TESTIMONY OF

DR. JOHN WAGNER, ASSOCIATE LABORATORY DIRECTOR NUCLEAR SCIENCE AND TECHNOLOGY DIRECTORATE

IDAHO NATIONAL LABORATORY

BEFORE THE

U.S. SENATE COMMITTEE ON ENERGY & NATURAL RESOURCES

"Full Committee Hearing to Examine Options for the Interim and Long-Term Storage of Nuclear Waste and to Consider S. 1234, the Nuclear Waste Administration Act of 2019."

JUNE 27, 2019

Chairwoman Murkowski, Ranking Member Manchin, and members of the committee, it is an honor and privilege to be with you today. My name is John Wagner, and I am the associate laboratory director for the Nuclear Science and Technology Directorate at Idaho National Laboratory (INL). I'm grateful for the opportunity to testify on S. 1234, the Nuclear Waste Administration Act of 2019, as well as to participate in a discussion on consolidated interim storage and disposal of spent nuclear fuel and high-level radioactive waste. I want to thank Senators Murkowski, Feinstein and Alexander for sponsoring S. 1234, and their persistent efforts to make progress on this important issue for the nation in general, and nuclear energy in particular.

For more than 50 years, Americans have debated the appropriate approach to manage spent nuclear fuel and high-level nuclear waste. That debate has spanned both technical and political arenas and, for that reason, I'm encouraged that this bill has been reintroduced this year. Our conversation today is a positive step toward an agreeable path forward for establishing consolidated interim storage facilities and repositories, and any progress toward developing these facilities is greatly needed and appreciated.

Currently, I oversee INL's nuclear energy research, development and deployment efforts, including R&D efforts related to the management and disposition of spent nuclear fuel. Throughout my career, I have been intimately involved in technical issues related to spent nuclear fuel storage, transportation, and disposal. My first position following graduate school was with a private company designing and licensing spent nuclear fuel storage and transportation systems. Later, during my employment at Oak Ridge National Laboratory, I supported the U.S. Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) on a variety of technical issues related to long-term storage, transportation, and disposal of spent nuclear fuel, including serving as the national technical director of the U.S. Department of

Energy's Nuclear Fuels Storage and Transportation Planning Project – a project established to implement the recommended near-term actions in the Blue Ribbon Commission on America's Nuclear Future (BRC) report, and to lay the groundwork for implementing interim storage, including associated transportation, per the administration's *Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste*.

In that role, and my roles since that time, I have seen firsthand how the lack of a sustained, coherent nuclear waste management plan adversely impacts the deployment of carbon-free nuclear energy.

Earlier, I framed this issue as important to the future of our nation. Here's why I say that: As the nation's nuclear energy research, development and deployment laboratory, INL is a leader in the effort to maintain and extend the lives of America's reactor fleet. These safe, efficient, and high-performing systems produce nearly 20% of the nation's electricity and more than half of our carbon-free electricity. That's more than solar, wind, hydro, and geothermal combined.

At INL, we work with industry on innovative advanced nuclear reactor designs. This includes megawatt-scale microreactors, small modular reactors, and a variety of advanced designs that offer the potential for improved performance, greater inherent safety features, and improved applicability for certain market applications, as well as reduced construction, licensing, and operating costs.

As this committee heard on April 30, during a discussion on the Nuclear Energy Leadership Act (NELA), a strong and vibrant commercial nuclear energy industry is vital to the United States for a number of reasons:

- First, the environment. The federal government's fourth National Climate Assessment detailed how changes in the earth's climate are having negative impacts on our economy, environment, communities, public health, infrastructure, tourism, recreation, and agriculture. We know that efforts to reduce carbon emissions while meeting present and future energy demands require a significant expansion of nuclear power. A recent Massachusetts Institute of Technology (MIT) study found that excluding nuclear energy from deep decarbonization scenarios could double or even triple the average cost of electricity because of the enormous amounts of wind and solar energy and battery storage that would be needed to meet our basic needs. As the only carbon-free, scalable energy source that produces electricity 24 hours/day, 7 days/week, 365 days/year, nuclear energy is the single most effective tool we have to combat carbon emissions, in the U.S. and across the world.
- Second, power grid reliability and security. Cold snaps in the Midwest and Northeast, as well as hurricanes in Texas and Florida, have demonstrated that nuclear power is best equipped to generate electricity under even the most challenging circumstances. As the changing climate affects weather patterns, and demand for electricity increases, reliable and secure nuclear energy will become even more important to the continuance of American prosperity.

- Third, our economy. The U.S. nuclear energy industry contributes $60 billion annually to the nation's gross domestic product. According to the Nuclear Energy Institute (NEI), it supports more than 100,000 direct jobs and is responsible for 475,000 indirect jobs across our economy.
- Fourth, U.S. national security. Because American ingenuity inspired and created the nuclear energy industry, the vast majority of reactors are based on American technology. Our safety and nonproliferation approaches are the world's standards. We remain among the world leaders, but our leadership and associated influence are declining. In the worldwide energy race, our competitors, specifically China and Russia, are rapidly making up ground.

Given how important nuclear energy is to our nation, today and into the future, we must address the major impediments to developing and deploying advanced reactors. Congress, to its credit, has begun that process by passing two important pieces of legislation – the Nuclear Energy Innovation Capabilities Act (NEICA) and Nuclear Energy Innovation and Modernization Act (NEIMA) – and introducing a third, NELA.

A variety of factors – high capital costs, the long time frame between licensing and construction, subsidies for other forms of electricity generation, and the low cost of natural gas – have led to premature nuclear plant closures and abandonment of new nuclear projects.

Another concern for deployment of new, advanced reactors, as well as continued operation of existing plants in some cases, is the reason we are here today – an effective solution for the management and ultimate disposition of nuclear waste. Every day that passes without a resolution to the back end of the fuel cycle is damaging to the U.S. nuclear energy industry, our nuclear-facility communities, taxpayers, the environment, economy, and national security.

Let's talk size and scope.

Currently, there is commercial-origin spent nuclear fuel at locations in 35 states. However, the total volume of spent fuel is surprisingly small when compared to the vast amount of clean energy produced over the past six decades. If all of the nation's commercial spent nuclear fuel generated to date were stacked up, it would fit within one football field at a depth of less than 10 meters. Though the volume of this material is relatively small, it is radioactive and must be safely and securely managed.

First and foremost, spent nuclear fuel storage and transportation is technically safe, as evidenced by more than 50 years of safe and secure operations by the public and private sectors. We do not have a spent nuclear fuel safety crisis in our country.

We do, however, have issues caused by the lack of a consistent national management approach for nuclear waste. These have been exacerbated by the delay in a final disposition solution.

This unanticipated delay has necessitated longer-than-anticipated storage approaches, and the national labs and industry – with input from the NRC – are proactively identifying and

addressing potential technical issues that may arise. A number of activities are being performed to ensure that safe storage and transportation of spent nuclear fuel is achieved, including:

- Development of improved understanding of spent fuel and spent fuel canister materials' performance during extended storage periods;
- Development and deployment of inspection technologies for spent fuel packages and canisters;
- Development of aging management plans for storage configurations;
- Development and evaluation of future alternative spent fuel storage configurations;
- Development of the transportation assets to move spent nuclear fuel when interim or final alternatives become available;
- Other system engineering evaluations to explore the trade-offs between different spent nuclear fuel management approaches.

More worrisome than the relatively minor technical risks associated with spent fuel storage are the socio, economic, and community impacts of on-site storage at permanently shutdown nuclear reactors. Spent fuel at these sites requires ongoing and expensive security, with no commercial value. The reactor is no longer producing megawatts of clean electricity, the reactor site is no longer supporting thousands of highly skilled and compensated nuclear workers or contributing to the local tax base, and the land cannot be reutilized until the fuel is removed.

Not only does on-site spent fuel storage have local economic impacts, the federal government's inability to accept these materials increases its liability. That bill is paid by all taxpayers, not just those who enjoyed the benefits of the clean, reliable electricity produced by the reactor. This cost of inaction increases the taxpayer burden by an estimated $2.2 million per day and will only increase until the government begins to fulfill its contractual obligation to take possession of the spent fuel.

A 2016 Oak Ridge National Laboratory-led report predicted that consolidated interim storage, due to the ability to accept fuel from reactor sites more quickly, has the potential to avoid billions of dollars in operation and maintenance costs at individual sites. This is consistent with the Nuclear Energy Institute's recent evaluation that more than $6 billion in taxpayer dollars have been distributed to date with an estimated $800 million for each upcoming year of inaction.

Because of this, an interim storage facility can be viewed as an economic investment in the waste management system, providing a range of benefits that have been identified in numerous studies, including the BRC report.

Finally, I would like to note that I am encouraged to see that S. 1234 identifies defense-related spent fuel under a compliance agreement as a priority, at the discretion of the new administrator. The U.S. Department of Energy at the INL Site is responsible for managing and storing a range of spent fuel, including defense-related spent fuel as well as commercial and research fuel from domestic and foreign reactors. This spent fuel is managed safely and

effectively in state-of-the-art facilities and protected by world-class security forces. However, the presence of this spent fuel without a clear disposition path causes concern among some in our community and is an impediment to our mission to discover, demonstrate, and secure innovative nuclear energy solutions. This bill would enable a meaningful storage alternative for a number of these spent fuels.

I appreciate the opportunity to testify and I want to thank you again for your attention to this very important issue for our nation. I look forward to your questions.