New Nuclear Energy Guide for State Policymakers

July 2025 Update

NUCLEAR INNOVATION ALLIANCE

New Nuclear Energy Guide for State Policymakers

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Table of Contents

Executive Summary for State Policymakers

States and local policymakers are increasingly taking a role in commercializing new nuclear reactor technology. This Guide serves as an introduction to new nuclear energy technologies and policies for state policymakers as well as other stakeholders such as labor groups, industry and state energy entities. Nuclear energy innovators are developing a suite of technologies that represent a shift from conventional nuclear energy designs. New nuclear reactors, ranging from microreactors that can provide distributed energy (~less than 10Mwe) to medium-size reactors that can power cities and industry (~300Mwe), as well as a new generation of large reactors, promise clean energy that is reliable, safe, and can contribute to state-level economic development, energy security, and environmental goals. This 2025 update of the Guide incorporates new information since the 2023 update.

Conventional Nuclear Energy		Advanced Nuclear Energy
Predominantly Large: More than 1000 MW_e	Reactor Size	Versatile: 1.5 MW_e to 300+ MW_e
Predominantly Light Water Reactors	Reactor Technology	Wide Variety of Reactor Technologies
Primarily Baseload Generation	Generation Type	Flexible and Dispatchable Generation
Designed with Active Safety Systems	Safety Approach	Designed with Inherent Safety Systems

Executive Summary Figure 1: Simple visualization of the differences between conventional and new nuclear

The first part of this Guide generally describes new reactor technology and its benefits, provides an overview of key enabling federal policies as of July 2025, and reviews state options to incentivize the development of new reactors. The second part of the Guide provides case studies with updated information on emerging state leaders in these technologies, including:

- New nuclear projects in Wyoming
- Energy Northwest's plans in Washington State
- Texas's Role in Pioneering Nuclear Innovation
- Virginia's New Nuclear Energy Future
- New York's Leadership on Nuclear Energy

The case studies provide insights into various states considering new nuclear energy to meet clean energy, economic and energy security goals. Finally, the last section of this Guide is a compendium of topical briefs that elaborate the characteristics of new reactors with respect to safety, economic benefits, waste management, flexibility and dispatchability, and timing of commercialization. Community leaders and state policymakers can learn from the case studies that exhibit the benefits of new nuclear energy in communities across the United States. For those interested in learning more about new nuclear energy, the topical briefs serve as introductory resources.

States can play a pivotal role in enabling new nuclear energy by including nuclear energy in state decarbonization requirements or clean energy standards, removing restrictions on the construction of new reactors, including new nuclear energy to state planning processes such as Integrated Resource Plans (IRPs), and coordinating with nearby states on planning nuclear energy projects and sharing lessons learned.

The Case for New Nuclear Energy

Nuclear energy is a clean energy solution for meeting energy security and net-zero emissions goals, and it is saving lives by reducing air pollution. One 2021 study has shown that the reduction in air pollution from generating clean nuclear energy has prevented almost 42 million deaths globally between 2000 and 2020 and projects an additional 46 million lives will be saved by 2040. Existing nuclear energy supplies roughly 10% of global electricity and 20% of U.S. electricity. In the United States, the existing nuclear fleet provides approximately the same amount of carbon-free electricity as wind, solar, and hydro power combined.

The next generation of nuclear reactors are initiating construction and will be completed by the end of the decade. Recent government and industry activities are encouraging new nuclear reactor commercialization. Bipartisan legislation has provided a foundation for federal research, development, demonstration and commercialization, and has provided funding to ensure a fuel supply for advanced reactors. The U.S. Department of Energy's Advanced Reactor Demonstration Program is funding public-private partnerships for first-of-a kind demonstrations. These new nuclear reactors provide multiple benefits over traditional reactors, and together with renewable energy and other carbon-free energy sources, will allow the United States to reach its energy security and clean energy goals by 2050.

Source: INL

In addition to the benefits traditional nuclear reactors provide, new nuclear reactors:

1. Include innovations that can reduce costs, increase fuel efficiency, and improve safety.
2. Create substantial economic benefits, including improved international competitiveness.
3. Help make reaching net-zero emissions a reality by providing firm clean electricity and decarbonizing non-electricity sectors.
4. Provide more flexible operation and additional services such as high-temperature heat

Reduced Costs, Increased Fuel Efficiency, and Improved Safety:

Nuclear innovators are pursuing multiple strategies to create new designs that make the next generation of reactors even better. Many new nuclear reactor designs, including small modular reactors and micro reactors, reduce the size of the reactor, which can lower upfront capital costs, shorten construction timelines, and decrease financing uncertainty. By building plants more quickly, developers can achieve rapid innovation cycles and continuous technological learning to reduce costs. Compared to traditional reactors, new nuclear reactors can burn more of their fuel, increasing fuel efficiency, decreasing the amount of fuel needed, and ultimately reducing the total cost of fuel needed.

Additionally, new reactor designs include inherent safety features, making them even safer than the already safe traditional reactors. Together, these innovations mean that new reactors promise to be more economically viable, efficient, and safe.

Economic Benefits and International Competitiveness:

Currently, the U.S. nuclear energy industry supports half a million employees with salaries that are 30% higher than local averages. In addition to higher salaries, nuclear employees have higher rates of unionization and provide substantial employment opportunities for veterans. New nuclear projects can support regional and state economies through innovation hubs and by attracting human capital. New nuclear reactors can be located at retiring coal plant sites, making use of transmission and other infrastructure while providing economic benefits to local communities. That is a significant advantage compared to other potential sources of zero-carbon generation, which typically require new sites that may be far from existing transmission, and do not provide similar levels of economic opportunities. Additionally, U.S. new reactor designs can be competitive in global markets, growing U.S. exports while enabling energy security, decarbonization and economic growth for emerging economies.

Reaching Net-Zero Emissions:

Most energy system modeling shows that full decarbonization will require firm zero-carbon electricity generation and decarbonized non-electric energy sectors. Nuclear energy can do both. Nuclear energy's historical role in providing a firm carbon-free backbone for the electric grid is well understood. New nuclear reactors can also contribute to the broader decarbonization of other sectors. For example, high-temperature and excess heat generated from new nuclear reactors have the potential to decarbonize industrial processes, provide district heating to residential and commercial buildings, generate clean hydrogen, and even provide the energy for desalinization plants. New nuclear technology can also enhance electricity market competitiveness through load following and integration with renewables and can generate clean electricity for electric vehicles and heat pumps to decarbonize the transportation, residential, and commercial sectors.

Mitigating Spent Fuel Concerns:

Advanced nuclear reactors can reduce the amount of spent nuclear fuel generated, thereby reducing the amount that requires long-term geological storage. Advanced reactors using TRISO fuel, for example, may benefit from directly disposing of the TRISO fuel particle without treatment or conditioning, making disposal easier.

Some advanced reactor designs can run on fuel recycled from existing stockpiles. Greater fuel efficiency will reduce the amount of spent nuclear fuel created per unit of nuclear energy produced. Additionally, some advanced reactors may reduce the duration and amount of the radioactivity of spent fuel.

Conclusion:

New nuclear reactors can help meet our energy security and clean energy goals. Many new reactor designs have been developed, and several companies are building or planning to build their reactors by the end of the decade. These innovative reactor designs include a wide array of benefits that improve upon existing light water reactor technologies. Over the next few decades, new nuclear energy can play a vital role in shaping an energy landscape that is affordable, reliable and clean.

New Nuclear Energy in State-Level Energy and Climate Policies

New Nuclear Energy in State-Level Energy and Climate Policies

Summary:
- States are taking an increasing role in deploying new nuclear energy technologies
- New reactors will help states and communities achieve their economic development, energy security and climate goals

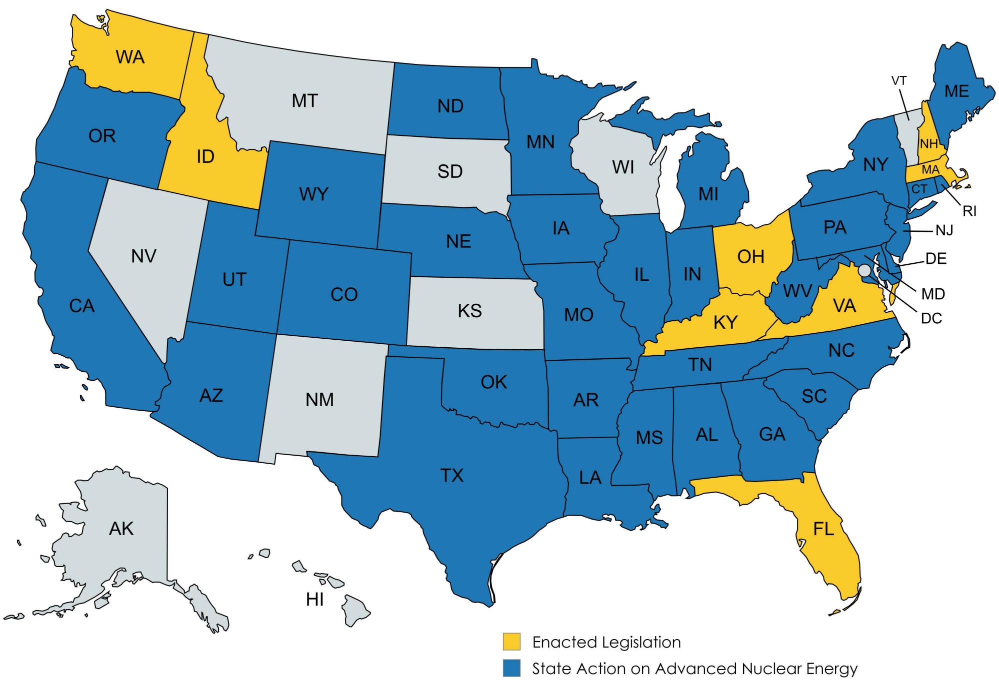


Figure 1: U.S. State Legislative Activity on New Nuclear Energy in 2024. Data derived from National Conference of State Legislators

Early movers in launching new nuclear reactor projects will enjoy large economic, environmental and reliability benefits in a time of growing energy demands. New reactors are different from conventional nuclear power (see ES Figure 1 in the executive summary of this Guide). They come in a wide variety of sizes, and through modularization will be quicker to build, enabling nuclear energy as an energy option for rural communities, municipal utilities, technology companies, and industrial users. They are scalable, meeting the needs of customers from small universities, to hyper-scalers like Google and Microsoft, to traditional large investor-owned utilities. Modular construction, rapid technological learning, and shorter construction times reduce the risks and size of cost and time overruns. New reactors that operate flexibly provide firm, zero- emission electricity to the grid and can decarbonize non-electrical sectors. New reactors feature improved safety and fuel performance, expanding siting opportunities.

State policymakers, communities, and industries that recognize this potential can become first movers by facilitating early demonstration projects. Early adoption will bring high-paying jobs and supply chain companies, and establish an industry set for rapid growth within that state. State policymakers interested in realizing the potential of nuclear innovation to meet state energy and environmental goals should consider:

- **Recognizing the benefits and opportunities of new nuclear reactor technologies.** Prerequisite to enacting policies to encourage new nuclear energy projects, state policymakers need to understand the opportunities of nuclear innovation and build state- and local-level consensus. New reactors can help states achieve their economic, energy security and environmental goals while guaranteeing a high level of safety performance. There are many resources, such as this Guide, that policymakers can use to better understand nuclear energy technologies and to share with colleagues.
- **Including new nuclear energy in state decarbonization requirements or Clean Energy Standards (CES).** Many states successfully implemented renewable portfolio standards to establish renewable energy industries in their states. States are now establishing and implementing 100% carbon-free generation requirements or other types of CES. Some of these are technology-inclusive and could incentivize the development of new reactors while others focus narrowly on existing nuclear facilities. Including new reactors in new or existing state-level decarbonization mandates, carbon-free goals, or CES maximizes a state's chances of achieving decarbonization at the lowest possible cost and with the least impact to reliability.
- **Creating innovation hubs to encourage regional economic development.** Successful deployment of new nuclear energy requires state and local government, universities, companies, and communities working together, with the potential for jobs ranging from highly trained engineers to union trades workers. Early movers in pursuing new reactor or nuclear manufacturing projects will build innovation hubs centered around the communities where projects are located. As the new reactor industry scales over time, these hubs will grow as other states adopt new nuclear energy.
- **Removing state restrictions on construction of new reactors.** As of July 2025, twelve states have restrictions on building new nuclear power plants. As states with moratoria look to decarbonize and increase energy security, they should consider removing restrictions on new nuclear in order to meet energy security, economic and clean energy goals.
- **Incorporating new reactors into state planning processes, including executive roadmaps and utility Integrated Resource Plans (IRPs).** State governments and regulated utilities are responsible for ensuring reliable, economic electricity supply to serve the public. Coordination between governors, state-level regulatory commissions, and utilities can better achieve their energy security and clean energy demands by including new reactors in these plans, especially utility IRPs.
- **Regional coordination is essential for nuclear energy development.** Nuclear power plants impact multi-state electricity grids, markets, and policies. In areas like the Midwest and New England, grid operators and states collaborate on the role of nuclear in meeting future energy and climate goals. Regional discussions on nuclear waste storage and emergency preparedness also require cooperation beyond individual state borders to address transportation, safety, and long-term disposal needs.

In 2024, over over 200 nuclear-related bills were introduced and considered in state legislatures to advance new and existing plants with 25 states enacting pro-nuclear legislation. As of July 2025, over 300 bills have been introduced in state legislatures relating to nuclear energy.

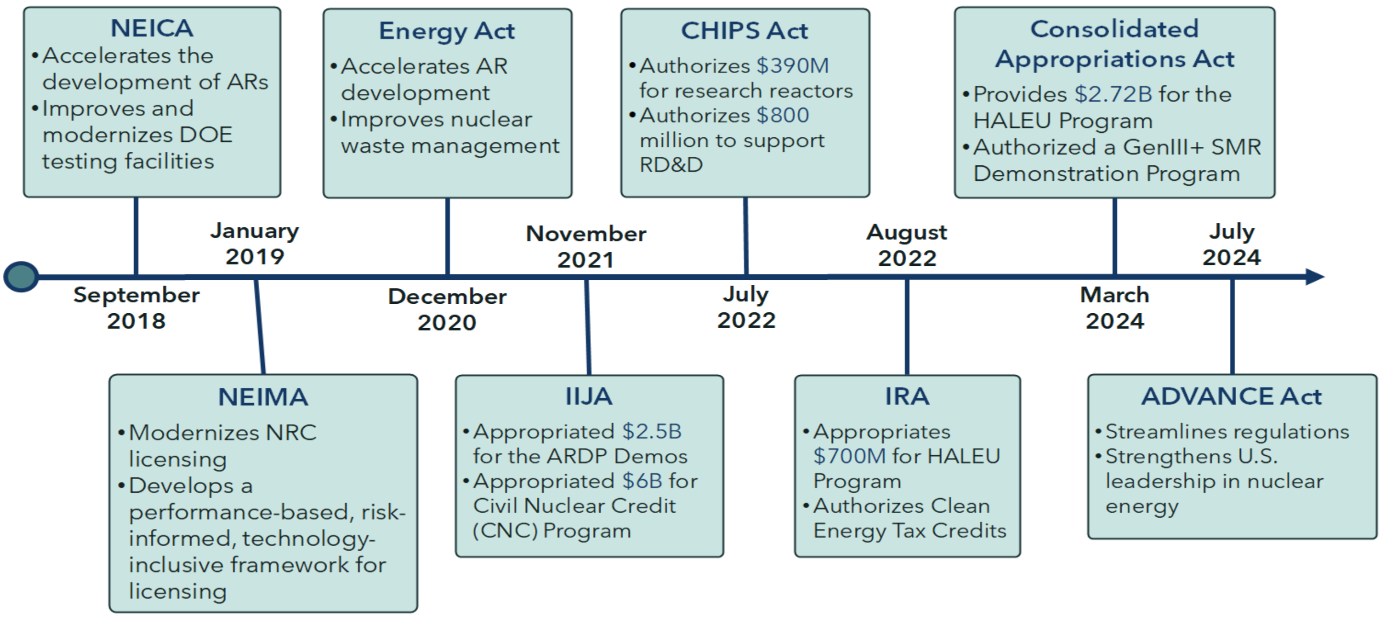
Federal Legislation for Nuclear Innovation

Summary:

- There is substantial, bipartisan, and sustained support for new nuclear reactor technologies
- The Nuclear Regulatory Commission (NRC) is in the midst of an ambitious regulatory modernization program to facilitate the effective, timely and efficient licensing of new reactors
- Federal investments in advanced reactor technology and demonstration projects provide a foundation for U.S. development and commercialization
- Demonstration projects and commercialization will foster economic opportunities for communities

Nuclear power is the United States' largest sources of carbon-free, reliable electricity. Once internationally pre-eminent, the United States fell behind in building new reactors globally, and federal lawmakers understand the importance of revitalizing and modernizing the nation's nuclear industry. As a result, there is substantial bipartisan and sustained support for new reactor innovation in Congress and across administrations. The timeline of federal legislation summarized below highlights continuing actions to promote new nuclear energy. The continued bipartisan support at the federal level is creating the conditions for success for new nuclear energy. State policies can complement and leverage these federal policies.

Over the past several years, Congress enacted major pieces of federal legislation that enable the development and commercialization of new nuclear reactors. These include:



More information on the legislation above can be found on the following page. *Note: AR means "advanced reactor"*

Nuclear Energy Innovation Capabilities Act (NEICA)

- Established programs to accelerate innovation and commercialization of advanced reactors in the United States
- Created the National Reactor Innovation Center to bridge the gap between government and private sector support
- Authorized the Versatile Test Reactor as a scientific research testbed to simulate and analyze prototypical conditions
- Authorized funding for the demonstration of advanced reactors through cost-shared partnerships with U.S. industry

The Nuclear Energy Innovation and Modernization Act (NEIMA)

- Modernizes the U.S. Nuclear Regulatory Commission's (NRC) functions
- Requires the NRC to develop a new, risk-informed, technology-inclusive regulatory framework for licensing innovative reactors by 2027
- Establishes a more transparent, risk-informed, performance-based fee structure for applicants, ensuring that licensing costs are fair and predictable for both existing and new nuclear technologies

Energy Act of 2020

- Authorizes the Advanced Reactor Demonstration Program(ARDP), which funds multiple companies to work with the U.S. Department of Energy to demonstrate their advanced reactor technology

Infrastructure Investment and Jobs Act (IIJA)

- Authorized and appropriated funding for DOE's ARDP
- Authorized $3.2 billion to support advanced reactor demonstration projects
- Appropriated $2.4 billion to fund ARDP Risk Reduction and Advanced Reactor Concepts (ARC-20) projects
- Established "Office of Clean Energy Demonstrations" within DOE to conduct project management and oversight of the ARDP and other covered clean energy demonstration projects

Creating Helpful Incentives to Produce Semiconductors and Science Act (CHIPS+)

- Enacted in late 2022, this act i nvests in the next generation of nuclear technologies and professions by funding critical DOE R&D programs and university research programs
- Authorizes $390 million to establish up to four new research reactors
- Authorizes $800 million for DOE to establish the Fission for the Future program, which allows eligible entities to support R&D activities for advanced nuclear reactors

Inflation Reduction Act

- Largest investment in clean energy to date
- Includes technology-neutral tax credits for which new nuclear is eligible
- Invests $700 million to start a domestic HALEU program

ADVANCE Act

- Streamlines nuclear energy regulation and promotes international cooperation
- Streamlines environmental reviews, micro-reactor deployment and deployment at brownfield sites
- Establishes NRC hiring and workforce development initiatives

Gen III + Program

- Accelerates the demonstration of up to 2 Gen III + SMRs through cost-sharing partnerships
- Provides $900 million to fund demonstration programs
- Implements a milestone-based approach and prioritizes applicants who are committed to establishing a multi-reactor orderbook

HALEU Funding

- Provides $2.7 billion to the DOE's HALEU program
- Catalyzes domestic uranium enrichment capacity and reduces U.S. reliance on foreign suppliers of enriched uranium
- Provides DOE with funding to kickstart and sustain public-private partnerships

Case Study: Repowering Wyoming Communities

In 2020, nuclear energy **generated more electricity** in the United States than coal for the first time ever, primarily due to coal plant retirements. While falling coal generation reduces greenhouse gas emissions, it creates an economic and energy vacuum that can negatively impact local communities. In states like Wyoming, where coal plants are planning a phase-out, local communities can face economic challenges due to the loss of jobs and uncertainty surrounding the future of coal-fired power. Reusing retired brownfield coal power plant sites for nuclear energy can help solve this problem, preserving local jobs and spurring local economic growth.

In June 2021, Wyoming emerged as a national leader in nuclear innovation by developing a project to deploy the next generation of nuclear reactors. TerraPower, Wyoming Governor Mark Gordon, and electric utility PacifiCorp (Rocky Mountain Power) announced that they will demonstrate the Natrium sodium-cooled fast reactor with a molten salt energy storage system, at a retiring coal plant site in Wyoming. Supported by fully authorized federal funding through a public-private partnership, the project is a first-of-a-kind opportunity to demonstrate new nuclear energy. It also serves as an opportunity to facilitate the first-ever siting of an advanced nuclear facility in a transitioning coal community, which would prove the viability of such projects, revitalize the local community, and demonstrate that re-purposing certain key pieces of infrastructure, such as transmission lines, can be a significant benefit to a new nuclear project.

In November 2021, TerraPower announced Kemmerer, Wyoming, as the preferred site for the Natrium reactor, and in August 2023, it purchased land in Kemmerer. Since then, TerraPower has finalized contracts with suppliers, performed site characterization, submitted a construction permit application to the NRC in March 2024, and, in June of the same year, broke ground at its construction site. The NRC also approved Terrapower's strategy to exclude non-nuclear components from the licensing review, validating their approach and enabling them to conduct non-nuclear construction activities before obtaining full license approval.

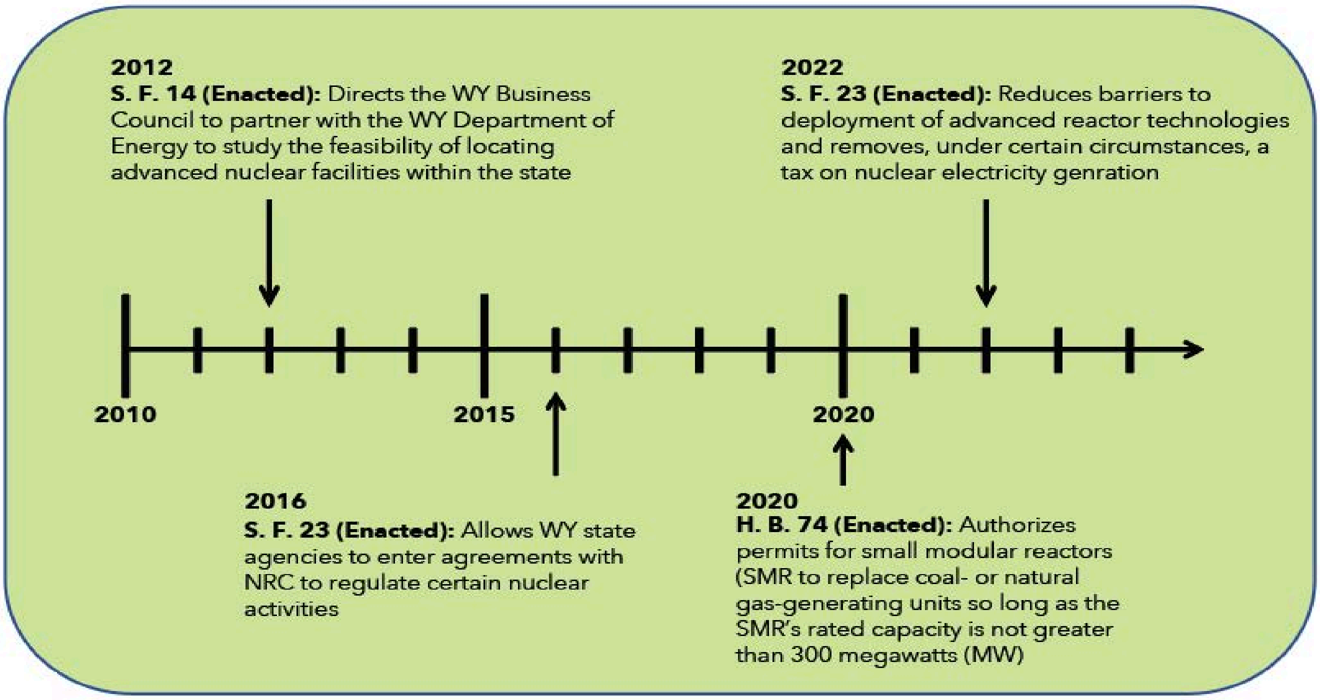


Figure 1: Key Legislation Enacted Leading to Wyoming's Position as a Nuclear Leader

The legislation shown above not only reflects a commitment to diversifying Wyoming's energy portfolio but also demonstrates the state's forward-thinking approach to addressing future energy challenges through new nuclear energy. By promoting nuclear energy development, Wyoming aims to secure a more sustainable and resilient energy future while fostering economic growth and job opportunities in the state. It's a pivotal step in the broader transition towards a cleaner and more robust energy sector, with potential implications for the entire nation's energy landscape.

Beyond the TerraPower project, the Wyoming Energy Authority has announced a two-phase, two-year contract with BWXT, a company working to deploy their BWXT Advanced Nuclear Reactor (BANR), a TRISO-fueled microreactor. Under Phase One of the contract, BWXT is working with industries in Wyoming to define the requirements for nuclear applications to meet the heat and power needs of trona mining operations within the state. Under Phase Two,BWXT will complete a conceptual design of a lead microreactor, develop a regulatory engagement plan, and conduct a demonstration of Wyoming's supply chain for nuclear component manufacturin g. Phase two is expected to be completed by the third quarter of 2025.

BWXT is also performing engineering work to further the design of its integrated "BANR" microreactor system that can help meet Wyoming's future power needs. This work will also include identifying areas where Wyoming's existing supply chain can demonstrate capabilities for reactor component manufacturing and support reactor deployment. In late September 2023, Tata Chemicals **signed an agreement** with BWXT to explore the viability (through support from the Wyoming Energy Authority) of using microreactors to decarbonize their industrial processes in Wyoming.

In 2025, Wyoming, along with Utah and Idaho, signed a Memorandum of Understanding (MOU) to strengthen regional collaboration on energy policy, infrastructure development, and nuclear energy innovation. The agreement, signed by Governors Cox (Utah), Little (Idaho), and Gordon (Wyoming), establishes a cooperative framework to align energy-related efforts across the three states. The agreement lays out a plan to deploy up to 4GW of new nuclear power during the 2030s, primarily focused in Wyoming and Utah. The compact focuses on advancing energy resilience, coordinating infrastructure, advocating for federal support of regional energy priorities, navigating regulatory and environmental challenges, and accelerating the development of reliable, affordable nuclear energy.

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Case Study: Washington State's Commitment to Nuclear Energy

Washington State's commitment to cutting greenhouse gas emissions was cemented when Governor Jay Inslee signed into law the Clean Energy Transformation Act in 2019 . The law, which applies to all electric utilities serving retail customers, sets specific milestones to reach 100% clean electricity by 2045 using renewable or low-greenhouse gas emitting generating sources. Consequently, this rulemaking left utilities with two key questions:

1. What are the optimal electricity portfolios to achieve deep decarbonization in the Pacific Northwest?

2. How does the availability of different zero-emitting generation technologies, like new nuclear energy, affect the cost of achieving deep decarbonization while maintaining reliability?

A **2020 study** conducted by E3 concluded that utilities could achieve substantial electricity sector emission reductions at competitive costs, provided firm generating capacity is available. Using data from a new reactor company and the National Renewable Energy Laboratory, the study found the use of new nuclear energy could competitively help Washington State achieve a zero-emissions energy portfolio.

To meet its future energy needs, Energy Northwest, a public power joint operating agency that provides at-cost power to public utilities across the northwest U.S., began exploring options to develop new reactor projects. Considering Energy Northwest's experience with nuclear energy as the operator for the Columbia Generating Station, Washington State and Energy Northwest are in an excellent position to launch a new generation of nuclear reactors.

Energy Northwest and X-energy, an advanced nuclear reactor developer, continue to work together to deploy new nuclear reactors in Washington state. In June 2023, Energy Northwest confirmed their continued relationship with X-energy by signing a Joint Development Agreement (JDA) for up to 12 Xe-100 new small modular reactors in central Washington.

In March 2024, the Washington State legislature provided $25m in the state's 2023-2025 supplemental capital budget as a non-federal match for Energy Northwest's application to the U.S. Department of Energy's Loan Programs Office to deploy small modular reactors in the state.

In October 2024, Amazon and Energy Northwest announced that they would work together to develop and deploy X-energy's Xe-100 SMRs within Washington state. As a part of this agreement, Amazon invested $334m to fund early development work for an initial four-unit, 320 MWe project near the Columbia Generating Station in central Washington, with an option to increase that project to 12 units and 960 MWe. The project is the first of a larger collaboration between Amazon and X-energy to bring more than 5 GW of new power projects online across the United States by 2039.

In addition to its commitment to the project with Energy Northwest, Amazon also provided an equity investment into X-energy as part of their $700m series C1 round. These types of investments in new nuclear energy, which are a part of Amazon's work to achieve their Climate Pledge commitment to be net-zero by 2040, represent the kind commitments that are important accelerators for the deployment of new nuclear projects. Moreover, Energy Northwest's overarching approach to deploying new nuclear technologies demonstrates how federal, state, and private sector resources can work together to support new nuclear project development.

Nuclear Innovation Alliance

Case Study: Texas's Role in Pioneering Nuclear Innovation

The state of Texas has a rich history in nuclear energy production, but as energy demands continue to escalate, the Texas Public Utility Commission (PUC) and policymakers face an increasing urgency to find a solution to the strain on its electrical grid. The demand for reliable, flexible, and scalable energy solutions has never been higher, but nuclear energy, with its proven track record in Texas and potential as a unique energy solution, emerges as a strategic avenue to meet these growing needs. Furthermore, Texas's large industrial sector could benefit from the process heat supplied by certain new reactor designs.

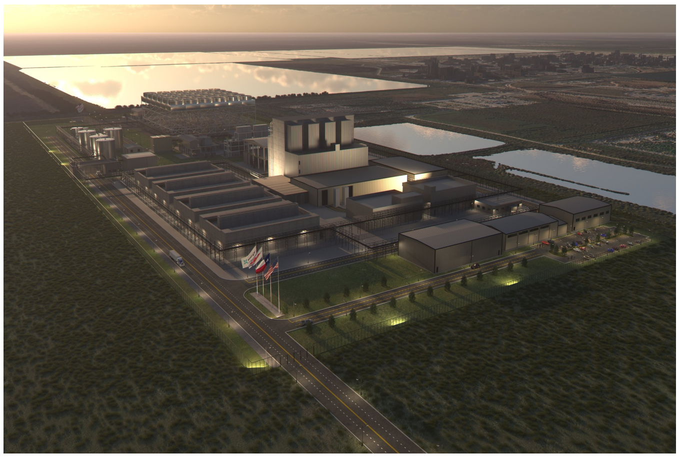

Figure 1: Rendering of Abiliene Christian University's Molten Salt Reactor Project and Dow and X-energy's Advanced Reactor Demonstration Program Project; Source: ACU and Dow

In August 2023, Texas Governor Greg Abbott directed the Texas PUC to establish the Texas Advanced Nuclear Reactor Working Group (TANRWG). The Working Group, comprised of experts and leaders in the policy, environmental safety, grid operation, and investment arenas, is evaluating how advanced nuclear reactors can provide safe, reliable, and affordable energy for Texas, including how to make the state a national leader in the deployment of nuclear power to take advantage of the economic benefits nuclear energy projects provide to states and local communities.

At the end of 2024, the TANRWG proposed 7 legislative recommendations that target critical nuclear industry issues and aim to accelerate advanced nuclear reactor projects in Texas. These proposals included the formation of the Texas Nuclear Office, instituting a fund dedicated to incentivize the development of new nuclear in Texas, and the construction of a statewide workforce program to meet the needs of a growing nuclear industry.

In 2025, the Texas Legislature followed through on these recommendations, passing House Bill 14 and Senate Bill 1535. House Bill 14 creates the Texas Advanced Nuclear Energy Office (TANEO), including a Nuclear Permitting Officer whose purpose is to advocate for and streamline new projects in the state, and authorizes a nuclear deployment fund to incentivize new nuclear projects in the state of Texas. Senate Bill 1535 requires that the state create a statewide program for building a nuclear workforce, including standardizing key curriculum for nuclear degrees and certificates. The legislature also provided nearly $500 million for new nuclear, including $350 million to fund HB 14's Texas Advanced Nuclear Development Fund and $120 million to fund the construction of Natura Resources' MSR-1 through the Texas Produced Water Consortium at Texas Tech University.

Following New Nuclear In Texas

Texas's trajectory as a leader in nuclear energy innovation is underpinned by its storied history in nuclear power and robust university systems. As of late, Texas has seen a flurry of announcements for new nuclear projects:

- The flagship nuclear project in Texas will be the commercial-scale public-private demonstration by the federal government and X-energy at Dow's Seadrift facility. The project, expected to be in operation by the early 2030s,, represents growing private-sector partnerships between industrial companies and nuclear technology companies to find low-carbon and reliable energy solutions using high-temperature gas-cooled reactors.

- In partnership with Abilene Christian University's (ACU) Nuclear Energy eXperimental Testing Laboratory (NEXT Lab) and a partnership between three major universities (Georgia Tech, UT-Austin, and Texas A&M), Natura Resources is designing, licensing, and constructing a molten salt research reactor on the ACU campus. The research reactor would be a 1 megawatt-thermal, graphite moderated, fluoride salt flowing fluid (fuel dissolved in the salt). The project is a trailblazer as it marked the first university advanced test reactor project to submit their Construction Permit (CP) application in late 2022. The NRC issued Natura Resources a CP for its demonstration reactor in the Summer 2024.

- Texas A&M University System announced its intention to incubate commercial reactors at its RELLIS Campus in Bryan, TX. In February 2025, TAMUS announced the down-selection of four nuclear developers to build commercial reactors at the site. Likewise, it began the application process with the NRC for its early site permit. Natura Resources (TX), Terrestrial Energy (Canada), Aalo Atomics (TX), and Kairos Power (CA) were accepted to utilize the site for construction of commercial SMRs.

- In June 2025, Fermi America announced a massive energy-data center project in the Texas panhandle. The project entails 11 GW of power from natural gas, nuclear, and solar and 18 million square feet of compute. Fermi has already filed its NRC application.

Stakeholder Spotlight – Texas Nuclear Alliance (TNA)

Texas' rapid and recent ascent in new nuclear is no accident. In 2022, the Texas Nuclear Alliance was created. The organization is the only nuclear industry association focused on growing the industry in the state of Texas. For years, the nuclear industry had no organizing entity in the state. With the formation of TNA, political success followed. The House of Representatives created the House Nuclear Caucus. The Governor soon thereafter created the Texas Advanced Nuclear Reactor Working Group. And, as detailed above, the Legislature followed through with the passage of House Bill 14 and Senate Bill 1535 – marking the biggest investment by any state to incubate the industry. Texas has also created a model for organizing and amplifying nuclear industry stakeholders to affect policy.

Case Study: Virginia's New Nuclear Energy Future

In October 2022, the Governor of Virginia released a new energy plan with a proposal for $10 million in funding for innovative energy technologies including hydrogen, carbon capture, battery storage, and new nuclear energy. Out of this $10 million, $5 million would fund the establishment of a Nuclear Innovation Hub in Southwest Virginia. According to this plan, the Nuclear Innovation Hub would leverage the existing "nuclear ecosystem" in Virginia and catalyze new nuclear innovation across the United States by deploying new nuclear technologies. The Governor's Nuclear Innovation Hub in southwest Virginia focuses on:

- Deploying the first commercial small modular reactor (SMR) in the US
- Funding for nuclear workforce development
- Developing Spent Fuel recycling technology
- Deploying nuclear-hydrogen energy projects across the state, leveraging the existing and future nuclear reactors throughout Virginia

Each project would be a first of its kind and would provide economic and social benefits to communities across Virginia. The Governor's Plan builds off years of momentum in the Virginia Legislature. In the years since 2013, the Virginia Legislature **enacted multiple bills** that have spurred clean energy technology development, including advanced nuclear reactor technologies (ANRT).

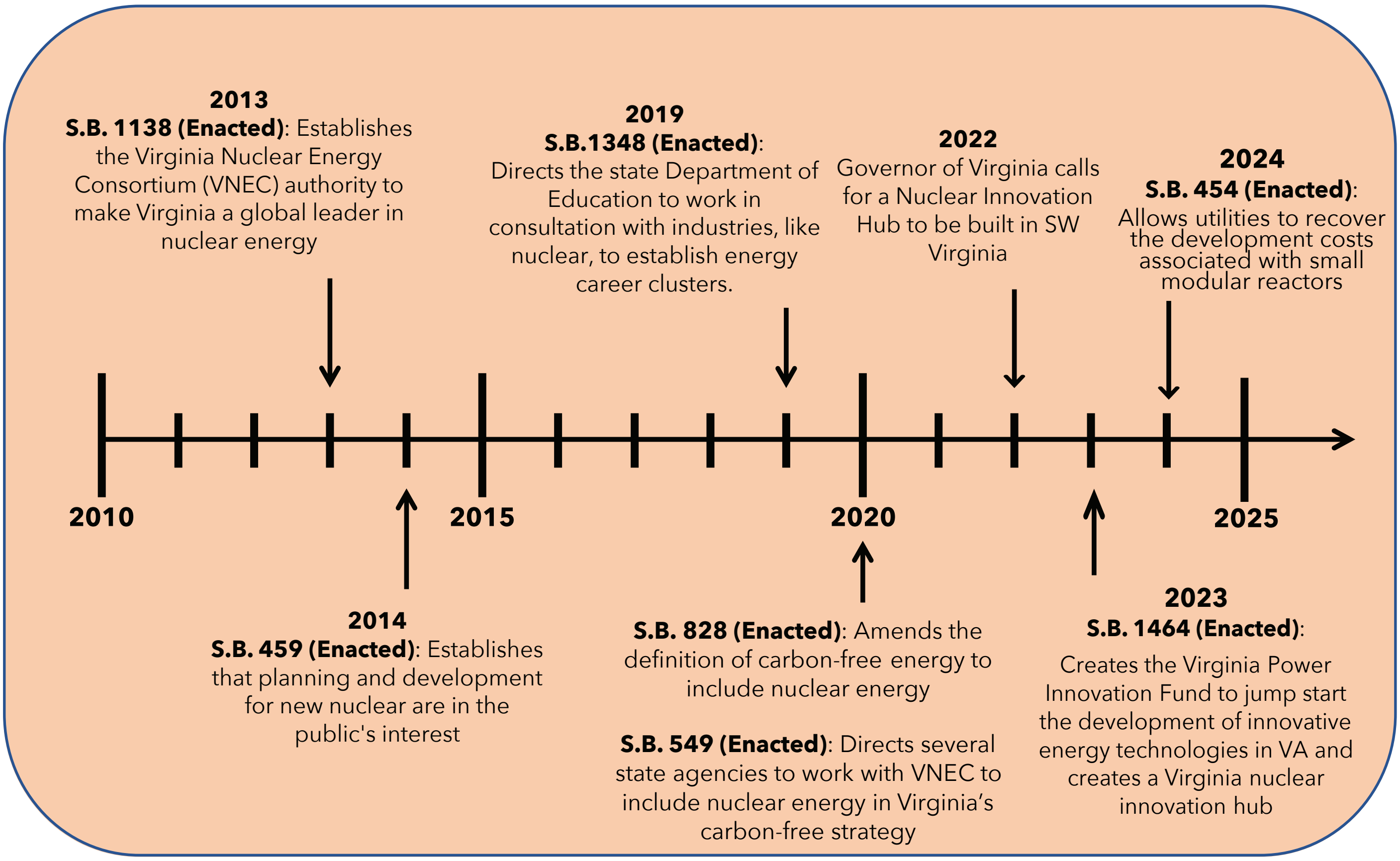

Figure 1: Key Legislation Enacted Leading Up to Nuclear Innovation Hub Annoucement

A key driver of Virginia's potential nuclear energy future is the **Virginia Nuclear Energy Consortium** (VNEC). The consortium consists of universities, utilities, and reactor technology companies ranging from developers to nuclear fuel companies. VNEC's mission is to sustain and enhance the Commonwealth of Virginia as a national and global leader by serving as an interdisciplinary business development, research, training, and information resource on nuclear energy issues.

Reactor Technology Companies

- Framatome (reactor and fuel developer)
- GE-Hitachi (reactor and fuel developer)
- Lightbridge (fuel developer)
- Newport News Shipbuilding
- Holtec International
- NuScale (reactor developer)
- X-energy (reactor developer)
- Kairos Power (reactor developer)

Universities

- Virginia Tech
- Virginia Commonwealth
- Liberty University
- University of Virginia
- James Madison University
- George Mason University
- Old Dominion University

Utilities

- Dominion Energy (nuclear power plant operator)
- Appalachian Power Company

Figure 2: Virginia Nuclear Energy Consortium (VNEC) Members

As a result of S.B 529 (2020), VNEC developed and submitted the "Virginia is Nuclear" Strategic Plan in early 2021 to advance Virginia's nuclear energy industry. Through VNEC and their work, Virginia enacted SB 1464 in 2023, which created the Virginia Power Innovation Fund, which kick-starts the development of innovative energy technologies in Virginia and starts the process of creating a Virginia nuclear innovation hub. Virginia Governor Glenn Youngkin announced a $1.2 million grant to the Virginia Innovative Nuclear Hub in 2025 to support research on infrastructure and workforce training. With an existing nuclear workforce, a variety of companies involved in nuclear innovation and operation, and a university system that can support the next generation of engineers, experts, and technologists, Virginia is among few states with the level of infrastructure required to develop a Nuclear Innovation Hub.

The Virginia Innovative Nuclear Hub (VIN) builds upon Virginia's existing strengths in the nuclear energy industry. With a robust supply chain established by industry leaders such as BWXT, Framatome and Dominion Energy, the expansion of the nuclear energy sector will provide Virginians with **more high-paying jobs** and centralized supply chains that can serve as footholds for a rapidly growing and dynamic industry. The deployment of new nuclear can also help achieve Virginia's long-term energy goals by serving as a reliable, flexible, low-carbon emission energy source that can be used to generate electricity as well as decarbonize other sectors with hydrogen production or process heat.

Virginia's policies and funding of nuclear energy activities is one example of momentum across the United States for nuclear innovation and the deployment of new nuclear projects. States have begun to take notice of the advantages of new nuclear energy and have taken the first steps to deploy these technologies by introducing and enacting nuclear-inclusive legislation.

Case Study: New York's Leadership on Nuclear Energy

As the national interest in advanced nuclear energy increased, New York State found itself in a situation similar to many other states. New York was experiencing increased load growth and demand for energy, particularly clean, firm power. In tandem, economic development and grid decarbonization were state-wide priorities. New York State established the Climate Leadership and Community Protection Act which sets a goal of achieving 100% clean energy generation by 2040. To help meet climate, energy and economic goals, New York State set forth a systematic approach to reinvigorate its nuclear energy sector as a complement to its growing renewables portfolio.

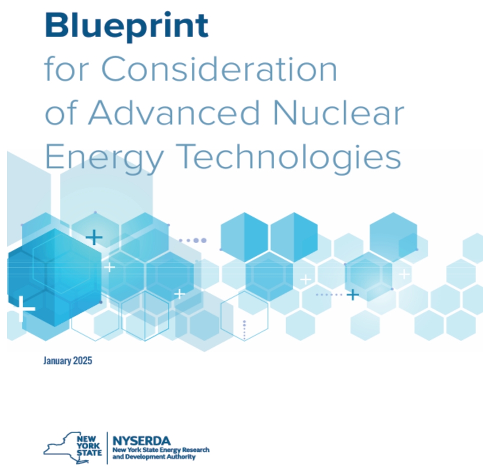

Figure 1: (Image on left) Nine Mile Point Nuclear Station. Source: U.S. Department of Energy; (image on right) NYSERDA's Blueprint for Advanced Nuclear Technologies. Source: NYSERDA

In 2024, Governor Hochul and the New York State Research and Development Authority (NYSERDA) launched the **Draft Blueprint for the Consideration of Advanced Nuclear Technologies**. The Draft Blueprint outlines key considerations for deploying advanced nuclear technologies in New York state. The Draft Blueprint was opened for public comments, and NYSERDA published an updated version in January of 2025. The updated version incorporated public feedback and signaled the development of the **Master Plan for Responsible Advanced Nuclear Development in New York**. The Master Plan sets forth a two-year process to convene technical working groups and study, among other areas, waste, policy and cost options, workforce development, siting, and regulatory matters. New York State and NYSERDA have dedicated their resources to developing to funding these studies and pursuing the next phase of advanced nuclear energy development in New York State.

NYSERDA and Constellation Energy have also partnered together to apply for a Department of Energy (DOE) grant to support Constellation's efforts to seek an early site permit from the Nuclear Regulatory Commission. Constellation intends to build one or more advanced nuclear reactors at the Nine Mile Point nuclear power plant site in Oswego, New York. The collaboration between NYSERDA and Constellation illustrates the importance of public-private partnerships that can accelerate the development of advanced nuclear technology on the state level.

NYSERDA, representing New York State, joined the National Association of State Energy Officials (NASEO) First Mover Initiative. New York is joined by Indiana, Kentucky, Tennessee, and Wyoming as co-chairs. Maryland, Pennsylvania, Utah, Virginia, and West Virginia are also participating. The initiative aims to accelerate advanced nuclear energy projects on the state level by exploring opportunities to reduce financial and technology risks, developing policies that enable nuclear energy development, creating public-private partnerships, and solidifying firm "orderbooks" - a set of multiple orders for the same reactor - by aligning on one or two standardized reactor technologies. By collaborating and sharing lessons learned, these states can better meet their climate, energy security and economic goals by bringing new nuclear energy to their states.

In June 2025, Governor Hochul directed the New York Power Authority (NYPA) to develop and construct one or more projects to generate at least one gigawatt of advanced nuclear power in Upstate New York. While the specific nuclear technology has yet to be determined, NYPA will begin considering the different reactor technologies, business models, and locations for the first deployment.

New York State's approach shows how it is possible to combine a systematic and methodical planning approach to new nuclear development with tangible, near-term project development action that recognizes both the importance of taking a considered approach and the urgency of the State's economic, decarbonization, and energy goals.

New Reactor Deployment Timelines

Multiple advanced reactor developers have announced domestic demonstration projects in the 2020s and early 2030s including demonstrations of non-light water reactors (non-LWRs), commercial small modular light water reactors (SMRs), demonstration and test microreactors, and university research microreactors (Figure 1). Reactor developers are already engaging with customers, local and state governments, and the Nuclear Regulatory Commission (NRC) to secure the regulatory approvals necessary for construction, commissioning and operation. These first-mover projects will provide the licensing, construction, and operational experience that enable rapid commercial deployment of advanced nuclear energy in the 2030s. Technology, business, and regulatory lessons learned from first-of-a-kind (FOAK) projects and demonstration reactors will facilitate lower costs and shorter construction timelines for subsequent nth-of-a-kind (NOAK) reactors due to wide-scale deployment and technological learning. Utilities and other customers that gain early experience with FOAK or early NOAK projects will be in competitive positions to become technology leaders.

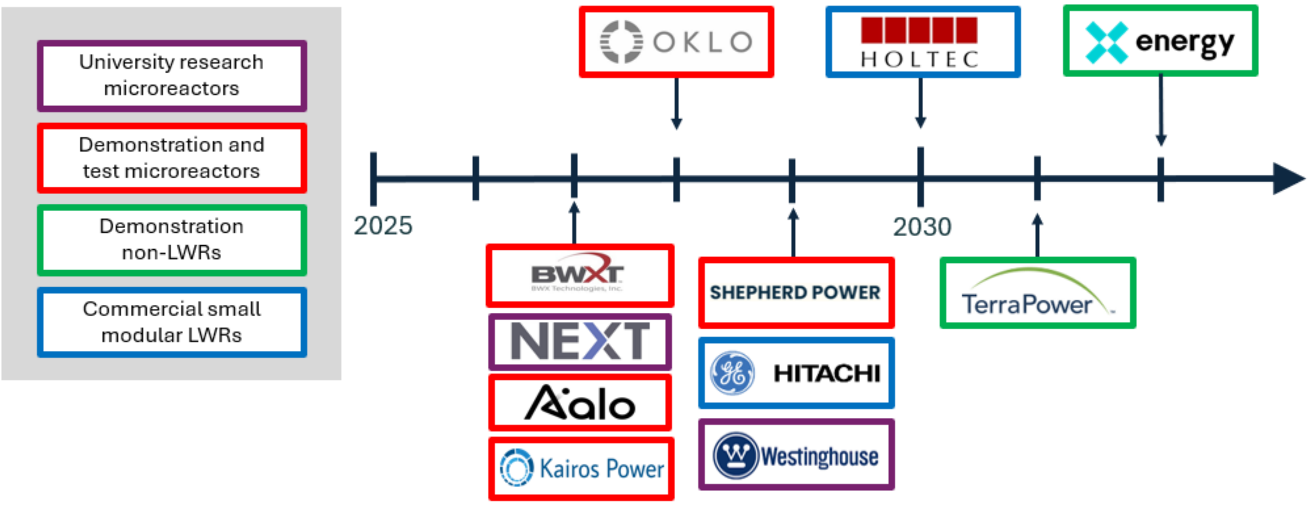

Figure 1: Announced Deployment Timeline for Selected New Reactors Projects in the United States. Source: NIA

Demonstration non-LWRs: The U.S. Department of Energy Advanced Reactor Demonstration Program (ARDP) made demonstration reactor cost-share awards to X-energy and TerraPower. X-energy and Dow Chemical Company will build four Xe-100 reactors at Dow's Seadrift site to provide high-quality steam and electricity to power the plant's operations, and TerraPower will build their Natrium reactor to support clean repowering of a retiring coal facility in Kemmerer, Wyoming.

Commercial small modular LWRs: GE-Hitachi announced commercial partnerships with the Tennessee Valley Authority and Ontario Power Generation, and plans to deploy the BWRX-300 reactor technology at the Clinch River Site in Tennessee and the Darlington site in Canada. Holtec has announced plans to build the SMR-300 reactor technology alongside the restarting large LWR reactor at the Palisades Nuclear Power Plant in Michigan.

Demonstration and test microreactors: Oklo and Aalo have both announced plans to construct and operate commercial demonstration microreactors at the Idaho National Laboratory (INL). BWXT is also slated to deploy the Project Pele demonstration microreactor for the U.S. Department of Defense at INL. Kairos Power has started construction on their Hermes test reactor near the East Tennessee Technology Park and is currently licensing two additional test reactors on the site. Shepherd Power has announced a partnership with BWXT to deploy the BANR technology in large numbers in West Texas to support oil and natural gas operations.

University research microreactors: Several advanced reactor developers are working with universities as sites and partners for their initial research microreactors. NANO Nuclear is partnering with the University of Illinois at Urbana Champaign on a high-temperature gas microreactor. NEXT Lab and Natura Resources are partnering with Abilene Christian University (ACU) on a molten salt research reactor, and Westinghouse is partnering with Penn State University to begin the application process for installing an eVinci microreactor at Penn State's new research facility.

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Economics of New Nuclear Energy

Summary

- New reactors are designed to be economically competitive and reduce investor risks associated with construction.
- Nuclear reactors can economically provide energy over very long lifetimes, making them sound long-term investments.
- Levelized cost of energy (LCOE) estimates, while a convenient metric, exclude system costs such as new transmission and storage. When all costs are included, nuclear energy is competitive with variable renewable generation, and may be essential in many regions.
- Most analyses of decarbonization pathways confirm that including firm energy sources such as nuclear energy, in addition to variable renewable energy, decreases the overall cost of decarbonization.
- Host communities find commercial nuclear power plants valuable because they provide well-paying union jobs, bring investment, support the local tax base, and stimulate local economies over the lifetime of the plant.
- Recent interest demonstrates that new nuclear energy is particularly attractive as an option to power data centers as well as industrial operations

New reactor designs were developed with a specific focus on cost-competitiveness and reducing construction complexity and risk compared to conventional nuclear plants. New reactor designs can feature smaller physical footprints than conventional plants and emphasize the use of manufactured components to reduce the amount of on-site construction. Many advanced reactors are designed for modular construction with reduced capital investment, and less construction complexity. This enables faster construction and scalable, incremental power additions to meet energy demand as needed. New reactors can be designed to limit water requirements and potentially reduce the need for large - scale off-site emergency evacuation requirements, opening up deployment options, such as repowering retired coal facilities or providing heat and power to industrial sites. Further, smaller designs like microreactors can unlock new uses and provide affordable, reliable and clean power to replace high-cost and carbon-intensive remote grids.

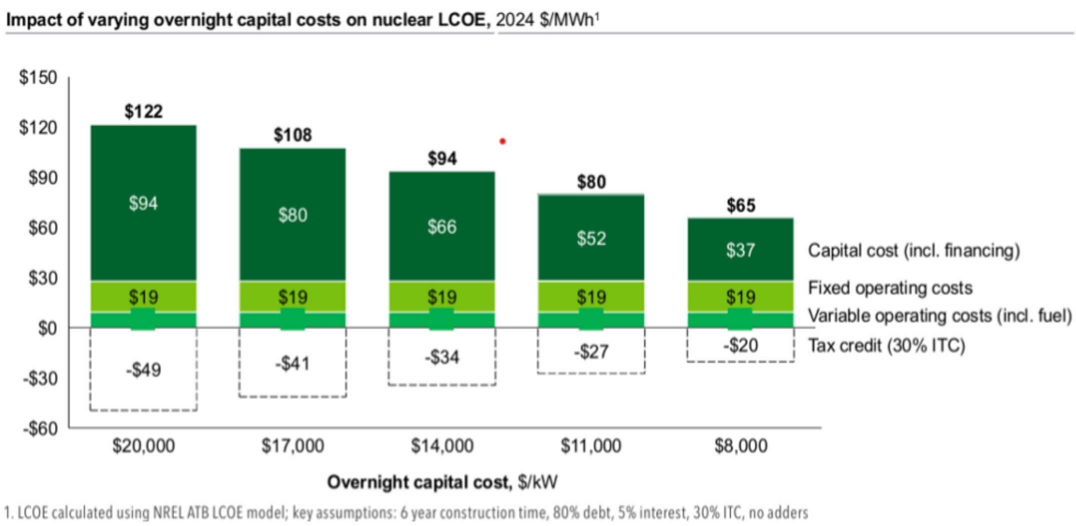

Figure 1: Impact of overnight capital costs on nuclear energy levelized cost of electrcity. Source: DOE Updated Advanced Nuclear Liftoff Report

Nuclear power plants have the longest lifetime operation among energy sources. Nuclear power plants are typically designed to operate upwards of 60 years. The Nuclear Regulatory Commission (NRC), the independent federal agency with authority to license the operation of commercial nuclear power plants in the United States, issues initial operating licenses for commercial power reactors to operate up to 40 years. These licenses can be extended for an additional 20 years at a time after an initial license, and many nuclear power plant operators are expected to seek a second, and potentially even a third, license extension. Out of 94 operating commercial nuclear reactors in the United States, 79 have been granted their first license renewal, and 6 have been granted their second license renewal. Most new nuclear reactors are also expected to operate between 60-80 years or more. In comparison, wind and solar energy sources are anticipated to operate on average for 25-30 years.

When all costs are included, nuclear energy is competitive with variable renewable generation, and may be essential in many regions. LCOE estimates are often cited to compare the economics of power generation options. However, the LCOE calculation has many limitations and should be used in combination with other metrics and factors to give a more comprehensive view of the economic and environmental impact of specific generating technologies over their lifetime.

Including nuclear power gives the world the best chance to tackle climate change and energy security. Princeton University's Net Zero America study analyzed the ability and affordability of five distinct technological pathways, all using technologies known today, to decarbonize the U.S. economy. Out of the five pathways, all but one used nuclear energy and the pathway that used the largest amount of nuclear energy **was also the most affordable.** While it is impossible to predict the exact energy mix necessary to fully meet the world's needs for reliable, affordable and clean energy by 2050, nuclear energy will likely play a significant part.

Building new nuclear plants will allow communities to retain well-paying union jobs and a significant tax base in the clean energy transition. Beyond competitively priced power, nuclear energy brings significant economic benefits to individuals, local communities, and states. Each year, a typical commercial U.S. reactor generates tens of millions of dollars in state and local tax revenue, stimulating local economies through local infrastructure buildout and maintenance. Construction of new nuclear power plants also benefits local and regional suppliers of design, engineering, procurement, construction and consulting services. These are well-paying jobs with high union rates that will allow communities the opportunity to retain workforces as carbon-emitting sources around the country retire.

New nuclear energy can also repower retiring fossil fuel sources. A September 2022 U.S. Department of Energy report on coal-to-nuclear feasibility found that advanced nuclear energy could play a major role in communities with retiring coal facilities. The DOE found that 80% of retired and operating coal power plant sites could host an advanced nuclear reactor, paving the way for over 250 GWe of coal-to-nuclear replacement projects across the United States. A 924 MWe coal-to-nuclear conversion could increase regional economic activity by $275 million and add 650 new, high-paying, permanent jobs to the region, many of which are traditional coal jobs that could transition to roles at a nuclear reactor.

New reactors have the potential to supply low-cost, zero-carbon energy for data centers, industrial and other energy needs. Many new reactor designs will be able to operate at and produce high-temperature heat that can be used for industry, hydrogen production, desalination, and similar applications. This is why certain companies, like Dow Chemical, are exploring using high-temperature gas reactor technology to decarbonize some of their industrial processes. Furthermore, hyper-scalers like Google, Amazon, Meta and Apple are all exploring how new nuclear energy can supply clean, firm power for their data center operations, which are highly energy-intensive operations.

Flexibility of New Nuclear Energy

Summary

- New reactors are well suited to provide firm, flexible and resilient electricity supply in future energy grids.
- Future electricity grids will need to incorporate high levels of variable renewable energy and manage concerns about grid reliability and resilience in the face of extreme and changing weather.
- Advanced reactors can supply energy for industrial requirements and enable co-production of hydrogen and desalination, helping to decarbonize other energy-intensive economic sectors and mitigate the impacts of climate change.

Electricity markets require closely matching electricity supply to demand on an instantaneous basis. Power system operators "dispatch" or adjust the production of power from electric generating units so that total generation matches demand as it varies throughout the day, season, and year. As the share of variable renewable energy continues to grow, the rest of the electric grid must feature increased flexibility to economically balance energy requirements while maintaining reliability. New reactors can provide the clean, firm power needed when renewable generation is unavailable, and work in tandem with renewable energy and energy storage to decarbonize energy systems. New nuclear energy will play an increasingly important role in supporting the growth of data centers, which require a constant and reliable source of power to operate.

Flexibility and compatibility with renewable energy have been part of new reactor designs from the start. New reactor designs can change their power level rapidly to complement variable levels of wind and solar generation. Some designs will even be able to ramp up or down from **40% to full power** in 12 minutes to match fluctuating supply or demand. In addition, most designs consist of multiple units that can be managed separately to meet fluctuations. In fact, it's a common misconception that nuclear reactors aren't compatible with renewables. Existing reactors were originally licensed to be able to modify their output to match changing energy demand (called load following) to help maintain the stability of the electric grid but have not typically done so in the United States because in the past, it has been more economically efficient for them to operate continuously at full power.

In addition to their ability to adjust energy output, some advanced reactor designs feature energy storage capabilities. This saves power when renewable energy is more readily available and provides the energy when renewables alone cannot meet demand. TerraPower's Natrium reactor can increase its output by about 45% for 5.5 hours using thermal storage.

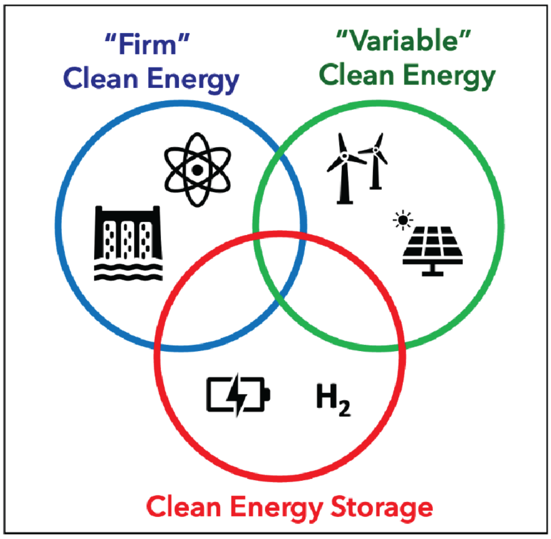

Figure 1: Simplified visualization of how grid flexibility can be achieved using clean energy sources

Figure 2: Range of applications that new nuclear energy can decarbonize. Source: Modified from X-energy

Some advanced reactor technologies can supply high-temperature heat for industrial operations. The ability to provide energy and high-temperature heat for industrial processes will be critical to achieving decarbonization objectives. Furthermore, it may be feasible to use some of these additional energy requirements to balance the production of electricity for the grid, providing an additional source of flexbility for power generation.

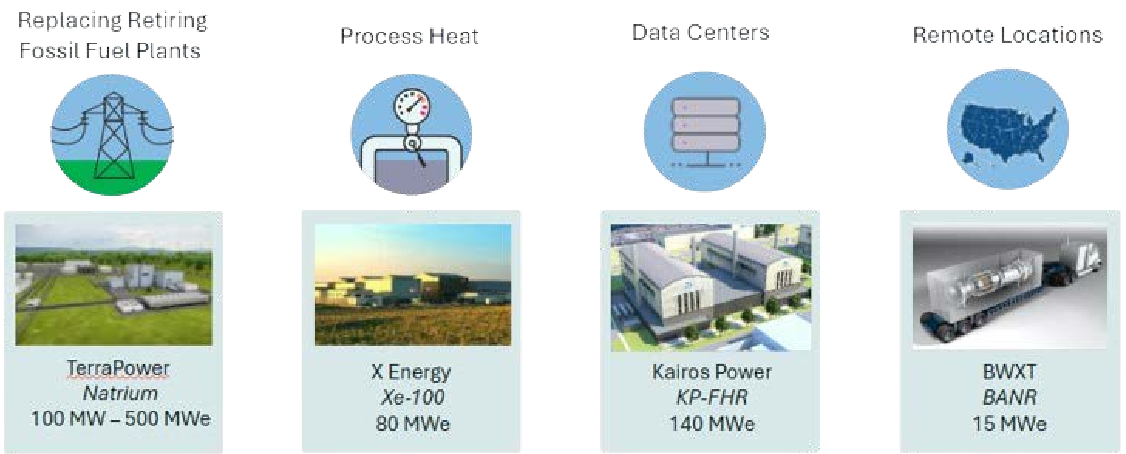

Figure 3: Proposed applications for various advanced reactor technologies. Source: NIA

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Spent Nuclear Fuel Management

The U.S. nuclear power industry has safely and effectively managed spent nuclear fuel (SNF) for decades. This specific form of nuclear waste is tracked with great precision and stored to keep it isolated from the public and the environment. SNF is currently stored at facilities on nuclear power plant sites, several well-understood approaches could be used for long-term storage, and innovators are exploring new ones. Given the relatively small quantity of SNF compared to the energy generated, it is feasible to greatly expand nuclear energy production while safely and effectively managing spent fuel. **To summarize:**

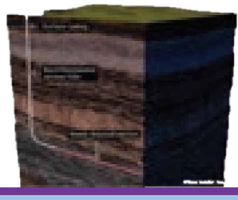
- **Safety:** Commercial SNF has been stored safely in the United States for decades. No member of the public has ever been harmed by the commercially generated spent nuclear fuel that is stored across 39 states.
- **Amount:**The total amount of SNF produced in the United States is very small compared to other waste streams and relative to the amount of energy it produces. In over 65 years of operation, the entire U.S. nuclear industry produced around 90,000 metric tons of SNF . In contrast, coal power plants produce over 100 million metric tons of coal ash every year. For context, the amount of SNF generated from an individual's lifetime electricity consumption of nuclear-generated electricity would only fill a soda can.
- **Management:** SNF is currently **stored safely at reactor sites** across the United States in dry casks or in wet storage, and it is precisely tracked and managed. The nuclear energy industry is the only industry that is completely responsible for monitoring and managing every aspect of its waste and ensuring it does not negatively affect the public or environment.

There are several approaches to disposing SNF:

While the current SNF management system in the United States is safe and effective, it is meant to only be an interim solution. Under the original Nuclear Waste Policy Act (NWPA), the U.S. Department of Energy (DOE) is responsible for taking waste from commercial reactor sites and putting it into long-term storage. However, DOE has yet to fulfill this responsibility. SNF will eventually need to be placed in a permanent storage facility. The good news is that solutions are available, and more are being explored by innovators, to help safely and permanently dispose of SNF . They include:

Geological Repositories

A geological repository is an underground facility designed for safe permanent disposal of SNF. Geological repositories are being implemented in several countries, including **Finland and Sweden** through successful consent-based siting implementation.



Deep Boreholes

Deep borehole technology would use advanced drilling techniques to safety store SNF deep underground in multiple boreholes. These boreholes could be easier to site and can be placed much deeper underground than mined repositories. Private companies like Deep Isolation, which recently received funding from ARPA-E, are already exploring this innovative solution.

Recycling

DOE is investing heavily into two SNF recycling programs to reduce the total amount needed to be stored and to provide fuel for advanced reactors. These include Optimizing Nuclear Waste and Advanced Reactor Disposal Systems (ONWARDS) and Converting SNF Radioisotopes Into Energy (CURIE). Projects within CURIE were **awarded $38 million in funding**.

Consolidated interim Storage: While not a permanent solution, DOE is considering establishing one or more consolidated interim storage facilities. DOE is in the process of developing a **collaborative-based siting process** that will be used when selecting an interim storage site and has recently established a collaborative -based siting consortia with $26M in funding to universities, nonprofits, and private-sector entities. Entities such as Holtec are actively engaged in consolidated interim storage development.

SNF from Advanced Reactors:

Advanced reactors offer opportunities to change the conversation about SNF. The characteristics of advanced reactor waste will vary depending on the reactor design. The fuel cycle of advanced reactors varies, too, which affects the SNF generated. Oklo, for example, plans to run its reactors on fuel recycled from existing SNF stockpiles. Additionally, advanced reactor designs generally offer greater efficiency and better utilization of nuclear fuel, which can reduce the rate at which SNF is generated per unit of nuclear energy produced.

The NIA report, *From Reactors to Repositories: Disposal Pathways for Advanced Reactor Wastes* characterizes the various waste streams that will be generated by advanced nuclear reactors and examines both interim storage and permanent disposal pathways. The graphic below summarizes these SNF forms. For more information on these SNF forms, along with details regarding their interim storage and permanent disposal considerations, see the full report or its summary for policymakers.

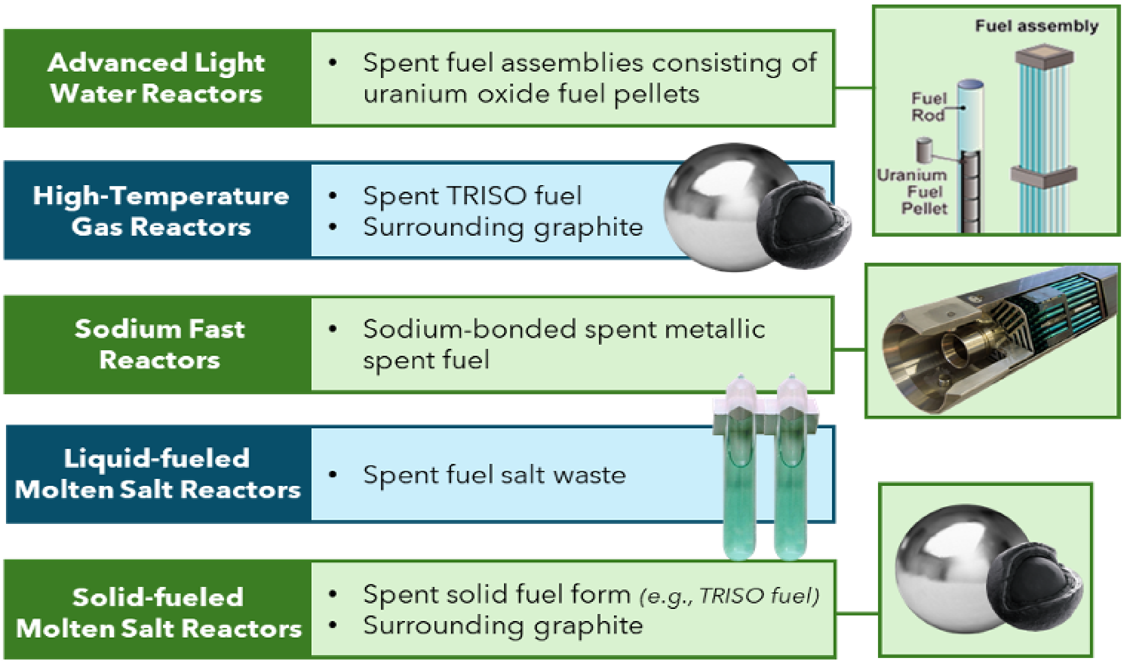


*Figure 1: Spent nuclear fuel generated by several advanced reactor technologies. Source: **NIA***

Additionally, some advanced reactors may also have the potential to reduce the lifetime of their SNF. Certain advanced reactor designs and fuel cycles can turn highly radioactive elements in SNF with extremely long half-lives into elements with much shorter half-lives. As a result, these designs could produce SNF that is radioactive for shorter time periods, which would significantly simplify the design and siting requirements for SNF disposal facilities. The SNF generated by different advanced reactor types will vary. The United States is well-positioned to manage advanced reactor waste in the near and intermediate term, but a permanent repository is still needed.

Conclusion:

Existing SNF is the byproduct of generating nearly one fifth of the United States' electricity and nearly half of its clean energy, and the quantity of SNF is very small relative to the energy produced. SNF is safely stored at existing nuclear power plant sites across the United States. Recent studies indicate that SNF from advanced nuclear reactors will be comparable to SNF generated by the existing conventional nuclear fleet in terms of quantity, but there will be differences in the physical, chemical and radiological properties of advanced reactor SNF. Broadly speaking, waste management of advanced reactor waste will generally look the same as it does for conventional reactors, but the specific waste management strategies we use must be tailored to the specific waste being managed. The United States has a long history of safely managing SNF, and our current waste management system is well equipped to handle SNF from advanced nuclear reactors as they are deployed towards the end of this decade, and beyond.

Safety of New Nuclear Energy

Summary:

New nuclear reactors build upon the experience and lessons learned from the existing fleet of nuclear reactors and incorporate innovations that promote even safer operations. Nuclear energy remains one of the safest forms of energy production available. Based on operational experience and lessons, new reactors feature innovations that further reduce the risks and consequences of accidents. These can include:

- Additional inherent and passive safety designs
- Reduced inventory of radioactive material
- Coolants or working fluids with improved thermochemical properties
- New and more robust forms of fuel, such as Tri-structural Isotropic, particles, molten salts, and metals
- Operating at reduced or atmospheric pressure
- Underground plant structures to limit operational and security risks

The U.S. Nuclear Regulatory Commission (NRC) provides strong independent regulatory oversight of nuclear power plants. Over the course of its existence, the NRC has ensured that no member of the public has been harmed by the radiation from the operation of U.S. nuclear power plants. Today, the NRC is evaluating the merits of different new reactor designs as well as different approaches for their deployment. Recently, the NRC has educated its staff and improved licensing through new and innovative methods of review. These efforts are facilitating the safety cases for numerous advanced reactor concepts to be thoroughly and appropriately vetted. The NRC is also focusing on more efficient licensing processes while upholding the same standards of safety. Kairos Power, for example, received a construction permit for the Hermes 2 demonstration reactor from NRC staff in record time, trimming a years-long process into an 18-month turnaround. Lastly, the NRC completed a rule making introducing a methodology for reducing the Emergency Planning Zone requirements for advanced reactors, signaling to the public the safety of new nuclear reactor designs.

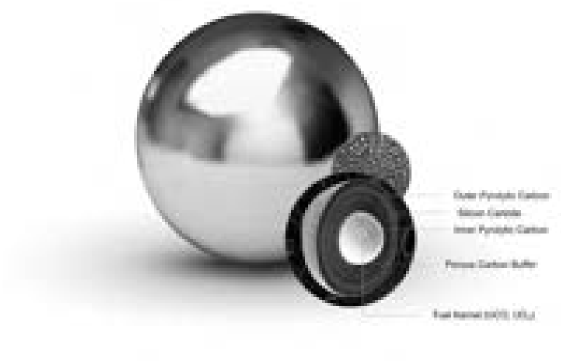


Figure 1: Example of TRISO fuel developed by advanced nuclear reactor companies NANO Nuclear and X-energy

Opportunities for a Coal-to-Nuclear Transition

Many communities across the U.S. rely heavily on aging coal facilities for electricity generation and as major sources of economic activity. Over the past 20 years, hundreds of coal facilities have shut down totaling around 100 gigawatts (GWs) of lost electric generation, leaving these coal communities susceptible to economic decline during the energy transition to zero-carbon emitting sources. These communities are looking for solutions that provide high-quality jobs and a reliable tax base as the nation seeks new sources of clean, firm power.

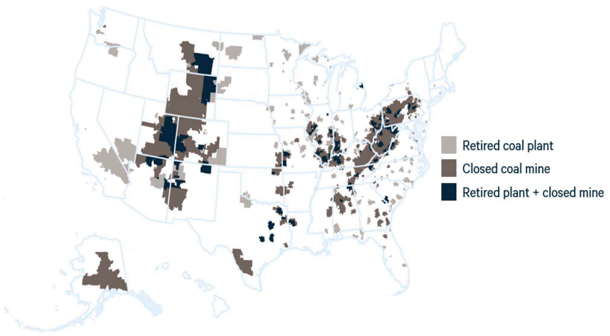


Figure 1: Retired coal facilities in the United States will affect communities nationwide. Source: RFF

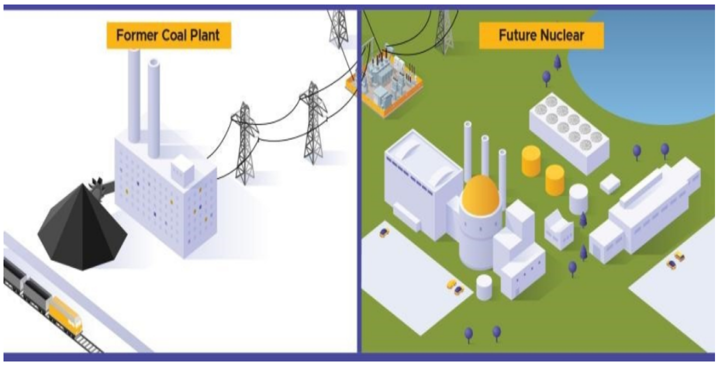
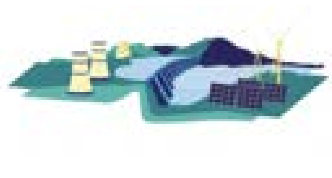
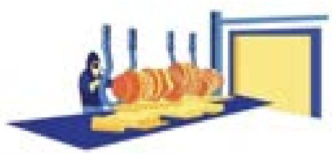


Figure 2: What a coal to nuclear transition can look like Source: US DOE

A September 2022 U.S. Department of Energy report on coal-to-nuclear feasibility found that advanced nuclear energy could play a major role in communities with retiring coal facilities:



Advanced Nuclear Energy Can Repower the Grid
The DOE found that 80% of retired and operating coal power plant sites could host an advanced nuclear reactor, paving the way for 263.3 GWe of coal-to-nuclear replacement projects across the United States. Advanced nuclear is a zero-carbon, "always available" energy source that helps meet communities' energy needs and complements renewable energy



Advanced Nuclear Energy Can Repower Communities
A 924 MWe coal-to-nuclear conversion could increase regional economic activity by $275 million and add 650 new, high paying, permanent jobs to the region. The existing workforce is largely transferable due to the similarities in skill sets.

The Inflation Reduction Act of 2022 (IRA) provides an opportunity for coal communities to invest in new nuclear energy. Included in the new nuclear energy tax provisions in IRA were additional boosters for each type of tax credit if a clean energy project is located within an "energy community". Retired coal sites, as defined by IRA, are considered " energy communities" and are eligible for boosted tax credits for clean energy projects. Fully decarbonizing the U.S. power grid and producing zero-carbon fuels will require hundreds of GWs of new zero-carbon, firm energy. Repowering coal plants with advanced nuclear energy helps to achieve decarbonization while maintaining local workforce with experience running energy facilities. For more information on coal-to-nuclear transitions, see NIA's report: **"Resources for Coal Repowering with Nuclear Energy".**

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New Nuclear Energy Tax Provisions

The Inflation Reduction Act (IRA) **created** two new technology neutral tax credits for zero-emitting, clean energy projects: **a Clean Electricity Production Tax Credit (PTC) and a Clean Electricity Investment Tax Credit (ITC)**. The technology neutral tax credits are intended to accelerate deployment of clean energy technologies, including new nuclear reactors. A project developer could elect either tax credit, but not both. Below is a summary of the two tax credits that new nuclear energy projects can choose from:

Tax Provision	Value without satisfying wages and apprenticeship requirement	Value with satisfying wages and apprenticeship requirement	Additional booster(s)
Clean Electricity Production Credit (PTC)	0.5 cent/kWh*	2.5 cents/kWh*	10% domestic content bonus
			10% booster if project located within an energy community
Clean Electricity Investment Credit (ITC)	6% of initial capital cost	30% of initial capital cost	10 percentage point domestic content bonus
			10 percentage points if project is placed within an energy community

*The Clean Electricity Production Credit is adjusted for inflation every year and the values in this table are given in 2021 dollars

As shown above, the technology neutral tax credits encourage clean energy project developers to invest in workers and communities by boosting the tax credits for projects that pay prevailing wages, provide for apprenticeships, and/or are sited in energy communities (draft or final guidance for these provisions can found be on the **Treasury's website**). Municipal power companies or tax-exempt cooperatives are eligible for "direct pay", which means they can receive a payment from the government in lieu of a tax credit. For private entities, the tax credits are transferable to any other taxpayer. Following the passage of HR 1 in 2025, projects must be placed in service after December 31st, 2024. The PTC will be available for electricity produced during a facility's first 10 years of operation. The credits begin to phase out for new facilities that commence construction after 2033. Each credit will phase out over a three-year period - 75% of the initial value after 2034, 50% of the initial value after 2035, and then 0% after 2035.

For more information on the clean electricity tax credits on new nuclear energy projects, please see NIA reports, **Implications of Inflation Reduction Act Tax Credits for Advanced Nuclear Energy**" and **The Importance of Tax Credits for U.S. Leadership in New Nuclear Energy.**

NUCLEAR INNOVATION ALLIANCE

Securing America's Energy Future with Domestic Uranium Enrichment

As the world grapples with energy security challenges and the urgent need to transition to cleaner energy sources, new nuclear energy stands out as a reliable, clean, and affordable solution. However, the "core" of this promising energy solution – **the reliable supply of uranium fuel for nuclear reactors – is dependent on a global supply chain now dominated by a small number of foreign state-supported and state-controlled entities**. It is imperative that the United States fortify its energy security by catalyzing a robust, domestic commercial uranium fuel supply chain to support current and future nuclear reactors.

The United States and its allies currently rely on a small number of companies involved in the nuclear fuel supply chain to meet their uranium fuel needs. Keyinternational companies supplying commercial uranium enrichment and conversion services include Orano (majority controlled by the French government), Urenco (majority controlled by the UK and Dutch governments), Cameco (publicly traded Canadian company), and TENEX (a Russian state-owned enterprise).

While international agreements and free markets have historically supported commercial agreements between nations and these companies, there is growing concern since the 2022 Russian invasion of Ukraine that **reliance by the United States and its allies on the Russian state-owned enterprise TENEX for nuclear fuels is a diplomatic and energy security risk**. The United States currently relies on TENEX to supply the enriched uranium for about 25% of U.S. reactors, but Russia's use of other energy exports as weapons of war and international coercion creates a significant vulnerability for both the United States and its allies. Additionally, TENEX is the only commercial supplier of High-Assay Low-Enriched Uranium (HALEU), which is a more highly enriched type of uranium that is needed to fuel many new nuclear reactor designs. Without domestic or allied HALEU production, the future of nuclear innovation and many new reactors in the U.S. is subject to geopolitical uncertainty.

The U.S. Department of Energy (DOE) is taking steps to reduce U.S. nuclear energy dependency on Russia by supporting expansion of the domestic nuclear fuel supply chain and creating new domestic HALEU production capacity, but until recently, DOE did not have sufficient funding to execute such a task. Analysis from the Nuclear Innovation Alliance in December 2023 found that additional federal funding of up to $2.9 billion was needed for DOE to successfully catalyze private investment in commercial HALEU production. Since then, Congress has recognized the importance of this issue and enacted legislation to provide DOE with the funding they need.

In March 2024 the Consolidated Appropriations Act of 2024 provided $2.72 billion to DOE's HALEU Availability Program for increasing U.S. domestic enrichment capacity to meet the needs of U.S. operating nuclear reactors and future reactor designs.

DOE now has the full funding it needs, totaling $3.4 billion [1], to reduce U.S. reliance on Russian uranium, create strong market signals for private investment in domestic uranium supply chain infrastructure, and pave the way for a robust domestic supply chain. Nevertheless, many challenges still lie ahead. DOE now needs to work effectively and efficiently with commercial industry, without delay, to kick-start the public-private partnership needed to accomplish U.S. goals. DOE has already awarded contracts to several companies in the HALEU supply chain, but this is just the start of a long complex road to success, and much further action is needed to reach the finish line.

Time is of the essence, and any delay could jeopardize efforts to reach U.S. energy security and climate goals. Numerous advanced reactor developers are relying on DOE to deliver on its commitments. Even small delays could send ripple effects throughout the developing nuclear fuel supply chain, disrupting deployment schedules and burdening developers with additional costs as they seek to navigate these setbacks. Given these risks and the urgency of securing U.S. energy and climate future amidst geopolitical tensions, it is critical that the DOE works swiftly to partner with industry, and that Congress provide the oversight needed to ensure DOE is moving at a fast pace.

New nuclear reactors can help the world address the challenges of energy security and the urgent need to transition to cleaner energy sources while providing reliable and affordable energy that complements other clean energy sources. Creating a pathway to this clean and secure energy future, however, relies on having a robust, domestic commercial uranium fuel supply chain to power current and future nuclear reactors. Enacted funding reflects a promising direction, showcasing a collective bipartisan recognition of the urgency and importance of securing the nuclear fuel supply.

The United States has an unprecedented opportunity to reshape our energy landscape, making it more secure, sustainable, and capable of meeting pressing climate and energy demands. However, to fully realize this potential it's essential to not only harness this opportunity with the urgency it demands but also keep a clear focus on the next steps that must be taken to achieve a reliable, affordable and clean energy future.

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[1] This includes $2.72 billion from the Consolidated Appropriations Act of 2024 and $700 million from the Inflation Reduction Act