COMMITTEE ON
SCIENCE, SPACE
AND TECHNOLOGY
CHAIRMAN BRIAN BABIN

ENERGY SUBCOMMITTEE

HEARING CHARTER

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

Wednesday, September 2, 2026
10:00 a.m.
2318 Rayburn House Office Building

PURPOSE
The purpose of this hearing is to examine the state of advanced nuclear reactor research in the United States. The hearing will assess remaining research, testing, and demonstration needs for these reactors, as well as the Department of Energy (DOE)'s role in supporting these technologies. The hearing will also focus on recent reactor demonstrations that have achieved criticality.

WITNESSES
- **Dr. Joe Hoagland**, Associate Lab Director for Fusion and Fission Energy Science, Oak Ridge National Laboratory
- **Mr. Isaiah Taylor**, CEO and Founder, Valar Atomics
- **Mr. Matt Loszak**, CEO, Aalo Atomics
- **Dr. Steven Shannon,** Head of the Department of Nuclear Engineering, North Carolina State University
- **Mr. Jordan Bramble**, CEO and Co-Founder, Antares Nuclear

KEY QUESTIONS
- What has the United States learned from the recent demonstrations of advanced reactors that achieved criticality? How should these lessons shape future federal investments?
- What gaps in research, testing, and demonstration activities must be addressed before advanced nuclear reactors can be commercially deployed at scale in the United States?
- What barriers currently exist that could prevent successful commercialization of advanced reactors? What steps can Congress or DOE take to address these barriers?
- How should the federal government prioritize support for advanced reactor technologies to ensure taxpayer resources accelerate U.S. nuclear innovation while maintaining U.S. competitiveness?

BACKGROUND

The United States is the world's largest producer of nuclear power, and it accounts for more than 30 percent of the world's nuclear generation of electricity.[1] In 2024, there were 94 operating commercial nuclear power plants in 28 states, which generated approximately 816 billion kilowatt-hours (kWh) of electricity. This is equivalent to 18 percent of total U.S. electricity generation.[2]

Nuclear energy plays a crucial role in ensuring America's energy security and supporting energy independence. A reliable and secure source of baseload power, nuclear energy can help meet growing national energy demands.

Advanced Reactor Technologies

The current U.S. nuclear fleet is almost entirely composed of light-water reactors (LWRs). These reactors use naturally occurring "light" water to cool the reactor system and moderate the speed of the neutrons in the chain reaction.[3] Due to decades of early-stage nuclear research at the DOE National Labs and renewed interest in more cost-effective, flexible, and fuel-efficient reactor designs, advanced nuclear reactors and concepts have the potential to change the way nuclear power is sourced, produced, and managed.

The term "advanced nuclear reactor" is defined by the Energy Act of 2020, as well as by other recent laws, as any fusion reactor or fission reactor that has "significant improvements" over existing commercial reactors.[4] These designs can vary by fuel type, coolant type, scalability, size, operating temperature, or the use of a moderator to slow the speed of neutrons in the reactor. To achieve these improvements, advanced designs may incorporate inherent or passive safety features, simplified or modular designs, enhanced load-following capabilities, high-temperature stability, fast neutron spectra, and "closed" fuel cycles.[5] Advanced reactor technologies are often referred to as "Generation IV" nuclear reactors, with existing commercial reactors constituting "Generation III" or, for the most recently constructed reactors, "Generation III+."[6]

[1] "Nuclear Power in the USA." *World Nuclear Association*, 29 July 2026, world-nuclear.org/information-library/country-profiles/countries-t-z/usa-nuclear-power.

[2] "Nuclear Power in the USA." *World Nuclear Association*, 29 July 2026, world-nuclear.org/information-library/country-profiles/countries-t-z/usa-nuclear-power.

[3] Holt, Mark. "Nuclear Energy: Overview of Congressional Issues." *Congressional Research Service*, 5 Aug. 2026, www.congress.gov/crs_external_products/R/PDF/R42853/R42853.43.pdf.

[4] Holt, Mark. "Nuclear Energy: Overview of Congressional Issues." *Congressional Research Service*, 5 Aug. 2026, www.congress.gov/crs_external_products/R/PDF/R42853/R42853.43.pdf.

[5] "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.

[6] "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.

Advanced reactor designs are separated into three primary categories: advanced water-cooled reactors, which provide evolutionary improvements to proven water-based fission technologies through innovations such as simplified design, smaller size, or enhanced efficiency; non-water-cooled reactors, which are fission reactors that use materials including liquid metals such as sodium and lead, gases such as helium and carbon dioxide, or molten salts as coolants rather than water; and fusion reactors, which generate energy by joining small atomic nuclei, as opposed to fission reactors, which generate energy by splitting large atomic nuclei.[7] Small modular reactors (SMRs), with electric generating capacity of no more than 300 megawatts (MW), can be in any of the three categories. Microreactors are even smaller-capacity SMRs, defined by DOE as producing 1-20 megawatts of thermal energy (MWt).[8]

Novel Use Cases

Advanced nuclear reactor technologies offer several novel use cases. They have the potential to support the growing energy needs of data centers and artificial intelligence technologies with reliable, around-the-clock power. They also have the potential to provide electricity and industrial heat for energy-intensive industries such as manufacturing, chemical production, and mining.[9]

Innovative forms of advanced nuclear are also being explored for maritime propulsion, powering space reactors for science outposts on the Moon, and interplanetary transport to Mars.[10] Nuclear innovations are also providing significant benefits in medicine, including through radionuclide therapies used to treat cancer.[11] The military is also starting to look at deploying advanced nuclear reactors on installations. This would help ensure that these missions do not depend on the civilian power grid, and in military operations overseas, such reactors would mean U.S. forces could operate without fear of an enemy cutting off fuel supplies.[12]

[7] "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.
[8] "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.
[9] "Value of Advanced Nuclear." *NEI*, 7 July 2026, www.nei.org/advanced-nuclear-energy/value-of-advanced-nuclear.
[10] "Use Cases and Reactor Types." *NIA*, 28 Sept. 2023, nuclearinnovationalliance.org/use-cases-and-reactor-types.
[11] "Use Cases and Reactor Types." *NIA*, 28 Sept. 2023, nuclearinnovationalliance.org/use-cases-and-reactor-types.
[12] Lopez, C. Todd. "War, Energy Departments Team up to Advance Future of Nuclear Power, Military Base Energy Security." *U.S. Department of War*, 15 Feb. 2026, www.war.gov/News/News-Stories/Article/Article/4407099/war-energy-departments-team-up-to-advance-future-of-nuclear-power-military-base/.

Executive Actions

In May 2025, President Trump issued several executive orders focused on the U.S. nuclear energy industry. Notably, Executive Order 14301, “Reforming Nuclear Reactor Testing at the Department of Energy,” aims to reform and streamline national laboratory processes for reactor testing at DOE and directs DOE to establish a new pilot program to expedite the testing of advanced reactor designs.[13]

Reactor Pilot Program

Executive Order 14301 established the Reactor Pilot Program, which creates a new pathway for advanced reactor demonstration to fast-track commercial licensing.[14] The program aims to leverage DOE authorities to expedite the research and development of advanced nuclear reactor technologies and sets a goal of reaching criticality for at least three advanced nuclear reactor concepts located outside national laboratories by July 4, 2026.

A nuclear reactor is “critical” when it achieves a self-sustaining nuclear chain reaction. In this state, each uranium atom that splits releases enough neutrons to cause one additional atom to split, thereby achieving a self-sustaining chain reaction. That stable chain reaction is what keeps nuclear power plants generating electricity 24 hours a day, seven days a week.

In August 2025, DOE selected 11 advanced reactor projects for the program to move their technologies toward deployment—Aalo Atomics Inc., Antares Nuclear Inc., Atomic Alchemy Inc., Deep Fission Inc., Last Energy Inc., Oklo Inc. (two projects), Natura Resources LLC, Radiant Industries Inc., Terrestrial Energy Inc., and Valar Atomics Inc.[15]

President Trump’s July 4, 2026, deadline was met and exceeded, with four advanced reactor projects completing a zero-power fueled criticality demonstration. In June 2026, Antares Nuclear’s Mark-0 reactor, Valar Atomics’ Ward 250, and Deployable Energy’s Unity, a project under the Nuclear Energy Launch Pad, achieved criticality, and Aalo Atomics’ Aalo-X test reactor achieved criticality in the early hours of July 4.[16] On August 5, 2026, a fifth reactor, Oklo’s Groves Isotope Test Reactor, successfully achieved criticality.[17] These demonstrations represent an important step in testing advanced reactor technologies and moving closer to commercial deployment.

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[13] “Reforming Nuclear Reactor Testing at the Department of Energy.” *The White House*, 22 June 2026, www.whitehouse.gov/presidential-actions/2025/05/reforming-nuclear-reactor-testing-at-the-department-of-energy/.

[14] “Reforming Nuclear Reactor Testing at the Department of Energy.” *The White House*, 22 June 2026, www.whitehouse.gov/presidential-actions/2025/05/reforming-nuclear-reactor-testing-at-the-department-of-energy/.

[15] “Department of Energy Announces Initial Selections for New Reactor Pilot Program.” *U.S. Department of Energy*, 4 Sept. 2025, www.energy.gov/articles/department-energy-announces-initial-selections-new-reactor-pilot-program.

[16] “Department of Energy Celebrates Fourth Criticality Ahead of July 4th Goal.” *U.S. Department of Energy*, 6 July 2026, www.energy.gov/articles/department-energy-celebrates-fourth-criticality-ahead-july-4th-goal.

[17] “Office of Nuclear Energy Celebrates Fifth Advanced Reactor Criticality.” *U.S. Department of Energy*, 6 Aug. 2026, www.energy.gov/ne/articles/office-nuclear-energy-celebrates-fifth-advanced-reactor-criticality.

Antares Nuclear's Mark-0 is a small, high-temperature, sodium heat-pipe reactor. The Mark-0 is also the 53rd reactor built at the Idaho National Laboratory (INL) site since 1951 and the first novel reactor design to achieve criticality at the laboratory in more than 50 years.[18] On July 27, 2026, Antares announced $470 million in Series C funding.[19] Antares is one of three finalists in military's Advanced Nuclear Power for Installations program, which will test SMRs at Air Force bases. Antares is also aiming to bring its first electricity-producing reactor online in 2027 and has deployments at U.S. military installations planned for 2028.[20]

Valar Atomics' Ward 250 is a compact, helium-cooled, high-temperature gas-cooled microreactor. The Ward 250 is the first DOE-authorized reactor built outside of a national laboratory.[21] On August 3, 2026, Valar Atomics announced $1 billion in Series B funding.[22] Valar Atomics plans to move from demonstrating one integrated reactor to mass-producing reactor fleets.

Deployable Energy's Unity is a water-moderated, gas-cooled microreactor. On August 17, 2026, Deployable Energy signed a Memorandum of Understanding with Hornback Offshore to deploy the Unity Nuclear Battery to develop maritime nuclear applications in inland waterways, offshore vessels and platforms, national security logistics, autonomous vessels, power barges, and floating data centers.[23] Deployable Energy is also working toward a full-power demonstration in 2027.[24]

Aalo Atomics' Aalo-X is a low-enriched uranium–fueled, sodium-cooled reactor. Aalo is working on a second nuclear reactor, Project Ascension, a commercial-scale system located on the Aalo-X campus at INL. This new reactor will have an electrical generating capacity of 10 megawatts electric (MWe) and power an on-site data center in 2027.

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[18] "Antares Achieves Zero-Power Criticality at INL." *Nuclear Newswire*, 5 June 2026, www.ans.org/news/2026-06-05/article-8099/antares-achieves-zeropower-criticality-at-inl/.

[19] "Antares Raises $470M Series C to Deploy Nuclear Microreactors for Critical Missions." *Antares*, 27 July 2026, antaresindustries.com/updates/antares-raises-seriesc.

[20] De Chant, Tim. "Antares Raises $470M to Build Nuclear Reactors for the US Military." *TechCrunch*, 27 July 2026, techcrunch.com/2026/07/27/antares-raises-470m-to-build-nuclear-reactors-for-the-u-s-military/.

[21] "Department of Energy Celebrates Second Advanced Reactor Achieving Criticality." *U.S. Department of Energy*, 19 June 2026, www.energy.gov/articles/department-energy-celebrates-second-advanced-reactor-achieving-criticality.

[22] Taylor, Isaiah. "Announcing Our $1B Series B Led By Sequoia." *Valar Atomics*, 3 Aug. 2026, www.valaratomics.com/docs/Announcing-our-1B-Series-B-Led-By-Sequoia.

[23] "Deployable Energy and Hornbeck Offshore Partner to Advance Maritime Nuclear Power." *Deployable Energy,* 17 Aug. 2026, www.deployable.energy/post/deployable-energy-and-hornbeck-offshore-partner-to-advance-maritime-nuclear-power.

[24] "Home." *Deployable Energy*, 31 Jan. 2025, www.deployable.energy/.

Oklo's Groves Isotope Test Reactor is a pool-type, water-cooled, non-pressurized test reactor. The Groves Isotope Test Reactor is also the first reactor under DOE authorization to achieve criticality on private land.[25] Oklo also secured DOE safety approval for its Aurora reactor earlier this summer, which is currently under construction at INL.[26] In January 2026, Oklo and Meta announced a partnership on developing advanced nuclear reactors to support Meta's growing electricity needs, including a 1.2 gigawatt (GW) project planned in Pike County, Ohio.[27]

Nuclear Energy Launch Pad

On March 5, 2026, DOE and the National Reactor Innovation Center (NRIC) at INL established the Nuclear Energy Launch Pad.[28] The Launch Pad aims to build on the Reactor Pilot Program to include testing and operation to scale first-of-a-kind technologies toward widespread commercial deployment. On April 27, 2026, NRIC selected four initial projects to participate in the Launch Pad—Deployable Energy, General Matter, a joint venture between NuCube Energy and Idaho State University, and Radiant Industries.

On August 24, 2026, NRIC announced 13 new Launch Pad projects focused on reactor development and nuclear fuel cycle advancements, including fabrication, enrichment, and conversion technologies.[29] Participants include Antares Nuclear, Atlas Atomics, Deployable Energy (two projects), Forge Atomics, Hexium Inc., Lightbridge Corporation, Nusano Inc., Oklo, Raven-Flint Nuclear, Scaled Atomics, Sublime Nuclear, and Valar Atomics.

Existing Technology Gaps

Nuclear energy technology development involves multiple stages, including research on fuels and materials, development of reactor concepts and designs, component testing and evaluation, licensing by the Nuclear Regulatory Commission (NRC), demonstration, and commercialization. One of the most significant gaps relates to fuels. Many advanced reactors would require fuels that are not currently commercially available in the United States, either due to a lack of demand or technological immaturity.[30] These include higher-enriched versions of existing uranium fuel as well as new types of fuels currently under development.[31] Without near-term investment in fuel processing and fabrication capabilities, there may be insufficient fuel supplies to support the deployment of advanced reactors.

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[25] "Oklo's Isotope Test Reactor Achieves Criticality." *Nuclear Newswire*, 6 Aug. 2026, www.ans.org/news/article-8277/oklos-isotope-test-reactor-achieves-criticality/.

[26] "Oklo Secures DOE PDSA Approval." *Nuclear Newswire*, 12 June 2026, www.ans.org/news/2026-06-12/article-8119/oklo-secures-doe-pdsa-approval/?utm_source=chatgpt.com.

[27] "Meta Announces Nuclear Energy Projects, Unlocking Up to 6.6 GW to Power American Leadership in AI Innovation." *Meta Newsroom*, 13 Jan. 2026, about.fb.com/news/2026/01/meta-nuclear-energy-projects-power-american-ai-leadership/.

[28] INL Media Relations. "NRIC Launch Pad to Take National Innovation to next Level." *Idaho National Laboratory*, 5 Mar. 2026, inl.gov/news-release/nric-launch-pad-to-take-national-innovation-to-next-level/.

[29] INL Media Relations. "NRIC Selects New Nuclear Energy Launch Pad Participants to Boost Nuclear Energy." *Idaho National Laboratory*, 24 Aug. 2026, inl.gov/news-release/nric-selects-new-nuclear-energy-launch-pad-participants-to-boost-nuclear-energy/.

[30] "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.

[31] "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.

The availability of High-Assay Low-Enriched Uranium (HALEU), which would be necessary for many advanced reactor concepts, is also a significant gap. HALEU is not used in existing commercial reactors, and it is not readily available for advanced reactor development and demonstration.[32] The only current commercial source of HALEU is Russia, but following Russia's full-scale invasion of Ukraine in February 2022, the United States imposed restrictions on Russian uranium imports, including a ban that took effect on August 11, 2024. These restrictions have contributed to a supply chain bottleneck that domestic enrichment capabilities are currently unable to fill.[33] As a result, DOE may issue waivers for certain Russian uranium imports through the end of 2027.[34]

NRC Challenges

The NRC faces challenges in modernizing its regulatory framework to keep up with the development and anticipated deployment of advanced nuclear reactors. For Fiscal Year 2026, the Office of the Inspector General identified "Modernizing Regulatory Frameworks for the Safe Deployment of Advanced Reactors, Small Modular Reactors, and Microreactors" as one of its top five most serious management and performance challenges.[35]
In May 2025, President Trump directed the NRC to reform its regulations, policies, and organizational processes to facilitate licensing and deployment of advanced nuclear technologies.[36] Specifically, the President called for the NRC to establish new pathways for licensing advanced reactors, including streamlined approval of reactor designs previously demonstrated by DOE or the military's and a new licensing framework for the high-volume deployment of advanced reactor technologies.[37]

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[32] "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.
[33] "Nuclear Energy: Overview of Congressional Issues." *Congressional Research Service*, 11 Aug. 2026, www.congress.gov/crs_external_products/R/PDF/R42853/R42853.44.pdf .
[34] "Russian Uranium Ban Waiver Guidance." *U.S. Department of Energy*, 24 May 2024, www.energy.gov/ne/russian-uranium-ban-waiver-guidance.
[35] "Top Management Challenges." *Nuclear Regulatory Commission Office of the Inspector General*, 12 Dec. 2025, nrcoig.oversight.gov/top-management-challenges.
[36] "Ordering the Reform of the Nuclear Regulatory Commission." *The White House*, 22 June 2026, www.whitehouse.gov/presidential-actions/2025/05/ordering-the-reform-of-the-nuclear-regulatory-commission/.
[37] Roma, Amy, et al. "Beyond Criticality: How the U.S. Nuclear Market Is Being Rebuilt." *Orrick*, 1 July 2026, www.orrick.com/en/Insights/2026/07/Beyond-Criticality-How-the-US-Nuclear-Market-Is-Being-Rebuilt.

International Competition

The United States faces increasing competition from other countries seeking to establish leadership in advanced nuclear reactor technologies. International competitors are investing in advanced reactor technologies, fuel supply chains, and manufacturing capabilities, creating both opportunities and challenges for U.S. nuclear leadership. For example, organizations in Canada, the European Union (EU), Japan, the People's Republic of China (PRC), and Russia are all developing supercritical water-cooled reactors, a high-temperature variant of existing LWR technologies.[38] Several experimental and commercial high-temperature gas reactors, which are helium-cooled, graphite-moderated thermal reactors, have been built in multiple countries outside of the U.S., including the United Kingdom (UK), Japan, Germany, and the PRC.[39] A consortium of European countries, including the Czech Republic, Hungary, Poland, and Slovakia, is jointly developing a conceptual gas-cooled fast reactor design.[40] Russia is the world leader in lead-cooled fast reactor (LFR) research and development, with experience building and operating LFRs for submarines. Other countries exploring LFR technologies outside the United States include the PRC, Japan, Korea, Sweden, and the UK.[41]

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38 "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.

39 "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.

40 "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.

41 "Advanced Nuclear Reactors: Technology Overview and Current Issues." *Congressional Research Service*, 22 Feb. 2023, www.congress.gov/crs_external_products/R/PDF/R45706/R45706.7.pdf.