Pathways to Commercial Liftoff
Advanced Nuclear

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Pathway to Commercial Liftoff

U.S. nuclear capacity has the potential to triple from ~100 GW in 2024 to ~300 GW by 2050. Power system decarbonization modeling, regardless of level of renewables deployment, shows the United States will need at least ~700–900 GW of additional clean firm capacity to reach net-zero; nuclear is one of the few proven options that could deliver this at scale. Decarbonization will require both new nuclear and renewable capacity; nuclear does not "displace" or "compete with" renewables. Including nuclear and other clean firm resources reduces the cost of decarbonization by reducing the need for additional variable generation capacity, energy storage, and transmission.

Nuclear provides a differentiated value proposition for a decarbonized grid. Nuclear generates carbon-free electricity, provides firm power that complements renewables, has low land-use requirements, and has lower transmission requirements than distributed or site-constrained generation sources. It also offers high-paying jobs and significant regional economic benefits, can aid in an equitable transition to a net-zero grid, and has a wide variety of use cases that enable grid flexibility and decarbonization beyond the grid, including high temperatures for industrial heat.

The path to commercial scale for U.S. advanced nuclear requires significant parallel development in three areas: (1) orderbook commitment, (2) project delivery, and (3) industrialization. A committed orderbook of 5–10 deployments of at least one reactor design is the first essential step for catalyzing commercial liftoff. Waiting until the mid-2030s to deploy new nuclear at scale could lead to missing decarbonization targets and/or significant nuclear supply chain overbuild. If deployment starts by 2030, ramping annual deployment to 13 GW by 2041 would provide 200 GW by 2050; a five-year delay could require 20+ GW per year to achieve the same 200 GW and could result in as much as a 50% increase in the capital required.

The nuclear industry is building momentum to break the commercial stalemate as utilities and other potential customers see the successful operation of Vogtle Units 3 and 4, anticipate sustained electrical load growth, and internalize benefits from the Inflation Reduction Act (IRA), including a 30-50% investment tax credit (ITC), low interest financing via the Loan Programs Office (LPO), and 5-year depreciation through the modified accelerated cost recovery systems (MACRS). In 2022, utilities were shutting down nuclear reactors; in 2024, they are extending reactor operations to 80 years, planning to uprate capacity, and restarting formerly closed reactors. In addition to incorporating lessons learned from Vogtle, customers can pool demand through consortium models to share costs and risks, lowering the individual barriers.

Market Status

Metric	Value	2050 Target[2]
U.S. Nuclear Capacity	~97 GW	~300 GW
Combined Operating Licenses (COLs) Issued for New Reactors[1] Source: NRC 2024	6	-
Uranium Enrichment Capacity (domestic or otherwise available)	~15M SWU	~45-55M SWU
Nuclear Industry Workers Trained	~100,000	~300,000-400,000

1. Not including Terminated or Operating units 2. Targets derived from 2024 Advanced Nuclear Liftoff Report

Possible Near-term Actions

1. Explore potential pathways to incentivize advanced nuclear, including through programs that take into account its decarbonization and reliability benefits as a clean firm source of power
2. Develop a consortium of utilities and/or offtakers to share cost and risk and achieve a critical mass of orders for a single design
3. Establish an Integrated Project Delivery model to align incentives for on-budget and on-time delivery among all project participants
4. Increase U.S. domestic capacity and access to sources of uranium conversion, enrichment, and fabrication