MORNINGSTAR®

The State of Nuclear

U.S. Power and Gas Weekly

Morningstar Commodities Research
10 October 2019

Dan Grunwald
Associate, Power and Gas
+1 312 244-7135
daniel.grunwald@morningstar.com

Data Sources Used in This Publication
Energy Information Administration
Department of Energy

To discover more about the data sources used, click here.

The Current State

Nuclear generation has remained a stable and reliable source of energy over the last few decades. Until recently, new additions were stalled and there had been no retirements. Nuclear capacity has made up 9% of national generation for decades. The sector will see a shift in coming decades that will change an already evolving electricity market in dramatic ways. This aging fleet has started to draw down as recently as 2013 and will continue to draw down, but state subsidies have slowed the trend. New technology is on the way in the 2020s that could bring about some strategic replacement in the coming years. This note looks at the current nuclear generation fleet and potential changes.

The Current Fleet

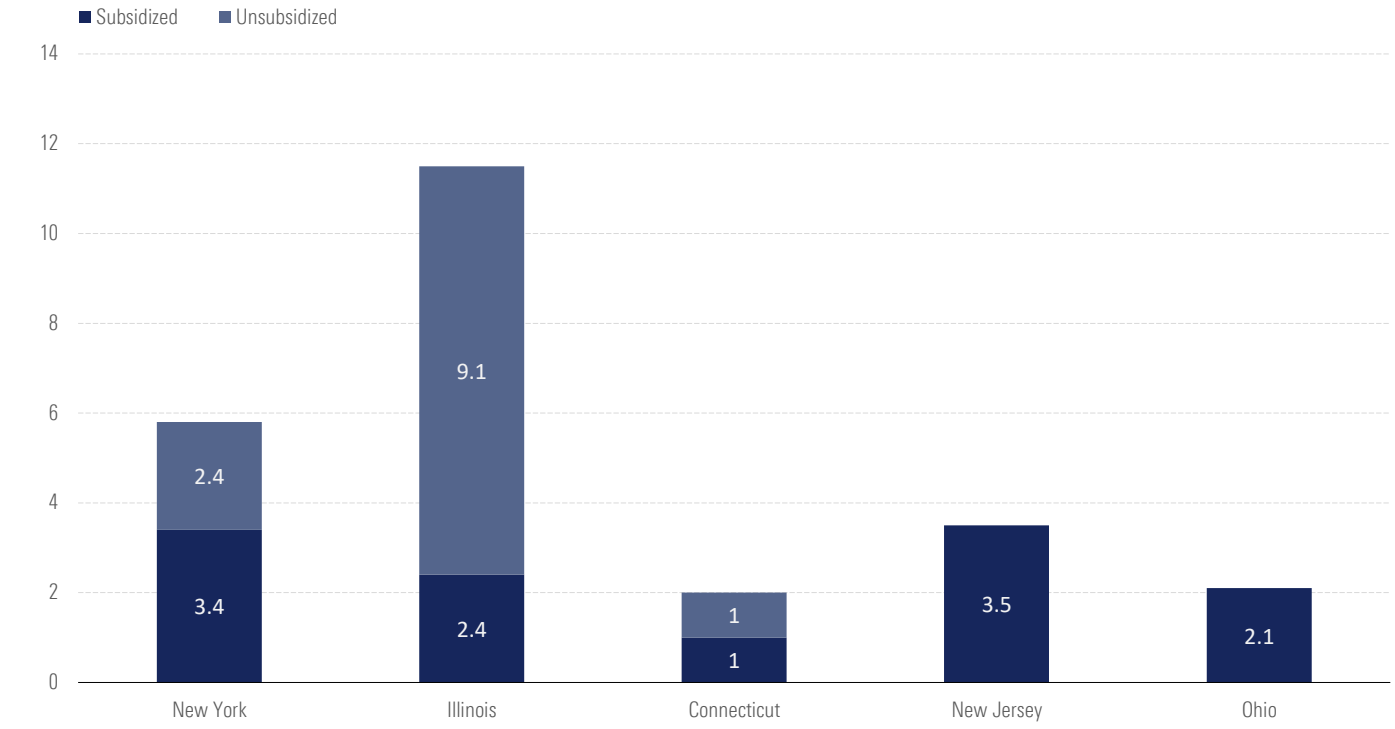
The United States currently has 59 operating nuclear plants comprising 97 generation units with a combined 101.2 gigawatts of nameplate capacity. The average unit age is over 38 years, and only two generators are under 25. Since 2013, around 6,000 megawatts of generation has retired with an average age just shy of 40 years. That leaves around 60% of generation under 40 years old and 40% over. Despite the aging fleet, nuclear still accounted for 9.2% of total U.S. net summer capacity as of 2018.

Power generated by nuclear plants has been range-bound across the country for decades despite recent retirements. Average generation from 2001 to today is 66,000 gigawatt-hours per month. While the average has been slowly ticking up since 2001, nuclear generation has stayed between 19% and 21% of total U.S. generation in any given year, with a slight decreasing trend. This stable output is largely driven by the nuclear fleet achieving a 92.6% annual capacity factor.

State Subsidies

Five states—New York, Illinois, Connecticut, New Jersey, and Ohio—have enacted legislation to protect their states' nuclear plants from closure (Exhibit 1). These subsidies have largely been a push to correct market externalities caused by carbon emissions. The intermittent nature of renewable generators still has many grid operators on edge, creating an additional reliability-based argument for maintaining the aging nuclear fleet. Outside of Ohio's recent legislation, which included coal, other states' legislators have generally copied renewable energy credits in renewable and clean energy mandates and offered zero-emission credits to keep their nuclear plants intact. Unlike high-emission coal plants, many nuclear operators have argued the merits of both reliability and low carbon emissions. These subsidies have so far stayed within PJM, NYISO, and ISONE. Even so, they cover about 13% of all U.S. nuclear generation capacity. Overall, age factors will drive retirements, but any larger losses should be held off.

Exhibit 1 State's with Subsidized Nuclear Generation (GW)



Source: EIA, Morningstar

Generation Outlook

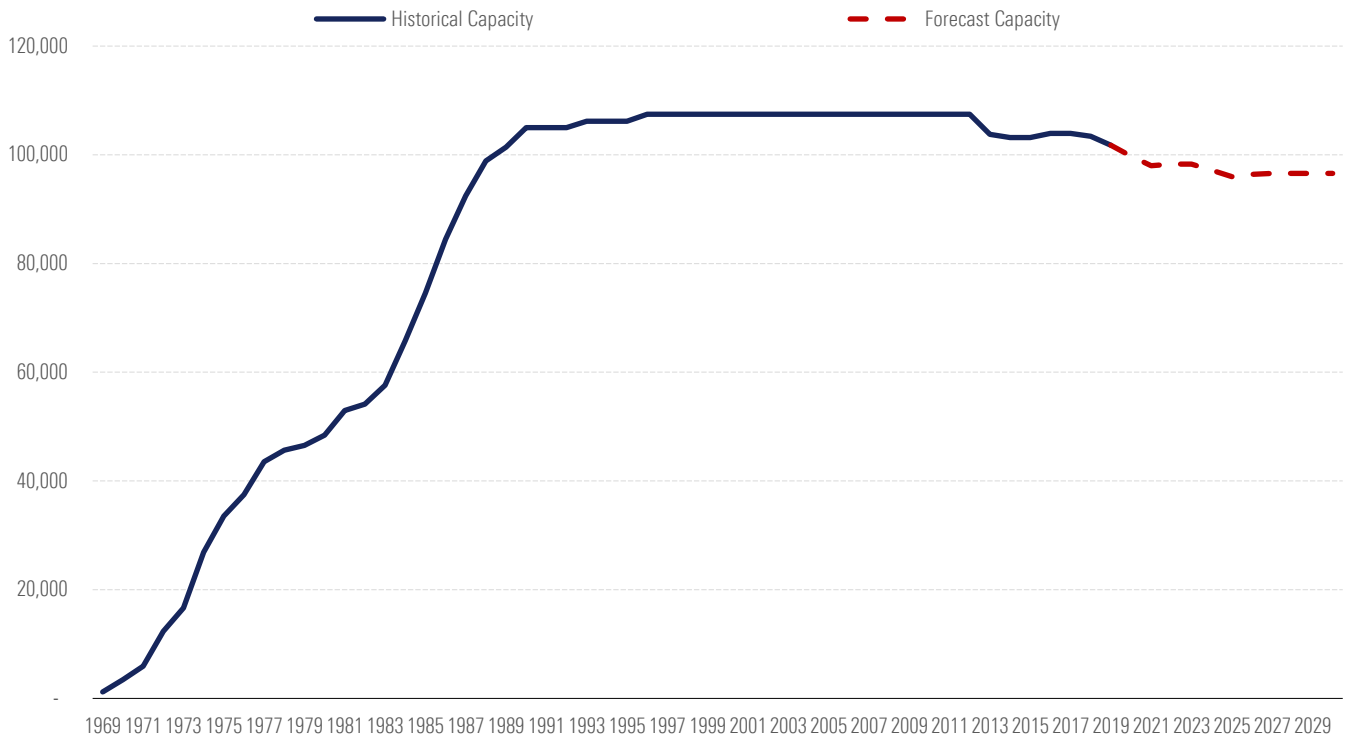
Announced retirements will account for another 9,875 MW of nameplate capacity lost over the next decade. The majority comes from Diablo Canyon in California (2,323 MW) and Indian Point in New York (2,311 MW), with the rest from Pennsylvania, Iowa, and Michigan. Subsidies and the relatively young age of the current fleet mean the rest of the operating nuclear plants in the country will likely survive another decade with few further retirements.

One region that could increase retirements is MISO. Almost all 13,290 MW of nuclear capacity in MISO is likely unprofitable or only marginally so at best, given its small single-unit nature. These plants largely sit in Minnesota, Wisconsin, and Michigan. The likelihood of these retirements may depend on whether these states decide to follow others and protect their nuclear fleets. Many of these plants are operated by regulated utilities, which can be slow to swap out one generation type for another over a short period. While some additional plant retirements are possible, we see only a few more announcements with retirement dates before 2030.

However, there are still new nuclear generators on the horizon. Generating units 3 and 4 at Vogtle in Georgia are still slated to come on line in 2021 and 2022. Beyond these two, additional nuclear projects with capacities exceeding 1,100 MW per unit are unlikely to be built anytime soon. The recent failure of the V.C. Summer project has damped the appetite for large-scale nuclear projects in the U.S.

Exhibit 2 shows the current state and potential capacity to 2030. With nearly 10,000 MW of capacity out and at least 2,000 MW coming in, the likely outlook is at least another two or three retirements within 3,000 MW. Using our current generation levels, we would end up with generation output moving from around 800 terawatt-hours or 20% to around 725 terawatt-hours or 15%.

Exhibit 2 Annual Total Nuclear Capacity (GW)



Source: EIA, Morningstar

Small Modular Reactors

While new large-scale nuclear plants have a negligible chance of getting any interest or approval, small modular reactors, or SMRs, are still finding interest and potential growth. Smaller size and capital requirements as well as easier siting make this technology a more attractive option in clean energy. Several designs are available, but the first U.S. SMR design to hit the licensing phase is NuScale Power. Utah Associated Municipal Power Systems is looking to finish an initial project by 2027 using NuScale Power, which hopes to complete federal design approvals next year. The initial project scope is 12 modules in 50 MW capacity blocks. SMRs could be an additional tool for balancing authorities to achieve the last portions of reliability needed to complement renewables. The potential for a 600 MW addition taking under a decade from permitting to operation could still give nuclear energy a path to the future.

Nuclear Outlook

Nuclear has been in a slight decline, with aging plants and little new interest for decades. With only two recent projects, one of which was a massive failure, achieved over the last decade, the general outlook for nuclear is neutral to gradually declining in the short term. A combination of age, state subsidies, and which plants are showing profitability should limit future retirements and safeguard most of the existing fleet for some time. Improvements in technology and the potential for SMRs to provide reliability at a lower cost may be the nuclear industry's comeback story over the next decade.

About Morningstar® Commodities Research™

Morningstar Commodities Research provides independent, fundamental research differentiated by a consistent focus on the competitive dynamics in worldwide commodities markets. This joint effort between Morningstar's Research and Commodities & Energy groups leverages the expertise of Morningstar's 23 energy, utilities, basic materials, and commodities analysts as well as Morningstar's extensive data platform. Morningstar Commodities Research initially will focus on North American power and natural gas markets with plans to expand coverage of other markets worldwide.

Morningstar, Inc. is a leading provider of independent investment research in North America, Europe, Australia, and Asia. The company offers an extensive line of products and services for individuals, financial advisors, and institutions. Morningstar's Commodities & Energy group provides superior quality market data and analytical products for energy data management systems, financial and agricultural data management, historical analysis, trading, risk management, and forecasting.

For More Information

+1 800 546-9646 North America
+44 20 3194 1455 Europe
commoditydata-sales@morningstar.com

MORNINGSTAR®

22 West Washington Street
Chicago, IL 60602 USA