

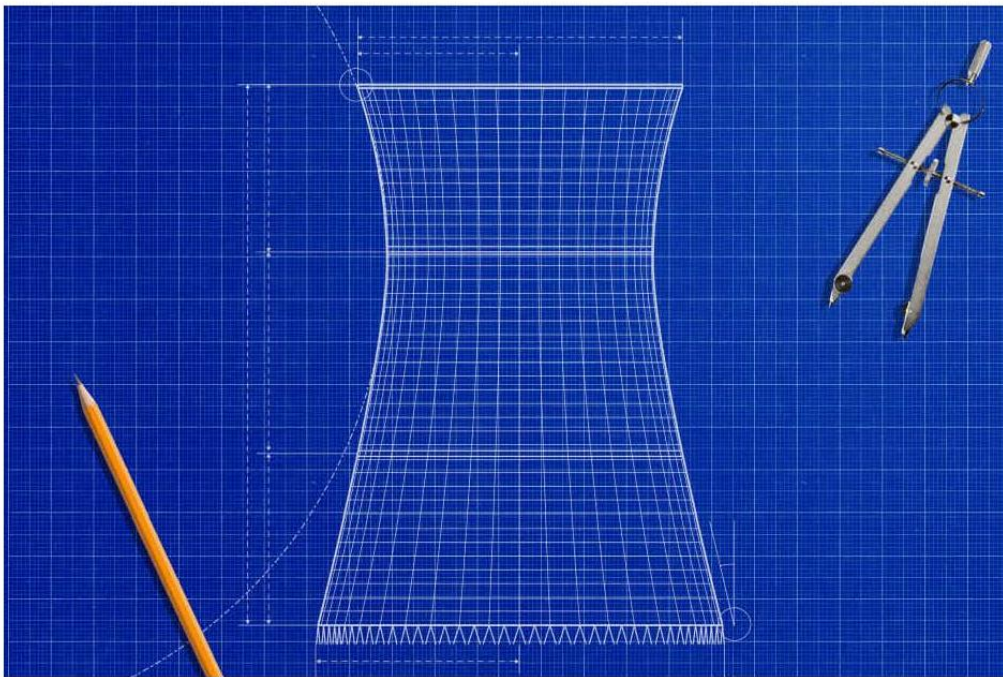
Sujet traité : L'IA et les voitures électriques dévorent l'électricité aux États-Unis. Comment l'énergie nucléaire pourrait à nouveau augmenter / AI and EVs are Devouring America's Electricity. How Nuclear Energy Could Rise Again

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## AI and EVs are Devouring America's Electricity. How Nuclear Energy Could Rise Again.

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September 6, 2024



(Illustration by Carl Godfrey)

### Get Ready for the New Nuclear Age. It Could Help Solve America's Electricity Problems.

#### Artificial intelligence and electric vehicles are devouring enormous amounts of electricity. Constellation Energy and Vistra could benefit.

Just south of Harrisburg, Pa., on a narrow island in the Susquehanna River, something extraordinary is taking place. The Three Mile Island nuclear plant, scene of a historic radioactive meltdown in 1979, is quietly getting prepped for a second chance. Within three or four years, the plant's one undamaged reactor may start up again, heralding a new era in American energy.

Just south of Harrisburg, Pa., on a narrow island in the Susquehanna River, something extraordinary is taking place. The Three Mile Island nuclear plant, scene of a historic radioactive meltdown in 1979, is quietly getting prepped for a second chance. Within three or four years, the plant's one undamaged reactor may start up again, heralding a new era in American energy.

"It would be incredibly symbolic," says Joe Dominguez, CEO of Baltimore-based Constellation Energy, which owns the Three Mile Island reactor. The 1979 accident taught the industry "hard lessons" about how to make nuclear power safer. Now, Dominguez says, it can "also be the birthplace for this renewed interest in nuclear power."

The stars are aligning for a nuclear power revival in the U.S. The government is funneling billions of dollars into the industry, tech luminaries like Bill Gates and OpenAI's Sam Altman are backing new companies, and public support for nuclear power is firmly on the rise.

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One sign of the industry's rebound is Constellation's stock price. The nation's largest owner of nuclear power plants was begging state regulators for bailouts just a few years ago; now it's thriving, and its stock is up 70% in the past year. There's reason to believe that shares of Constellation and peers like Texas-based power producer Vistra will keep rising as government support increases and utilities boost payments to nuclear plant owners. Other publicly traded nuclear players, such as Canadian mining and nuclear-tech company Cameco, could also benefit as demand for uranium rises.

The rebound has come just as the nuclear age looked to be in its twilight. America's 94 nuclear reactors generate 18.6% of U.S. electricity, enough to power 72 million homes. They're the largest single source of carbon-free energy in the country. But nuclear's share of total electricity generation has been ebbing for years, after peaking above 20% in the 1990s. A dozen U.S. reactors shut down from 2012 to 2021.

The tide is turning. Six reactors slated to close from 2021 to 2025 have been saved through state and federal action. And three reactors that were closed and decommissioned may be restarted, which has never happened before. Gates' nuclear company, TerraPower, is preparing the site of a retired coal plant in Wyoming for a new reactor with more than \$2 billion in government financing, and two Altman-backed companies are testing nuclear technologies. The Biden administration has announced a goal to triple the nation's nuclear capacity by 2050.

The biggest reason for nuclear power's resurgence is that U.S. electricity demand is growing after more than a decade of flat power consumption. In some areas, demand is exploding. Electric vehicles, data centers powering artificial intelligence, and new factories fueling a "Made in the U.S.A." industrial boom all need enormous amounts of electricity. Utilities are scrambling to secure reliable power, and they're willing to pay up for it. The electric grid operator covering the mid-Atlantic and Midwest agreed in July to boost capacity payments to power plant owners ninefold, a multibillion-dollar windfall.

In past centuries, that new power might have come from coal. But America's climate goals favor sources that don't emit carbon dioxide, and that points to nuclear, solar, and wind. Among those, nuclear stands out as a clean source that can run whether the sun shines or the wind blows.

"We need hundreds of Hoover Dams' worth of firm power if we're going to make this energy transition, and we're not in dam-building mode anymore," says Katy Huff, a University of Illinois professor who was the highest-ranking nuclear power official at the Department of Energy until she left in May.

Huff's time in government was remarkably fruitful for nuclear energy policy, with plant closures stemmed and older facilities upgraded to improve performance.

Still, there's a large caveat to this story of a nuclear renaissance. Even as the Biden administration and state governments have saved plants from closing, and urged owners of defunct sites to start them up again, the country's larger targets look daunting. Tripling nuclear capacity would necessitate building about 200 large-scale reactors. Yet not a single new one is under construction today. Even if a project were to be announced before the end of the year, it would probably take a decade to plan and build.

The most important players in the industry—utilities with the heft and expertise to build reactors—aren't ready to commit to big projects, despite increasingly generous federal and state subsidies. The DOE acknowledged in one report that the industry is "stuck in a stalemate" that may not break without more taxpayer backing or innovative funding models.

The U.S., which has more reactors than any other nation, is on the verge of falling behind. Around the world, 64 reactors are being constructed. China is building about 30 of them and has lately been approving new reactors at a rate of 10 or more a year. France, Russia, and South Korea have ambitious government-supported plans of their own.

## Taking a Cue From Eisenhower

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For most of the history of nuclear power, the U.S. led the development and deployment of the technology. The commercial nuclear reactor industry grew from the Department of Defense's World War II era atomic weapons program, and its basic components haven't changed dramatically. Inside nuclear reactors, uranium-filled tubes power a process called

fission, where neutrons collide with uranium atoms, releasing energy and spurring more reactions. U.S. reactors use water to help control temperatures. And heat produced by reactors turns water into steam, which spins turbines and generates electricity.

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President Dwight Eisenhower dedicated the first nuclear plant in Shippingport, Pa., in 1958 with a speech celebrating America's ability to "put the atom to work for the good of mankind, not his destruction." By the 1960s, the U.S. was building dozens of plants capable of keeping lights on at millions of homes.

The rollout wasn't always smooth. Nuclear energy has long been controversial because it's inextricably connected to nuclear weapons in the public imagination. Safety processes have improved but have not fully quashed fears of radioactive leaks. Some of those fears were realized in 1979 when one Three Mile Island reactor partially melted down. The incident forced evacuations and raised health concerns, though the Nuclear Regulatory Commission said the accident's "small radioactive releases had no detectable health effects on plant workers or the public." The Chernobyl and Fukushima accidents in 1986 and 2011, respectively, were more devastating, and slowed the rollout of new plants.

There have been other problems, too. The government hasn't figured out where to store nuclear waste generated by the plants. Americans don't want it in their neighborhoods or trucked through them, and much of it sits encased in concrete near to the reactors. Concerns about radiation and radioactive waste were among the reasons the rollout of new reactors slowed in the late 1970s. The total number of reactors peaked at 112 in 1990 and has declined since.

In recent years, economic pressure has been the biggest factor forcing nuclear plants to close. Natural gas grew into the largest source of electricity-generation in the country. Cheap gas and growing renewable power drove down wholesale electricity prices, making it difficult for nuclear plants to compete at auctions where utilities buy electricity. The Three Mile Island reactor not involved in the meltdown closed in 2019 for financial reasons. At the time, it was losing over \$100 million a year, Dominguez says.

The biggest shift since then has been the change in government support for nuclear power. The Inflation Reduction Act included nuclear tax credits that rival support for wind and solar. Those credits essentially create a floor for power prices paid to nuclear plants, which is well above operating costs. The DOE has also directly funded reactors that were on the brink of extinction. Diablo Canyon, California's last nuclear plant and the source of 9% of the state's electricity, was slated to close its two reactors this year and next, but \$1.1 billion worth of federal funding will help keep it open for several more years.

Government leaders may be following public opinion. Pew Research Center found that 57% of Americans supported adding more nuclear plants in 2023, up from 43% in 2020. Support is higher among Republicans, but Democrats are increasingly warming to the industry.

“You’re seeing a generational shift—from people who grew up when nuclear energy was conflated with nuclear weapons programs, to younger people who don’t have that kind of history,” says John Wagner, director of the Idaho National Laboratory, a government-run facility that was the birthplace of nuclear-powered electricity 75 years ago. It’s now hosting experiments for new nuclear-power technologies.

The new generation has its own existential fear—climate change—and it increasingly sees nuclear power as a solution. While solar and wind power production is growing, it’s intermittent, and **most lithium batteries operate for just four hours at a time**—not enough to get Americans through the night.

Politicians around the world are embracing nuclear power. At the COP28 climate conference in Dubai last December, **more than 20 countries, including the U.S., agreed to try to triple nuclear capacity by 2050**. The signatories included Japan, which had suspended all of its nuclear plants after Fukushima.

## Sizing Up the Winners

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“It has been a fascinating time, probably the best supply/demand fundamentals I’ve seen in 40 years in this business,” says  **Cameco CEO Tim Gitzel. Cameco is now reopening uranium mines it shut after the Fukushima disaster.** The company’s stock has risen with uranium prices. **Analysts see earnings roughly doubling next year. That scorching growth rate isn’t fully reflected in shares, which trade at 29 times their estimates.**

The other big winners in the nuclear revival are owners of existing reactors; they’re poised to benefit from rising power prices. Constellation and **Vistra** are in particularly good shape because they operate as independent power producers whose profits aren’t regulated like traditional utilities. Their reactors are becoming more profitable, and their stocks trade at multiples below the market average.

They also may have the potential to increase their nuclear capacity without going into debt to build new reactors. Constellation’s Dominguez thinks his company can add 1.5 to two gigawatts worth of capacity—about as much as the Hoover Dam—by modernizing existing plants and restarting mothballed ones.

The first test case of whether an old reactor can be restarted is unfolding in Michigan. Holtec International, a company that normally makes money from decommissioning nuclear plants, is now planning to reopen a shuttered reactor at a site known as Palisades, on the banks of Lake Michigan.

Patrick O'Brien, Holtec's director of government affairs and communications, says the company had not expected to reopen the reactor when it took over the site from utility **Entergy** in 2022. But Michigan Gov. Gretchen Whitmer's office insisted they consider it, and the state was willing to put up part of the money to make it happen. Michigan has committed to decarbonizing its electricity grid by 2040. Officials there realized that leaving out Palisades, which can serve 800,000 customers, would be a major setback. Achieving the state's climate goals "would be really hard without bringing this facility back on-line," says Kara Cook, the state's chief climate and energy strategist.



(Illustration by Carl Godfrey)

The state has pledged \$300 million to support Palisades, and the federal government has conditionally approved a \$1.5 billion loan guarantee. Depending on the speed of permitting, Palisades could come back on-line by October 2025. The company is also applying to build two small reactors, potentially generating enough power for about 500,000 additional people.

Not everyone is cheering. The Sierra Club argues that reopening Palisades means that more dangerous nuclear waste will be stored along the Lake Michigan shore. The environmental organization also says the state is wasting money that could be spent on better options, including a speedier rollout of solar and wind.

Three Mile Island could be the next decommissioned site to reopen. A recent engineering assessment yielded good news. "The equipment was in just as good a shape as when we prematurely shut it down in 2019," Dominguez says.

If the company moves ahead, the restart could take 36 to 48 months, he adds. [NextEra](#) CEO John Ketchum told investors recently that his company is “looking at” reopening a decommissioned Iowa reactor.

Upgrading and restarting existing plants might add 5% or so to nuclear capacity over the coming decade. To meet the government’s goal of tripling capacity, America would have to embark on an effort several times as big as the Manhattan Project and sustain it for decades. It would cost hundreds of billions of dollars and require training as many as 375,000 workers.

Recent history doesn’t bode well for that. In the past 28 years, the U.S. has built just three nuclear reactors. Two of them—located near Augusta, Ga.—started operating in 2023 and 2024, respectively. At their opening, DOE Secretary Jennifer Granholm declared hopefully, “Two down, 198 to go!”

## Lessons From Georgia

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The next 198 won’t come easily. The Georgia reactors, known as Vogtle 3 and 4, offer a cautionary tale. Originally expected to open in 2016 and 2017, they faced extensive delays and cost overruns that were estimated to be as high as \$20 billion. [Westinghouse](#), which designed the reactors, filed for bankruptcy protection midway through the project. Sometimes, reactor parts that had been shipped to the site wouldn’t fit together correctly, says Joe Klecha, who oversaw part of the construction process for owner [Southern Co.](#)

Klecha says the basic problem is that building the first version of a new industrial facility is always difficult, and tends to be plagued by delays and cost overruns. Cost savings start to kick in after enough nuclear reactors have been built that the construction teams have ironed out the problems. He now works for a start-up called The Nuclear Company that’s looking to seed development of several large standardized reactors.

Much of the cost overruns in Georgia will have to be paid by ratepayers, who already have been facing rising electricity prices. That leaves Georgia regulators with a dilemma. New data centers and factories are causing electricity demand to spike beyond their previous projections, but they’re wary of approving new plants without protections for customers. “We have the experience to build more [large nuclear] units, and we need the capacity,” wrote Tim Echols, vice-chair of the Georgia Public Service Commission, in an email to *Barron’s*. “But we cannot do it like we did before—we need assurances.”

The question now is who will provide that assurance. In countries with the most aggressive nuclear programs, such as China, the government has bankrolled programs that pay for teams of workers to travel from site to site, building identical reactors quickly and efficiently. They can now build reactors in seven years or less at a fraction of the cost as in the U.S.

The U.S. has done things differently, offering grants and loan guarantees to private companies. The DOE's Loan Programs Office is reviewing \$65 billion worth of loan applications for various kinds of nuclear power projects.

The funding already has sparked a flurry of innovation and competition. Some companies are working on new designs for reactors that use novel methods to produce and store nuclear power, and can be built rapidly in modular segments. The new companies include TerraPower, founded by Gates in 2008, and Oklo, a public company chaired by OpenAI's Altman. The companies say they can operate more efficiently and safely than most existing players, but they are years away from producing reactors. Neither has received approval for their designs from the Nuclear Regulatory Commission.

The U.S. may have erred by lending money to several competing companies rather than directly funding a massive buildout of cookie-cutter reactors, some argue.

"I think their heart was in the right place," says Seth Grae, chairman of the American Nuclear Society's International Council and CEO of nuclear tech company Lightbridge. "But in terms of cold reality, the other countries made a better decision. The U.S. can catch up and can do well, but we're kind of in a rush, because we needed the energy yesterday."

The DOE didn't respond to Grae's criticisms. Huff says the department recognizes that direct funding is a "much more reliable strategy" to build nuclear quickly, but the approach is limited by congressional appropriations.

Nonetheless, Huff and other officials see a way forward for nuclear that may involve some unusual players. Big tech companies have gotten particularly interested in nuclear power for data centers and other applications. Nuclear reactors can support huge power needs, including the most demanding AI applications, without adding to carbon emissions. All of the big tech firms have goals to emit less carbon but are finding that challenging as they invest in power-hungry AI. To control their emissions, the tech giants have found they can no longer be passive electricity consumers.

Microsoft has been hiring nuclear experts, and seems willing to experiment. The company agreed to buy nuclear energy as soon as 2028 from an Altman-backed start-up called Helion that's working on nuclear fusion—a technology most experts think is many years from commercialization. And earlier this year, Amazon.com agreed to a deal with power producer Talen Energy to connect its data centers directly to an existing Pennsylvania nuclear plant, bypassing the grid. That agreement won't add to the country's nuclear fleet—in fact, critics argue that it will reduce power available to other customers—but it shows that nuclear is on the radar.

A nuclear energy resurgence in America is in progress, but won't come easy, Barron's Senior Writer Avi Salzman explains.



Other agreements could lead to new reactors being built. Alphabet, Microsoft, Amazon, and steel maker Nucor are partnering with North Carolina–based utility Duke Energy to explore new financing mechanisms “designed specifically to lower the long-term costs” of nuclear power and other clean sources. That could include committing to “tariffs” that would provide some of the money for the new plants. Duke hasn’t yet announced new plants, but the utility may need nuclear to cover its escalating power needs. Duke added more customers than ever last year, and its expectations for new electricity demand by 2030 are eight times as high as they were just two years ago. “New nuclear undoubtedly will play a role in Duke Energy’s clean energy future,” says Kelvin Henderson, Duke’s chief nuclear officer, in a statement to *Barron’s*.

The tech companies declined interviews about their strategies. Some nuclear experts are skeptical they’ll foot enough of the bill to jump-start nuclear construction without more government help. Nonetheless, economic and environmental imperatives have come together to put nuclear energy back in the spotlight. The next couple of years will determine whether the technology is once again ready to shine.

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