Written Testimony of Joe Hoagland, Ph.D.

Associate Laboratory Director, Fusion and Fission Energy and Science Directorate
Oak Ridge National Laboratory

Before the

Committee on Science, Space, and Technology

Subcommittee on Energy

U.S. House of Representatives

Powering the Nuclear Renaissance: Accelerating U.S. Leadership in Advanced Nuclear Reactors

September 2, 2026

Chairman Weber, Ranking Member Ross, and Members of the Subcommittee, thank you for the opportunity to appear before you today. I am Joe Hoagland, Associate Laboratory Director for Fusion and Fission Energy and Science at Oak Ridge National Laboratory. Prior to joining ORNL in 2025, I spent more than 30 years with the Tennessee Valley Authority, advancing major strategic initiatives in nuclear innovation, resource planning, and deployment of new energy technologies. Today, I am honored to represent ORNL and speak to the role of the broader national laboratory system, a network built to apply science at the scale of the nation's most consequential challenges.

In May 2025, President Trump issued an executive order directing the Department of Energy to reform its reactor-testing process and establish a pilot program with the goal of bringing at least three advanced test reactors to criticality by July 4, 2026. The objective was specific, time-bound, and ambitious: to move advanced reactor concepts into fueled, controlled operation on a timeline measured in months rather than many years.

The country exceeded that goal. Four privately developed advanced reactors achieved criticality by the deadline: Antares Nuclear's Mark-0, Deployable Energy's Unity, Aalo

Atomics' Aalo-X, and Valar Atomics' Ward 250. The first three demonstrations took place at Idaho National Laboratory, while Ward 250 operated at a state research site in Utah. Mark-0 became the first new privately developed, non-light-water reactor to achieve criticality in the United States in more than 40 years. Momentum continued after the deadline: on August 5, Oklo's Groves Isotope Test Reactor achieved criticality at the company's site in Texas, becoming the fifth DOE-authorized advanced reactor to reach the milestone this summer. Together, these efforts moved advanced reactor development from plans and models into real-world concrete and steel.

So, what should our nation, and the world, conclude from these recent criticality demonstrations? First, urgency and scientific rigor can reinforce one another. The deadline did not change the physics or remove the need for safety. It concentrated attention on the decisions, evidence, facilities, and expertise required to conduct the work. DOE, the national laboratories, and industry organized around a common mission and produced an observable technical result. That is an important model for future nuclear innovation.

Second, criticality is a threshold, not the endpoint. It confirms that a reactor can sustain a controlled chain reaction and that the physical system performs as predicted under test conditions. It also generates operating data that cannot be obtained from a design on paper. The next steps are to use that evidence to advance design, component reliability, fuel performance, manufacturing repeatability, operating experience, and the safety basis required for the intended application.

Third, the demonstrations change what is imaginable about delivery. They show that early advanced reactor development timelines can be safely compressed from decades to months or a few years. They also point to a different way of building some reactors: standardized designs, domestically produced components, and repeatable factory processes instead of treating every project as one-of-a-kind construction. Repetition can improve quality, make schedules more predictable, and lower costs as the domestic supply chain matures. Early tests also occurred across federal, state, and private sites, demonstrating that a streamlined, collaborative DOE authorization framework can move quickly while preserving the most rigorous safety requirements.

That demonstrated pace is already building confidence among federal customers. On August 26, the Army selected five vendors for its Janus Program and announced awards of up to a combined $2.2 billion to deploy microreactors at five installations, with more than 20 reactors expected across military installations. A credible order book gives companies and suppliers reason to invest in people, tooling, facilities, and quality systems. This is how faster scientific learning can lead to faster production, stronger supply chains, and more affordable technology.

This progress is encouraging, but we cannot stop here. These criticalities come as America enters a new era of electricity demand. After more than a decade of relatively flat growth, utilities are planning for large, concentrated, and time-sensitive loads from data centers and artificial intelligence, advanced manufacturing, electrification, and economic expansion. The U.S. Energy Information Administration forecasts the strongest four-year growth in electricity use since 2000. Lawrence Berkeley National Laboratory estimates that data centers could account for 11.8 percent of total U.S. electricity use by 2030, with projected scenarios ranging from 9.5 to 15.3 percent. New capacity must be reliable, available when customers need it, and affordable. More power cannot come at any cost.

The existing nuclear fleet supplied approximately 18 percent of U.S. electricity in 2025. New nuclear can add firm, reliable power, but deployment will depend on three connected factors: cost, technical and supply-chain maturity, and time to implementation. The recent criticalities are promising evidence that development timelines can be accelerated. They are also our cue that we are entering the next scientific phase, one in which the national laboratories must help carry that momentum forward by addressing the remaining barriers to deployment.

These demonstrations were not designed to produce electricity or process heat. Their purpose was to establish criticality, validate core physics and generate operating evidence on an accelerated timeline. The next challenge is converting that successful first step into complete, reliable energy systems capable of commercial deployment. We must prove that fuels, materials, and components will perform over time; that the integrated plant can convert and deliver energy reliably; that its sensors, controls, maintenance strategies, and trained operators can support safe operation throughout its life; and that the system can be manufactured and deployed repeatedly at an economic cost.

This is where the national laboratory system is indispensable. Companies bring designs, investment, speed, and a path to market. The laboratories provide the specialized basic science, test facilities and reactors, hot cells, materials laboratories, validated models, high-performance computing, and independent expertise needed to examine performance under conditions industry cannot easily reproduce. Because many challenges cut across reactor designs, laboratory results become shared knowledge that reduces risk and minimizes duplication of efforts for multiple developers.

ORNL is particularly well positioned to help the industry cross the gap from demonstration to deployment. The laboratory brings together reactor and fuel development, irradiation testing and post-irradiation examination, nuclear safety modeling and simulation, advanced manufacturing, high-performance computing, and fuel-cycle research. At ORNL's High Flux Isotope Reactor and hot-cell facilities, researchers test fuels and materials under radiation and examine how they perform over time. SCALE, a modeling and simulation suite developed at ORNL, supports nuclear safety analysis and design.

ORNL also connects that scientific evidence to manufacturing and deployment. At ORNL's Manufacturing Demonstration Facility, the Transformational Challenge Reactor program connected digital engineering, additive manufacturing, sensors, and inspection across the path from design through production. ORNL is also deeply engaged in DOE's Prometheus initiative, an AI-enabled framework intended to make engineering evidence more traceable and reusable, accelerate fuel and component qualification, support predictive risk analysis, and reduce the time required to assemble and review the technical basis for deployment. Together, these capabilities help industry establish that fuels and components will last, that safety and performance can be validated, and that systems can be manufactured repeatedly and economically.

National laboratories also make progress cumulative beyond individual reactor demonstrations. On August 24, Westinghouse completed zero-power criticality testing for its eVinci microreactor at the National Criticality Experiments Research Center in partnership with Los Alamos and Idaho national laboratories. Conducted to validate the reactor's core design and modeling assumptions, the test was separate from the criticality demonstrations that met the executive-order goal

Through the DOE–NRC collaboration, national laboratory teams are also developing public data needed for commercial-scale high-assay low-enriched uranium fuel cycles and transportation. This less-visible work creates a scientific foundation that companies and regulators can use.

Although today's hearing focuses on fission, many of these lessons also extend to fusion energy, particularly in qualifying materials, operating specialized test facilities, developing manufacturing capabilities, and building resilient supply chains. ORNL's Material Plasma Exposure eXperiment, or MPEX, is one example of how specialized testing can generate the materials data needed to move emerging nuclear technologies toward deployment.

Building on that foundation, the ability to move advanced reactor concepts through criticality should become a repeatable national capability. The executive order asked whether America could move faster, and the recent criticalities provided a clear answer: yes. The next measure of success is whether complete systems work, last, and can be deployed repeatedly at an affordable cost. The national laboratories are ready for that next phase. Our role is to make scientific progress cumulative, transferable, and usable, so American industry can move from individual demonstrations to deployable nuclear systems that strengthen energy security, economic competitiveness, and national leadership. Thank you for the opportunity to testify. I look forward to your questions.

References

1. The White House. *Reforming Nuclear Reactor Testing at the Department of Energy*, Executive Order 14301 (2025). https://www.whitehouse.gov/presidential-actions/2025/05/reforming-nuclear-reactor-testing-at-the-department-of-energy/
2. U.S. Department of Energy. *FACT SHEET: The Golden Era of American Nuclear Energy Has Arrived* (2026). https://www.energy.gov/articles/fact-sheet-golden-era-american-nuclear-energy-has-arrived
3. U.S. Department of Energy, Office of Nuclear Energy. *Office of Nuclear Energy Celebrates Fifth Advanced Reactor Criticality* (2026). https://www.energy.gov/ne/articles/office-nuclear-energy-celebrates-fifth-advanced-reactor-criticality
4. U.S. Army Communication and Outreach Office. *Army Reaches Agreement with Private Industry for Nuclear Micro-Reactors* (2026). https://www.army.mil/article/294891/army_reaches_agreement_with_private_industry_for_nuclear_micro_reactors
5. U.S. Energy Information Administration. *EIA Forecasts Strongest Four-Year Growth in U.S. Electricity Demand Since 2000, Fueled by Data Centers* (2026). https://www.eia.gov/pressroom/releases/press582.php
6. Lawrence Berkeley National Laboratory. *United States Data Center Energy Usage Report: 2025 Update* (2026). https://www.energy.gov/documents/united-states-data-center-energy-usage-report-2025-update
7. U.S. Energy Information Administration. *Electricity Generation, Capacity, and Sales in the United States* (2026). https://www.eia.gov/energyexplained/electricity/electricity-in-the-us-generation-capacity-and-sales.php
8. Oak Ridge National Laboratory. *Nuclear Fuel Development Section* (n.d.). https://www.ornl.gov/section/nuclear-fuel-development

9. Wieselquist, W. A., and R. A. Lefebvre, eds. *SCALE 6.3.3 User Manual* (2025). Oak Ridge National Laboratory, ORNL/TM-2025/4004. https://www.osti.gov/biblio/3002301
10. Oak Ridge National Laboratory. *Transformational Challenge Reactor Program* (n.d.). https://www.ornl.gov/tcr
11. Oak Ridge National Laboratory. *Advancing AI for Nuclear Energy Through Prometheus* (2026). https://www.ornl.gov/project/advancing-ai-nuclear-energy-through-prometheus
12. Westinghouse Electric Company. *Westinghouse eVinci™ Microreactor Achieves Zero-Power Criticality* (2026). https://info.westinghousenuclear.com/news/westinghouse-evinci-microreactor-achieves-zero-power-criticality
13. U.S. Department of Energy, Office of Nuclear Energy. *U.S. Department of Energy Awards $17 Million for First Round of HALEU Criticality Benchmarking Projects* (2024). https://www.energy.gov/ne/articles/us-department-energy-awards-17-million-first-round-haleu-criticality-benchmarking
14. U.S. Department of Energy. *Fusion Science and Technology Roadmap* (2026). https://www.energy.gov/documents/fusion-st-roadmap-060926pdf
15. Oak Ridge National Laboratory. *AI Accelerated Fusion Materials Test Facility* (2026). https://www.ornl.gov/research-highlight/ai-accelerated-fusion-materials-test-facility