Testimony of NuScale Power before the
House Committee on Energy and Commerce
Subcommittee on Energy

"Building a 100 Percent Clean Economy:
Advanced Nuclear Technology's Role in a Decarbonized Future"

John L. Hopkins
Chairman and Chief Executive Officer
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March 3, 2020

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Thank you for the opportunity to testify before the Committee today. Advanced small modular nuclear reactors (SMRs) offer an opportunity for true decarbonization with safe, flexible, efficient and affordable zero-carbon baseload technology that will help drive growth in the clean energy economy.

Today I will provide an update on the state of advanced SMR technology and NuScale Power's progress, describe the contribution that advanced nuclear technology can make as we decarbonize our economy, and articulate policy actions that can help speed this transition.

Advanced Nuclear Technology: Small Modular Reactors

SMRs are a new type of smaller, safer nuclear reactors designed to provide flexible and cost-effective nuclear power solutions. NuScale Power is the leading developer of American SMR technology. The genesis of our 60 MWe light water reactor began twenty years ago with a US Department of Energy (DOE) grant and the construction of a one-third scale electrically-heated prototype test facility to validate the safety features of the plant. This prototype has been in operation since 2003.

NuScale is based in Corvallis, Oregon and majority-owned by the Fluor Corporation, headquartered in Irving, Texas. Our corporate offices are in Portland, and we have 380 full time employees with a significant number in Corvallis.

NuScale SMRs have revolutionized nuclear safety with a simplified design and walk-away safe technology. In a twelve unit configuration, all twelve NuScale Power Modules can shut-down and self-cool for an unlimited period of time, with no operator action, no need for additional water, and no electricity. We accomplished this by the use of natural forces of physics (convection, conduction and gravity) rather than outside power sources, to drive the flow of coolant in the reactor and by eliminating over two-thirds of the systems found in existing

operating nuclear power plants. Protected by more than 500 patents granted or pending in nearly 20 countries, this technology has been demonstrated through an extensive test program inspected by the US Nuclear Regulatory Commission (NRC).

Each NuScale SMR can generate up to 60MWe of electrical power and up to 12 modules are housed at each site, providing up to 720 MWe. The modular design allows investments in generating capacity to be right-sized for the application at hand and provides the flexibility to grow over time. SMRs are factory built and can be delivered by truck, rail, or barge to the site, installed, and be capable of generating electricity in one to three months after delivery. SMRs can integrate with a renewable energy source and load follow, provide reliable power to mission critical facilities and industrial processes like desalination and refining, and serve as emission-free baseload power. SMRs are well-positioned to replace aging coal-fired power plants that are being taken off-line, providing a continuity of employment for existing workers and a continuity of tax revenue for the host community.

NuScale Power: Leading the Transition

The regulatory and capital investment risks associated with development and deployment of first-of-a-kind nuclear technology can prove to be insurmountable.

Before a commercial nuclear technology can be deployed in the United States, it must be approved by the NRC. Customers who will purchase and operate an approved design must receive their own Combined License (COL). This process presents significant risks to any investor, and requires large up front investments without any certainty as to success.

To help overcome these risks, DOE has been supporting programmatic, cost-shared public-private partnerships to advance the development of these technologies, and the program is working. In 2013, NuScale won a competitive DOE 50-50 cost-shared funding opportunity. Fluor and its investors contributed $643 million, or 67% of expenditures to date, and the Federal government has contributed $314 million, or 33%. As we continue to advance our technology, we will continue to seek investors and partners consistent with the terms of our public-private partnership.

The NuScale design is undergoing review by the NRC. The 12,000 page design certification application (DCA) took over 2 million engineering hours, involved over 800 people and cost $500 million to prepare. We submitted our DCA at the end of 2016. The NRC accepted it for review in March 2017 and established a 42-month schedule. In December 2019, the NRC completed Phase 4 of the review, on schedule, and issued the Advanced Safety Evaluation Report with No Open Items. Completion of Phase 4 is a major milestone as it signifies near-completion of the technical review. NRC is on track for completing its review in September 2020 and completing the rulemaking by publishing the Design Certification in the Federal Register approximately four months later.

NuScale is the only near-term, commercially deployable advanced nuclear technology. Together with our utility partner we are proceeding towards near-term commercialization. We are preparing for our first deployment project known as the Utah Associated Municipal Power Systems (UAMPS) Carbon Free Power Project, which will be sited at the DOE's Idaho National Laboratory (INL) site. INL will use one of the modules to provide electricity to the site and a second module for research and demonstration at scale. The remaining modules will generate electricity for UAMPS' customers in Utah, Nevada, New Mexico, Idaho and California. Energy Northwest, which operates the Columbia Generating Station in Washington State, has joined this project and holds a first right of offer to operate the UAMPS project.

Let me be clear: the cost-shared funding provided by Congress has accelerated NuScale's advancement through a complex NRC Design Certification process. This is what DOE's SMR Program was created to do, and our success is credited to your strong bipartisan support.

Growing the Clean Energy Economy

Once deployment begins, NuScale's innovative manufacturing process along with investments in SMR technology will help grow the clean energy economy. Since NuScale SMRs are smaller, as production grows, they will be built in a factory and transported to each project site rather than being built on site. A manufacturing rate to support 3 plant deployments per year could help support 13,500 jobs in the manufacturing sector.

Our supply chain is already extensive, with 50 supplier partners located in 25 states. For example, Sargent & Lundy is an engineering firm headquartered in Chicago. The company currently has 75 engineers dedicated to completing the NuScale Standard Plant Design. That number is expected to increase to 160 by this time next year. Framatome, formerly called Areva, which is headquartered in Lynchburg, Virginia and located in Washington state, will manufacture fuel assemblies.

Our progress through NRC licensing is stimulating investment in the US manufacturing sector. When we submitted our DCA, there were seven forgings we would have to buy outside of the United States. Today that number is five. As we come to the end of the NRC review, we are turning to proof of concept testing, manufacturing trials, detailed design, and development of procurement specifications for the unique safety-significant components of the NuScale Power module, such as the control rod drive mechanisms, reactor pressure valves, containment isolation valves, reactor building cranes, underwater bolting equipment and other long lead items.

We anticipate about 1,171 construction jobs per plant, with significant needs for heavy equipment operators, welders, electricians, pipefitters and plumbers, and others. Fluor has executed a Memorandum of Understanding with the North American Building Trades Union for the construction of NuScale Plants in the United States.

SMRs are well-positioned to replace retiring coal-fired power plants, providing a transition path for existing workers to participate in the clean energy economy. Once operating, each NuScale plant is expected to employ about 305 full-time employees. This is about twice the workforce of

a similarly-sized coal plant and six times that of combined cycle natural gas plant. Jobs at a nuclear plant pay 20% more on average, and three-quarters of the workforce will require skills obtained through completion of an associate's degree, vocational training, or military training. NuScale and Fluor have collaborated with US-based universities on over 20 research projects to support the reactor design. DOE has also announced grant funding to support deployment of digital control simulators at Oregon State University, Texas A&M at College Station and the University of Idaho. The simulators will be used for research and education. Two weeks ago, Fluor and its partners in South Carolina announced an MOU with South Carolina State University and Claflin University to explore curriculum development, faculty engagement, and pathways for employment that will be provided to qualifying students and schools at these historically black colleges and universities.

Once in place, NuScale SMRs can serve as baseload power to balance generation from intermittent resources like wind and solar, reducing the need for fossil-based backup, or infrequently needed renewable generation and energy storage.

NuScale plants can rapidly change power generation with the use of the highly maneuverable core design or, for more rapid changes, a "turbine bypass valve" that directs steam into or away from the steam turbine generator. With this technology, zero-carbon options like wind and solar can thrive without relying on fossil-based generation or expensive battery storage - while maintaining grid stability.

Studies by MIT[1], the International Energy Agency[2] and E3[3] demonstrate that moving to a low carbon economy with nuclear is far more affordable. MIT reported that without nuclear energy, the cost of deep decarbonization of the electricity sector would be two to three times higher. E3 reported that without nuclear energy, achieving Washington state's 100% clean electricity standard by 2045 would cost $8 billion more per year. Energy Northwest has sponsored studies that forecast a need of up to 5GW of "NuScale-like" dispatchable nuclear power for Washington state electricity suppliers to affordably supply 100% clean energy to their customers by 2045.[4]

Policies to Accelerate Deployment of Advanced Small Modular Reactors

Given these advantages, advanced SMRs can offer a transformative solution on our path to decarbonization. However, the risks involved in development of first-of-a-kind technology and the extended and costly uncertain regulatory approval process, can create hurdles. DOE's ongoing public-private partnership for SMRs has been and remains a critical factor in the

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[1] *The Future of Nuclear Energy in a Carbon-Constrained World: An Interdisciplinary MIT Study,* 2018.

[2] "Nuclear Power in a Clean Energy System,", IEA, Paris, 2019.

[3] *Pacific Northwest Zero-Emitting Resources Study*, 2020.

[4] *Ibid., Executive Summary*.

successful advancement of this technology as we move toward commercial deployment. I would like to highlight some additional policy actions that can help speed the deployment.

Continued resources for DOE's public-private partnerships should be a priority for Congress. If appropriations for DOE's SMR Program continue, funds will be used for acceleration of design finalization activities, development of the manufacturing supply chain, and site licensing and deployment activities.

Further, NRC should have sufficient resources assigned to process advanced nuclear applications in a timely manner.

The draft Climate Leadership and Environmental Action for our Nation's (CLEAN) Future Act contains several provisions that would create positive momentum in the advanced nuclear sector.

- First, the bill's proposed Clean Energy Standard is technology-neutral, ensuring that nuclear power will be considered on its merits as a zero-carbon solution.
- Second, the Long-Term Nuclear Power Purchase Agreement Pilot Program will help reduce risk and spur early growth in advanced nuclear technologies.
- Third, the extension of the maximum length of federal power purchase agreements from 10 to 40 years for zero-emission power generation technologies removes a significant hurdle for deployment of zero-carbon technologies like advanced nuclear.

Enactment of H.R. 3306, the Nuclear Energy Leadership Act (NELA) introduced by Representative Luria, Riggleman, Lamb, and Wittman and co-sponsored by 22 other Republican and Democratic members, will accelerate growth in the advanced nuclear sector.

The 2018 enactment of the Nuclear Energy Innovation and Modernization Act (NEIMA) will help future advanced nuclear technologies navigate the NRC process. NuScale was pleased to support that bill and lay the groundwork for many of these reforms through our pioneering work with the NRC on the NuScale Power Module.

The action taken by Congress in 2018 to update the nuclear production tax credit was also a critical step in ensuring that the low carbon benefits of nuclear power are valued in the marketplace.

Conclusion

The NuScale SMR is a disruptive technology that will change the way the world views nuclear energy and will play an important role in the next generation deployment of zero-carbon baseload sources of electricity.

NuScale is proud to be developing a new innovative advanced SMR technology that sets a new safety standard for nuclear energy facilities, is carbon-free, factory-built, incrementally deployable, capable of load-following, and affordable. Replacement of coal-fired generating assets with SMRs can spur growth in the clean energy economy and create workforce opportunities.

We are grateful for the support of the DOE and the Congress. We take the responsibilities associated with the use of taxpayer dollars very seriously and are singularly-focused on our role in the re-establishment of US leadership in nuclear technology. We are proud to be paving the way for future advanced reactor technologies.

I want to thank the Committee for the opportunity to testify before you today, and I look forward to your questions.