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Data Center and AI Power Demand – Will Nuclear Be the Answer?

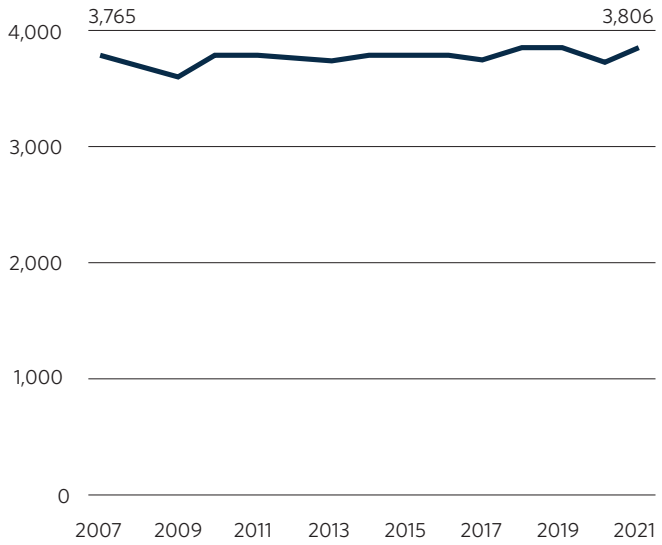
by Dan Connell

In recent years, electricity demand in the United States has started to rise again after a long period of stagnation, putting pressure on the power grid. This has renewed interest in nuclear energy—especially Small Modular Reactors—as a possible solution.

For nearly two decades, power demand in the United States was largely flat. This period of flat demand saw, setting aside an early pandemic era reversal, significant growth from 2017 to 2023. This growth comes at a moment where the electrical grid, particularly in the United States, is already straining to meet demand. As investors, regulators and consumers all confront this challenge, many eyes have turned back to nuclear power after decades of decline. Against this backdrop, one question continually comes to the fore – is a nuclear renaissance, particularly driven by Small Modular Reactors (colloquially referred to as "SMR"), likely to meet this need?

U.S. ELECTRICITY SALES (MWH/YEAR) 2007-2021

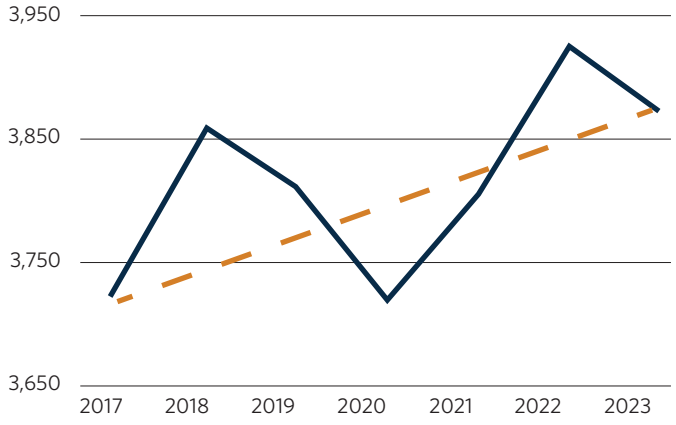
Numbers in Millions



Source: U.S. Energy Information Agency: "U.S. Annual Power Sales 1990-2009 and 2010-2024." (Accessed January 15, 2025).

U.S. ELECTRICITY SALES (MWH/YEAR) 2017-2023

Numbers in Millions



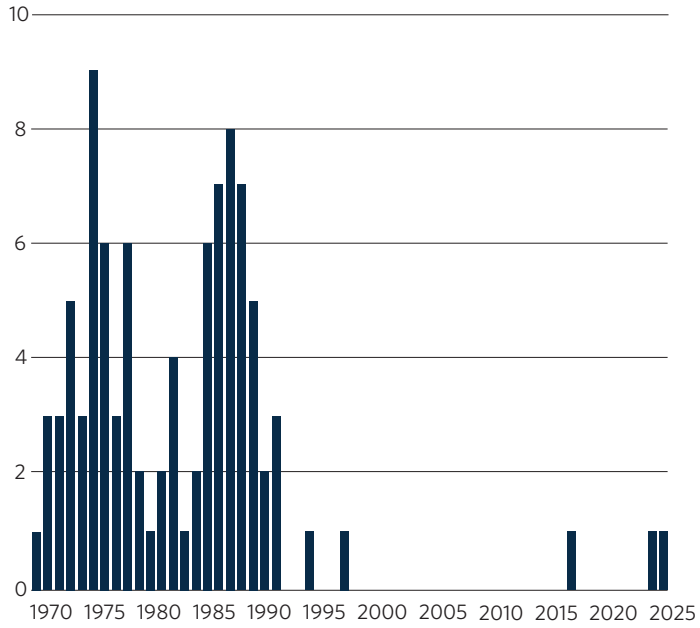
Source: Ibid.

NUCLEAR INDUSTRY TODAY

Before looking ahead, it's helpful to take a brief look back on how we arrived at this point. The first two decades of the 21st century saw precious little in terms of new nuclear projects added to the U.S. power generation mix.

U.S. NUCLEAR PLANTS ARE EASIER TO PROMISE THAN TO BUILD

Bars represent number of new nuclear plants put into operation



Source: Reuters: "Mini Nuclear Reactor Rush Has a Short Half-Life." (April 1, 2025)

Indeed, the construction of Units 3 and 4 at the Vogtle nuclear plant in Georgia was thought to be a harbinger of the nuclear renaissance in North America. Seven years late – and $17 billion over budget – these reactors instead drove Westinghouse into bankruptcy and cast a pall over the optimism around the U.S. nuclear market.[1]

Despite these challenging headlines, nuclear power remains tantalizing given the scale and reliability it offers at a time where large quantities of dispatchable power are experiencing high demand. One place where the nuclear industry is clearly seeing a rebound is existing plants, with even those in mothballs getting a new lease on life. As technology companies seek out options for reliable power, they are again and again arriving at nuclear as a solution. In June 2025, Meta announced a 20-year power purchase agreement ("PPA") with Constellation Energy to extend the life of the 1.1 GW Clinton Clean Energy Center in Illinois (previously in line to retire in 2027).[2] Microsoft

1 AP: "Georgia Nuclear Rebirth Arrives 7 Years Late, $17B Over Cost." (May 25, 2023)
2 Axios: "Meta Goes Nuclear to Power AI with Clean Electrons." (June 3, 2025)

entered into a 20-year PPA, also with Constellation, to re-open Three Mile Island in Pennsylvania by 2028.[3] Amazon followed suit with plans for a nearly 2 GW PPA with Talen Energy's Susquehanna plant, also in Pennsylvania.[4]

But back to Vogtle for a moment. Clearly the sunk cost of existing nuclear plants provides value to consumers – but how can the industry meet the market if they deliver projects *that* late and *that* over budget?

ALL ABOUT SMR?

A key issue for nuclear projects has been replicability, the lack of which contributes to delays and cost overruns as each site has tended to have a novel design. The thinking around SMR technology is that while larger projects benefit from economies of scale, SMR could trade scale for replicability and potentially speed. "Modularity is definitely appealing. Take the reactors in Georgia. If their design could become a new standard, repeatedly produced at scale, its lifetime cost could drop by around 70% to $60 per megawatt, the DOE estimates."[5]

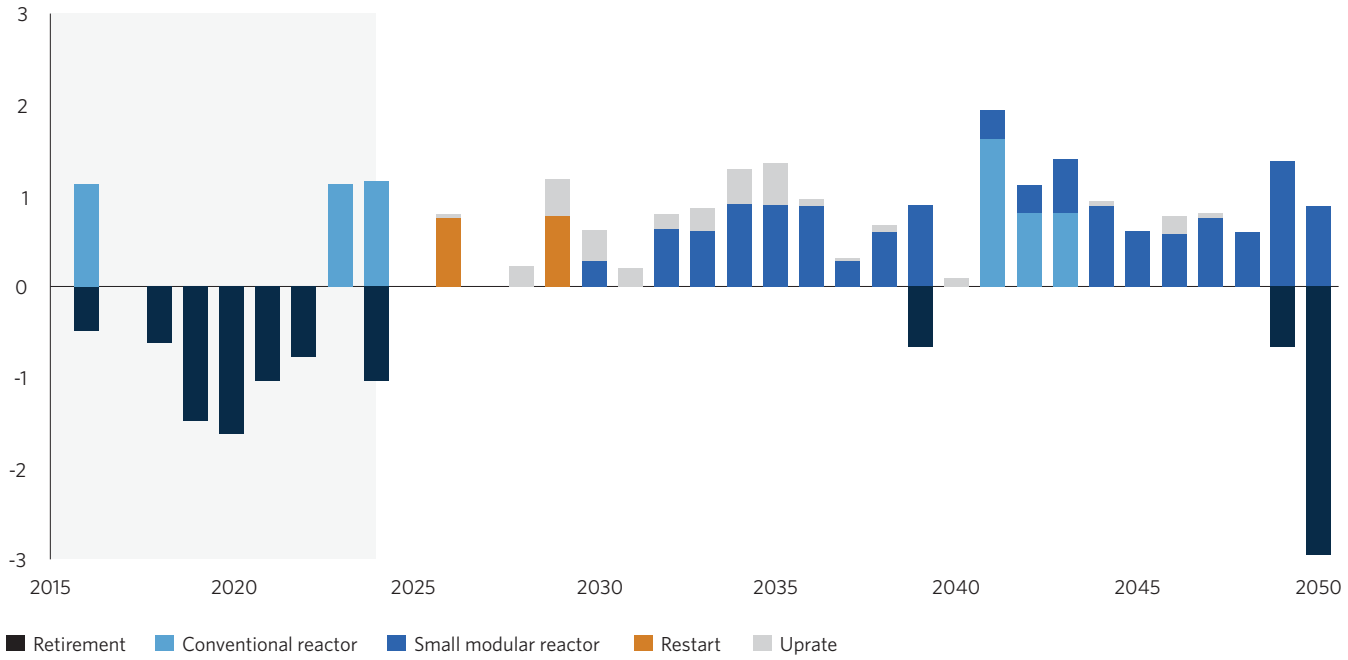
All of which sounds encouraging, but caution is warranted. One prominent player in the U.S. SMR market is NuScale. The company recently received approval for a revised, larger design from the U.S. Nuclear Regulatory Commission for a version of their planned SMRs.[6] A recipient of federal funding since 2014, NuScale's previously planned Carbon Free Power Project in Utah was announced in 2020 but terminated in 2023 as rising costs led towns to withdraw from the project.[7]

While projects have experienced cancellations and delays, optimism persists. The Tennessee Valley Authority ("TVA") recently applied for a construction permit to bring an SMR project online in the early 2030s.[8] The U.S. is not alone in pursuing SMR and, indeed, won't be the first to deploy it. China is making strides on SMR deployment, having brought an ACP100 unit online with more expected to follow.[9]

PROJECTIONS AND CONTEXT

The sentiment around SMR today remains optimistic, even as projections on deployment (such as those depicted below) now suggest these are likely to be a "next decade" type solution.

NORTH AMERICA NUCLEAR ADDITIONS AND RETIREMENTS (GW)

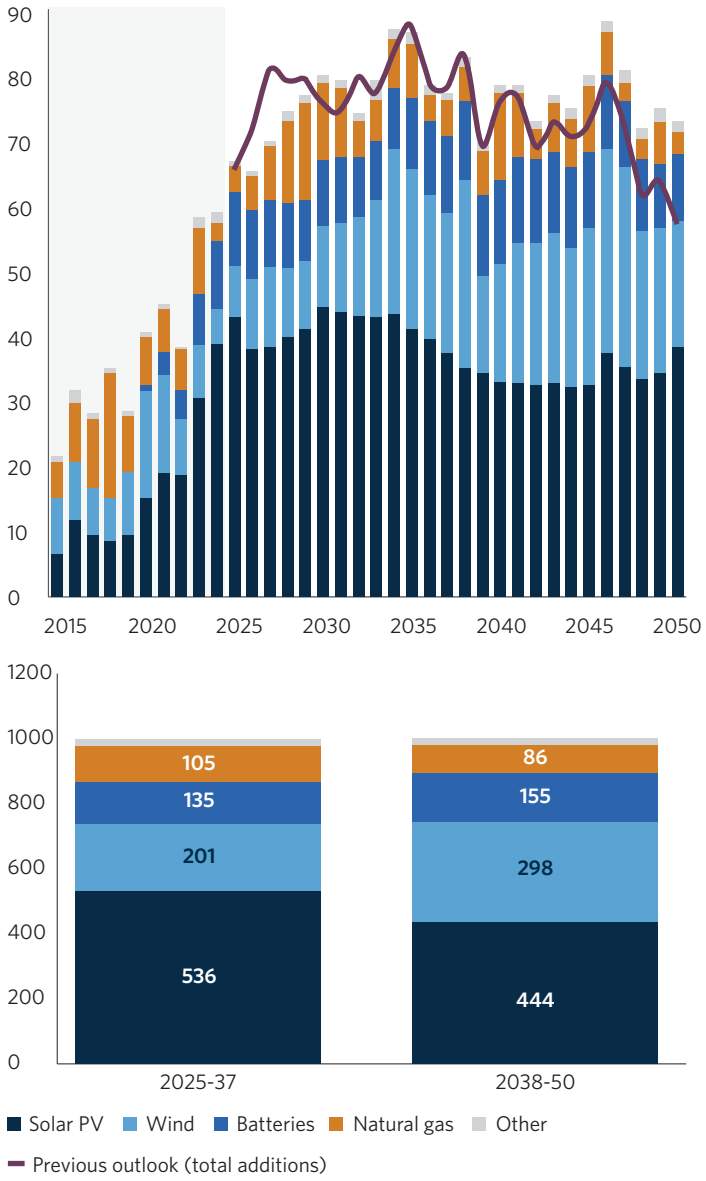


Source: S&P Global: "North American Power Market Outlook." (June 2025)

3 BBC: "Microsoft Chooses Infamous Nuclear Site for AI Power." (September 20, 2024)
4 Utility Dive: "Talen to Sell Amazon 1.9 GW from Susquehanna Nuclear Plant." (June 11, 2025)
5 Reuters: "Mini Nuclear Reactor Rush Has a Short Half-Life." (April 1, 2025)
6 Reuters: "U.S. Approves NuScale's Bigger Nuclear Reactor Design." (May 29, 2025)
7 Reuters: "NuScale Ends Utah Project, in Blow to U.S. Nuclear Power Ambitions." (November 9, 2023)
8 Utility Dive: "TVA is First U.S. Utility to Apply for an SMR Construction Permit." (May 21, 2025)
9 EnergyNews: "ACP100, China's First Modular Reactor for Sustainable Nuclear Energy." (September 17, 2024)

This return to growth for the industry marks an impressive reversal of the preceding period of decline – but context is also helpful. While these additions are significant for the nuclear industry, they are projected to be a fraction of total additional installed capacity in North America in the coming decades.

U.S. LOWER 48 NAMEPLATE CAPACITY ADDITIONS (GW)



Source: Ibid.

Renewables, particularly onshore wind and solar, are expected to contribute meaningfully to the supply mix (as seen left). While the recent passage of the One Big Beautiful Bill Act will create a period of volatility for renewables, there is an expectation that renewable deployment will continue at a significant pace.[10] Natural gas fired power generation is also expected to be a material portion of the overall net additions to generating capacity in the United States. Along with batteries, these two sources of supply will be leaned on heavily as dispatchable, responsive power.

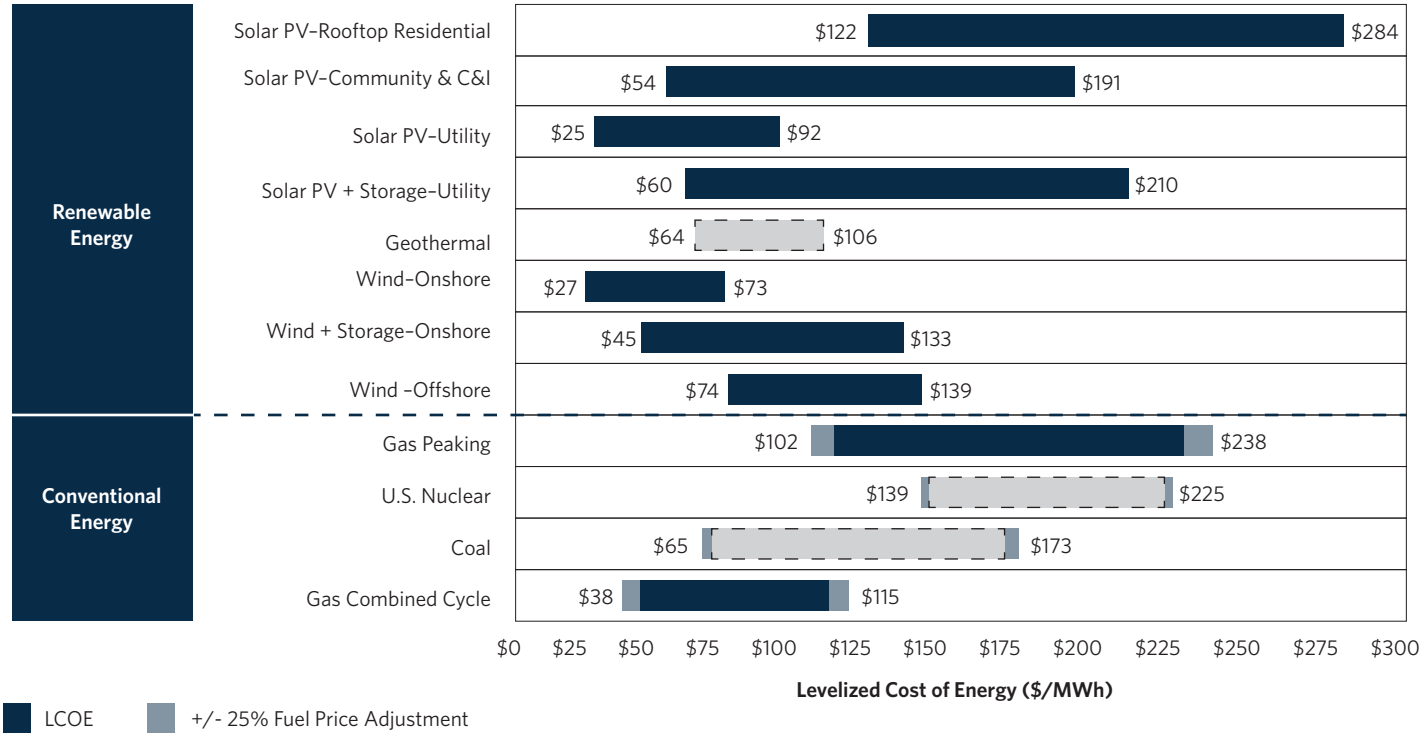
COST CONSIDERATIONS AND SITING CONSTRAINTS?

As noted above, cost overruns historically posed challenges for nuclear. While SMR doesn't necessarily benefit from the economies of scale that large, conventional nuclear projects do, it is hoped that they can help bring down cost through repeatability. While levelized cost of energy has its issues (not accounting for the cost of firming intermittent renewable resources), it can be a helpful measure of the cost to add new megawatts to the grid. As the chart below demonstrates, utility scale renewables (onshore wind and photovoltaic solar) compare very favorably with conventional sources, including nuclear.

10 Columbia University Business School: "America's Clean Energy Transition Will Continue Despite the One Big Beautiful Bill Act." (July 16, 2025)

LEVELIZED COST OF ENERGY COMPARISON–SENSITIVITY TO FUEL PRICES

Variations in fuel prices can materially affect the LCOE of conventional generation technologies, but direct comparisons to "competing" renewable energy generation technologies must take into account issues such as dispatch characteristics (e.g., baseload and/or dispatchable intermediate capacity vs. peaking or intermittent technologies)



Source: Lazard: "LCOE+ 2024." (June 2024)

Ample caveats apply when comparing renewables to nuclear, but combined cycle natural gas does not come with such caveats and is definitively a lower cost solution. Again, there is hope that SMR can help bring these costs down.

Beyond cost considerations, siting is another challenge – for all forms of power generation. No one source is singularly and universally beloved, but nuclear can often face challenges with siting. Take existing projects like the recently retired Indian Point project north of New York City. Even as that market experiences challenges with growing demand, Indian Point faced opposition from environmental groups.[11] A study published by Risk Analysis in 2009 on NIMBYism ("Not In My Backyard") and nuclear development noted that "Public and political opposition have made finding locations for new nuclear power plants, waste management, and nuclear research and development facilities a challenge for the U.S. government and the nuclear industry."[12] A litany of other types of projects (offshore wind as one example) have often faced similar pressure[13], but it seems clear that there is at least that possibility that such resistance could serve as a governor on the pace of deployment for nuclear broadly and SMR specifically – regardless of how the cost and efficiency of delivery evolves.

CONCLUSION

Some of the headlines on nuclear are hugely attention grabbing – restarting Three Mile Island, anyone?[14] – but there is a growing expectation that meaningful deployment of some of these solutions, especially SMR, is likely a decade or more away. Nuclear power has the potential to gain share as a portion of new capacity additions – but it should be expected to take time at a moment where data center operators and residential consumers alike are already feeling the rising cost of demand growth. There will be investment opportunities along the way – in services for these assets as well as the deployment of the assets themselves – but there is clearly the potential for the nuclear renaissance to arrive later than hoped…if at all.

11 Bloomberg: "New York Plans New Nuclear Plant as Energy Demand Surges." (June 23, 2025)
12 Risk Analysis: "NIMBY, CLAMP and the location of new nuclear-related facilities." (September 2009)
13 Utility Dive: "Carrots, sticks or both: State efforts to combat anti-renewables NIMBYs." (August 22, 2024)
14 BBC: "Microsoft Chooses Infamous Nuclear Site for AI Power." (September 20, 2024)

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