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Rundown: All nuclear plants extended, revived, or planned as energy demand soars

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Nuclear power has seen a revival throughout 2024, thanks in large part to soaring energy demand from the tech sector. At least two retired plants are set to come back online, one nuclear facility has been saved from closing, and around half a dozen deals have been made for new generation.

Criticized over waste, risk of accidents, and its environmental impact, nuclear energy generation has tended to decline in past decades. However, more recently, support for nuclear energy has risen in tandem with fears about the reliability and stability of the nuclear grid, as artificial intelligence data centers, electrification, and manufacturing developments have caused energy demand to soar. While the Biden administration has sought to accelerate the phase-out of coal and fossil fuels, renewable energy sources, such as solar and wind, have yet to take over as dominant power sources.

The Energy Information Administration estimated that nuclear facilities in the United States have a capacity factor of 93%, meaning nuclear plants operate at full capacity 93% of the time. Solar and wind have capacity factors of 23% and 33%, respectively, while coal has a capacity factor of 42% and a combined cycle for natural gas is at 58.8%.

Craig Piercy, CEO of the American Nuclear Society, told the *Washington Examiner* that much of the nuclear boost is being driven by rising energy demand caused by the reshoring of domestic manufacturing, electric vehicle infrastructure, AI, and data centers.

“It’s no longer a question of if there’s going to be new nuclear, right?” Piercy said. “The question is how much and how fast.”

For those in the industry, it comes as no surprise that major technology companies, such as Amazon, Google, and Microsoft, would then boost nuclear efforts.

“They needed this power all along, and I can see them running out,” Mark Nelson, managing director of Radiant Energy, told the *Washington Examiner*. “I guess I could say these initial steps are really satisfying to see because it’s showing what we — what energy experts knew to be true the entire time: constant load requires constant power.”

Restoring old facilities

At the end of September, Microsoft announced its plan to enter an agreement with Constellation Energy to purchase nuclear power from the Three Mile Island facility in Pennsylvania, the site of the worst nuclear accident in U.S. history.

Constellation Energy said it plans to sell the nuclear plant's energy to Microsoft in a 20-year agreement. The tech giant said it will then use the power to achieve its goal of matching the energy that its data centers consume with carbon-free energy.

The Three Mile Island nuclear power generating station shown, March 28, 2011, in Middletown, Pennsylvania. (AP Photo/Bradley C Bower, File)

The companies hope to see the plant come back online in 2028, extending operations until at least 2054. Its reopening is subject to approval by the Nuclear Regulatory Commission. As of Friday, the NRC told the *Washington Examiner* it had not received anything formal from Constellation Energy regarding the plans to restart the plant.

Previously, the commission said it may take around two years for Three Mile Island to receive approval to reopen. However, this is subject to change, as the U.S. has never seen a nuclear plant restart after being retired.

"It's without a doubt true that the NRC is feeling an enormous amount of pressure to go as fast as possible and be as flexible as possible," Nelson said. "And I'm excited, I'm excited to see how fast it can go. One of the big tests is how fast the NRC goes with technology it already understands."

Luckily, the energy industry won't have to wait until 2026 to see results from the NRC. In early 2025, the commission is expected to release its final decision on the reopening of the Palisades Nuclear Plant on Lake Michigan. The 800-megawatt

facility run by Holtec is anticipated to come back online by the end of next year, providing power for up to 800,000 homes.

In a major sign of support for nuclear power, the Biden administration has indicated interest in restarting additional closed plants. White House climate adviser Ali Zaidi told *Reuters* earlier this month that the administration was "working on it in a very concrete way," adding that he could think of at least two possible options.

While Zaidi did not offer any more details, executives with NextEra Energy have said in recent months that they are considering restarting the Duane Arnold nuclear facility, the only nuclear power plant in Iowa, which closed in 2020. CEO John Ketchum told *Bloomberg* in June that he would consider bringing the plant back online, which would supply 600 megawatts of power to the grid, if it could be executed "safely and on budget."

Extending plant life

Giving retired nuclear power plants a second life isn't the only way the power source is being backed.

In California, the Diablo Canyon Power Plant received approval in December 2023 to extend its operations until at least 2030. The plant is considered to be the largest source of clean energy in the state, providing around 17% of California's carbon-free electricity and nearly 9% of the state's total electricity supply.

Previously, the nuclear plant's reactors had been scheduled to shutter in 2024 and 2025. Environmentalist groups have pushed for the closure, claiming its location puts it at risk of earthquakes, which could then, in turn, cause a meltdown. Meanwhile, executives at the plant have said keeping the facility running will offer lower costs for Californians, saving an average of $200 million per year.

One of Pacific Gas & Electric's Diablo Canyon Power Plant's nuclear reactors in Avila Beach, California, is viewed Nov. 3, 2008. On June 13, 2024, former state and federal officials joined environmentalists to spotlight soaring cost estimates for keeping the plant running beyond 2025. (AP Photo/Michael A. Mariant)

New nuclear

Nuclear innovation doesn't stop at existing and past plants. As former regulators and electricity power transmission operators have sounded the alarm over the increased strain on the grid, technology companies have sought to secure future energy for their AI systems, turning to small modular reactors.

Compared to larger nuclear facilities, SMRs are known to have a smaller physical footprint, which allows the reactors to be built closer to local grids. SMRs also historically take less time to build, allowing the facilities to come online and supply energy sooner. At the moment, there are no SMRs operational in the U.S., and only three are operational in the world.

However, that could change as soon as the early 2030s.

On Oct. 14, Google announced a deal with Kairos Power to purchase nuclear energy produced by several SMRs, with the first coming online at the start of the new decade. Additional reactors are expected to come online by 2035, supplying around 500 megawatts of power in total. One megawatt is considered to be roughly the same amount of energy consumed by 400 to 900 homes in one year.

Just days later, Amazon said it was investing in three projects in Virginia and Washington state to support its operations, data centers, and local grids with nuclear energy provided by SMRs. In Washington, four SMRs are expected to be built and supply energy by the early 2030s. Their total capacity will be around 960 megawatts. Over in Virginia, which is the data center hub of the country, an SMR is set to be constructed with a capacity of 300 megawatts.

"These announcements from the last week are evidence that they see nuclear as an absolute essential element to their clean energy and net-zero commitments in the future," Piercy said. "In the next five years, we're going to be licensing these and beginning to build them and rebuild our supply chain so that in the early 2030s, I expect that you'll see a major scale-up, commercial scale-up, of technology."

This isn't Amazon's first investment in nuclear power. The company announced it would be co-locating a data center with Talen Energy's Susquehanna nuclear plant in Pennsylvania, which is expected to provide up to 960 megawatts of power.

Similarly, Oracle founder Larry Ellison said during a September earnings call that the software company already had building permits for three SMRs. The founder said these reactors will be used to power a massive data center that will require more than a gigawatt of power.

As SMRs traditionally generate upward of 300 megawatts of power, some in the industry have questioned if the reactors can actually be classified as SMRs. Oracle has yet to release where the data center and reactors plan to be built.

In June, Bill Gates and his energy company, TerraPower, broke ground at a

Wyoming site for a next-gen nuclear power plant that is expected to use sodium instead of water for cooling. The 345-megawatt reactor is being built next to PacifiCorp's Naughton Power Plant and is phasing out coal and natural gas by 2036, according to the *Associated Press*.

Outside of the tech industry, materials science company Dow announced in early 2023 that it planned to deploy several SMRs to power one of its Texas facilities. Dow said it would be partnering with X-energy to develop and build the reactor by the end of the decade. Construction is expected to begin in 2026.

Additionally, in September, nuclear startup Oklo received approval from the Department of Energy to investigate sites for a planned nuclear microreactor at the Idaho National Laboratory. Oklo, which is backed by OpenAI CEO Sam Altman, hopes to break ground in 2026, bringing the reactor online by 2027. The company plans to sell the power generated by the reactor directly to consumers, according to CNBC.

Moving forward

These recent announcements are evidence of a widespread embrace of nuclear power, which Piercy said is a positive tipping point for the industry.

"We're starting to see order books fill up. We're starting to see companies investing," he said. "I think 2024 was the year that nuclear got real, [that] new nuclear got real."

However, Piercy indicated it is important to recognize that the effects of increased nuclear power won't be seen immediately. He likened it to a deep dish pizza, saying that between the investments, bipartisan support in Washington, and government funding, the "ingredients" are there.

"But the thing about a deep dish pizza is that it has to sit in the oven for 45 minutes, but when it comes out, it's delicious," Piercy said, adding that the U.S. will likely have to "muddle along" for the next couple of years with existing power sources "because there aren't any better options."

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Nelson agreed, telling the *Washington Examiner* that the deals and agreements fall "way short" of what is needed. As a result, he warned that some states may have to defer the phase-out of fossil fuels and coal.

"These plants are going to get a second lease on life. Whatever financial entities are willing to bear the reputational cost of dealing with extending fossil fuels, they're going to do very well here. And then the nuclear is going to lock in clean power in the future," he said. "We're going to have this dirty best, followed by either nuclear or nothing."