also want to emphasize that the DOE, under Secretary Moniz and now Secretary Perry is deeply committed to the national laboratories and are partnering with the laboratories to improve our effectiveness.

Last fall, the National Laboratory Directors Council wrote a letter to Energy Secretary Rick Perry in support of DOE's efforts to drive fundamental change across four key areas:

(1) Focus on national priorities

We do this through strategic planning and working collectively and individually to meet DOE and NNSA mission needs and address national priorities.

(2) Improved DOE governance at the laboratories

DOE has worked to streamline and simplify contract mechanisms that reduce transactional oversight, and allow the M&O contractors a better understanding of expectations and greater authority and accountability in key areas, such as procurement and incident reporting.

(3) Regulatory reform

In accordance with Executive Order 13777, "Enforcing the Regulatory Reform Agenda," the department is prioritizing a reduction of regulatory burdens that impede innovation.

(4) Industry collaboration

We have seen DOE take specific steps to move scientific and technological advances into the marketplace. And the laboratories are being encouraged to work with the private sector to find ways for our R&D to provide pathways that create new businesses, products, and jobs.

As we continue to evolve the relationship between DOE and its M&O contractors, let us focus on the following areas:

- Rebuilding trust between DOE and its contractors.
- Restoring responsibility, authority, and accountability for decisions and performance to the M&O contractors.
- A reduction of bureaucracy, specifically duplicative, contradictive, and unnecessary requirements.
- And, when appropriate, the use of consensus national, international, commercial, industrial, and institutional standards.

The Revolutionary Working Group contract negotiated at SLAC National Laboratory was an effort to redesign the M&O contract in a way that enabled an increased level of efficiency and effectiveness. In a limited sample size, this approach has resulted in reductions in transactional oversight, increases in private investment, and a reduction in operating costs.

I believe empowering the M&O contractors managing the laboratories will result in the most effective use of our taxpayer dollars. As we allow the laboratories to hire good people, provide them with the tools they need, demand results, and hold them accountable, we will unleash the genius of our national laboratories.

DOE, Congress, and the national laboratories should partner to continue to develop and test new contracting mechanisms that allow for greater collaboration with industry and less cumbersome oversight. Hold the laboratories accountable, but let us work together to develop innovative contracting, partnership, and oversight models to see what we might achieve.

We understand also that in asking to be more empowered, the laboratories are betting on ourselves. We need to embrace a safety culture and transparency, and we must conduct business in a way that will make our fellow citizens proud. We need to admit mistakes when they occur, correct them, and learn from them. Let our national laboratories lead the way in establishing cultures of transparency, accountability, and accomplishment.

The importance of Research and Development (R&D)

The core mission of the 10 DOE Office of Science Laboratories is to pursue basic research for the advancement of scientific knowledge for fundamental discovery and to provide the foundation to addressing energy and security challenges. This does not necessarily have specific near-term commercialization objectives or applications.

The core mission of the applied energy laboratories is two-fold:

- Research, development, and demonstration (RD&D) for the ultimate application of new knowledge having specific performance objectives with respect to products or processes;
- And to act as the technical resource for the country in the areas of specific expertise. In this role, the applied energy laboratories provide the nation with expert advice and serve as honest brokers between industry, government, and regulators on all aspects of the appropriate energy technology or security system.

Moreover, the applied energy laboratories serve the public interest for access to safe, secure, sustainable, reliable, and resilient energy by developing, validating, and demonstrating at scale, new technologies in their areas of specialty. The applied energy laboratories have a strong public purpose, but also work at the nexus of government and industry, often addressing problems that are neither purely governmental nor purely private, but where there is a clear national interest. Examples include the development of advanced energy technologies, solutions to maintain grid reliability and resilience, and management of used nuclear fuel.

Finally, there are legitimate and essential federal government roles in reducing risk to induce private investment that go beyond basic science in the arena of technology development, validation, and commercialization of energy systems. The laboratories serve an essential role in this part of the science and innovation ecosystem.

INL is extremely proud of its status as the nation's lead nuclear energy R&D laboratory, and its history of helping build an industry that provides nearly 20 percent of this nation's electricity and 60 percent of its carbon-free electricity. An industry that is responsible for 500,000 direct and indirect jobs and adds $60 billion annually to the U.S. gross domestic product. As part of the effort to maintain and extend the lives of the U.S. nuclear reactor fleet, INL is working with utilities to modernize control rooms based on decades-old technologies. That includes digital instrumentation and controls.

The Laboratory is supporting utilities in the license renewal process. 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 DOE'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.

If we are to maintain our historic advantages in the civil nuclear sector we must enable the private-public partnerships necessary to develop and deploy the next generation of nuclear reactors. 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).

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) at INL, High Flux Isotope Reactor (HFIR) at ORNL, and Materials and Fuels Complex (MFC) and Transient Reactor Test Facility (TREAT) at INL.

To further U.S. leadership in the science and technology of advanced nuclear energy systems, we are also exploring 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 national laboratories, universities, and industry for many decades to come.

INL, as a multi-program national laboratory, also addresses broader energy and security challenges. For example, our scientists are working in advanced manufacturing, hybrid energy systems, and electric vehicles. And INL's National and Homeland Security Directorate is committed to protecting the reliability and resiliency of our power grid and energy infrastructure. Our Cybercore Integration Center initiative facilitates research and development that identifies vulnerabilities and develops solutions to reduce cyber risks.

In summary, the national laboratories meet the special, long-term needs of the nation that cannot be met in any other way. Continued investments in these vital national assets will boost our economy, protect our national security, protect our environment, and benefit our citizens in a variety of ways difficult to imagine. Additional DOE national laboratory accomplishments that further illustrate these points include:

- **Purified vaccines**

National laboratory researchers adapted nuclear separations technology to develop a zonal centrifuge used to purify vaccines, which reduces or eliminates unwanted side effects. Commercial centrifuges based on the invention produce vaccines for millions of people.

- **The "Fracking" revolution**
  National laboratory research jump-started the shale gas revolution by pointing the way to key technologies and methodologies for cost-efficient extraction. An estimated $220 million in R&D expenditures on unconventional gas R&D from 1976 to 1992 have resulted in an estimated $100 billion in annual economic activity from shale gas production alone.
- **Delivered troops safely**
  National laboratory researchers have developed computer models that effectively manage the complex logistical tasks of deploying troops and equipment to distant destinations.
- **Made wind power mainstream**
  Increasing wind turbine efficiency with high efficiency airfoils has reduced the cost of wind power by more than 80 percent over the last 30 years. Now deployed in wind farms nationwide, these turbines owe their existence to national laboratory research.
- **Improved airport security**
  Weapons, explosives, plastic devices, and other concealed tools of terrorists are easier to detect thanks to technology developed at national laboratories and now installed in airports worldwide.
- **Clean up Anthrax**
  National laboratory scientists developed a nontoxic foam that neutralizes chemical and biological agents. This foam was used to clean up congressional office buildings and mail rooms exposed to anthrax in 2001.
- **Launched the LED lighting revolution**
  In the 1990s, national laboratory scientists saw the need for energy-efficient solid-state lighting and worked with industry to develop white LEDs. Today, white LEDs are about 30 percent efficient, with the potential to reach 70 percent to 80 percent efficiency.

Private-public Partnerships

While federal government funding is vital to ensuring the success of our national laboratories, the importance of private-public partnerships cannot be overstated. The close relationship of applied energy laboratories, in particular, with the private sector ensures transition of knowledge and technologies into commercial products and practices that are market relevant.

That certainly applies to private-public partnerships that may end up being a game changer for the American nuclear energy industry. INL has partnered with NuScale Power and their Small Modular Reactor (SMR) from the beginning, providing technical support and guidance. And NuScale's first SMR is planned for the INL desert Site. A private-public 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 one or two of the modules to demonstrate other energy 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, including safe, secure, and resilient micro-grid systems.

This private-public partnership is just the beginning and 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) initiative. This collaborative effort between 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, and successfully develop innovative nuclear technologies.

A plea for stability

Maintaining our country's leadership in science and innovation requires sustained and strong support in building cutting-edge scientific and engineering facilities and infrastructure, and maintaining an outstanding workforce. Other countries are doubling down their investments in government-funded R&D. In fact, other countries are basing their planning on DOE and its national laboratory system. This threatens the U.S.'s long-held science and technology leadership with implications for the economy, national security, and environmental sustainability. The national laboratory system is strongest when DOE is strong. That is why it is critical that DOE's core missions have strong support and stable funding across the entire R&D spectrum.

And we all would benefit from a return to a stable federal funding process. Operating under continuing resolutions and the threat of government shutdowns is demoralizing. It is also an inefficient and ineffective way to manage agencies, departments, laboratories, and science and technology. When the television news is dominated by the approach of another government shutdown date, our workforce – talented people dedicated to the mission of leaving this world a better place than they found it – cannot be blamed if they spend time wondering about their next paycheck instead of their next scientific breakthrough.

Closing

I began by talking about the challenges our nation faces today, and into the future, and how I believe our national laboratories are ideally suited to foster the scientific achievement and innovation necessary to overcoming those challenges. I want to end by saying that DOE is working actively with the national laboratories to make the system more effective and efficient. Secretary Rick Perry, Deputy Secretary Dan Brouillette, and the DOE team are to be commended for spearheading this effort, which cannot help but result in better outcomes vital to our national security, environment, and economy. For our part, the laboratories are committed to working with Secretary Perry and the DOE to build trust and accountability and ensure the best possible return for the nation's investment in the DOE national laboratories.

Thank you again for the opportunity to be here today. I am happy to answer any questions you may have.