

Nukes Part 9, Scorecard

By John Benson

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1. Introduction

Readers will note that the title of this paper starts with “Part 9”, which means I have written at least eight of these before. Actually, more: to see the full list (as of now) go through the link below to my papers’ directory.

<https://energycentral.com/c/ec/papers-directory-fourth-quarter-2024-update>

Click on the “Access Publication” Button on the summary page, go to the index at the beginning of the Directory, and scroll down to the index-category-title “Nukes.” This is probably on page 14 or 15 of the directory. Once you reach this, you can either click on the category title “Nukes” and go to the beginning of this category (newest posts are at the top of each category), or click on any post/paper titles in the index and go directly to the summary and link for that post/paper.

Note that I update the above-linked directory at the beginning of every quarter (last update was at the beginning of April). You can access the latest update by going through the link below shortly after the beginning of the quarter. Note that you will need to be an Energy Central Member (it’s free), and sign in to access the chronological-directory linked below. You can also access all of my posts & directory-updates through this directory (in addition to the papers’ directory) and this chronological-directory is (for now) 60 pages long.

https://energycentral.com/member/profile/200777/activity#keywords%3D%26entity_bundles%3D-all%26sort_type%3Ddate_newest%26page%3D1

2. Existing Nukes, Built 1980 through 2024

The reason I picked this period is that this chronicles the demise of the U.S. Nuclear Industry. Also, per at least one source¹ no new nuclear power reactors are currently being planned nor constructed in the US.

For the record, per the criteria stated below, the following is this chronology:

Number of plants with newest reactor beginning operation in the 1980s	24
Number of plants with newest reactor beginning operation in the 1990s	3
Number of plants with newest reactor beginning operation in the 2000s	0
Number of plants with newest reactor beginning operation in the 2010s	1
Number of plants with newest reactor beginning operation in the 2020s	1

¹ <https://world-nuclear.org/information-library/current-and-future-generation/plans-for-new-reactors-worldwide>

The list below is in chronological order with the latest commissioned reactor in each plant (oldest such reactor) first (No. 29). If any reader is interested in operational reactors built before 1980. There is an excellent Wikipedia Site that is referenced here.² Note that I believe the megawatt ratings below are net megawatts (not gross) unless otherwise noted. Start of commercial operations is when builders hand over a reactor to the plant owner or operator, declaring the reactor to be officially in commercial operation.

29. **Joseph M. Farley Nuclear Plant, AL**

- > Start of commercial operations, newest active reactor: July 1, 1981
- > Electricity production capacity: 5,642 megawatts
- > Location: Columbia, AL
- > Operator: Southern Nuclear Operation Company

28. **Sequoyah Nuclear Plant, TN**

- > Start of commercial operations, newest active reactor: June 1, 1982
- > Electricity production capacity: 2,278 megawatts
- > Location: Soddy-Daisy, TN (16 mi. NE of Chattanooga, TN)
- > Operator: Tennessee Valley Authority

27. **Virgil C. Summer Nuclear Station, SC**

- > Start of commercial operations, newest active reactor: Jan. 1, 1984
- > Electricity production capacity: 971 megawatts
- > Location: Jenkinsville, SC (26 mi. NW of Columbia, SC)
- > Operator: Dominion Energy South Carolina, Inc.

26. **McGuire Nuclear Station, NC**

- > Start of commercial operations, newest active reactor: March 1, 1984
- > Electricity production capacity: 2,316 megawatts
- > Location: Huntersville, NC (17 mi. N of Charlotte, NC)
- > Operator: Duke Energy Carolinas, LLC

25. **LaSalle County Station, IL**

- > Start of commercial operations, newest active reactor: Oct. 19, 1984
- > Electricity production capacity: 2,265 megawatts
- > Location: Marseilles, IL (11 mi. SE of Ottawa, IL)
- > Operator: Exelon Generation Co., LLC

24. **Columbia Generating Station, WA**

- > Start of commercial operations, newest active reactor: Dec. 13, 1984
- > Electricity production capacity: 1,163 megawatts
- > Location: Richland, WA (20 mi. NNE of Pasco, WA)
- > Operator: Energy Northwest

² https://en.wikipedia.org/wiki/Nuclear_power_in_the_United_States

23. Callaway Plant, MO

- > Start of commercial operations, newest active reactor: Dec. 19, 1984
- > Electricity production capacity: 1,190 megawatts
- > Location: Fulton, MO (25 mi. ENE of Jefferson City, MO)
- > Operator: Union Electric Co.

22. Susquehanna Steam Electric Station, PA

- > Start of commercial operations, newest active reactor: Feb. 12, 1985
- > Electricity production capacity: 2,494 megawatts
- > Location: Salem Township, PA (70 mi. NE of Harrisburg, PA)
- > Operator: Susquehanna Nuclear, LLC

21. Grand Gulf Nuclear Station, MS

- > Start of commercial operations, newest active reactor: July 1, 1985
- > Electricity production capacity: 1,401 megawatts
- > Location: Port Gibson, MS (20 mi. S of Vicksburg, MS)
- > Operator: Entergy Operations, Inc.

20. Wolf Creek Generating Station, KS

- > Start of commercial operations, newest active reactor: Sept. 3, 1985
- > Electricity production capacity: 1,225 megawatts
- > Location: Burlington, KS (28 mi. SE of Emporia, KS)
- > Operator: Wolf Creek Nuclear Operating Corp.

19. Waterford Steam Electric Station, LA

- > Start of commercial operations, newest active reactor: Sept. 24, 1985
- > Electricity production capacity: 1,165 megawatts
- > Location: Killona, LA (25 mi. W of New Orleans, LA)
- > Operator: Entergy Operations, Inc.

18. Diablo Canyon Nuclear Power Plant, CA

- > Start of commercial operations, newest active reactor: March 13, 1986
- > Electricity production capacity: 2,240 megawatts
- > Location: Avila Beach, CA (12 mi. WSW of San Luis Obispo, CA)
- > Operator: Pacific Gas & Electric Co.

17. Millstone Nuclear Power Plant, CT

- > Start of commercial operations, newest active reactor: Apr 23, 1986
- > Electricity production capacity: 2,079 megawatts
- > Location: Waterford, CT
- > Operator: Northeast Utilities

16. River Bend Station, LA

- > Start of commercial operations, newest active reactor: June 16, 1986
- > Electricity production capacity: 968 megawatts
- > Location: St. Francisville, LA (24 mi. NNW of Baton Rouge, LA)
- > Operator: Entergy Operations, Inc.

15. **Catawba Nuclear Station, SC**

- > Start of commercial operations, newest active reactor: Aug. 19, 1986
- > Electricity production capacity: 2,310 megawatts
- > Location: York, SC (18 mi. S of Charlotte, NC)
- > Operator: Duke Energy Carolinas, LLC

14. **Hope Creek Generating Station, NJ**

- > Start of commercial operations, newest active reactor: Dec. 20, 1986
- > Electricity production capacity: 1,172 megawatts
- > Location: Hancocks Bridge, NJ (18 mi. SE of Wilmington, DE)
- > Operator: PSEG Nuclear, LLC

13. **Shearon Harris Nuclear Power Plant, NC**

- > Start of commercial operations, newest active reactor: May 2, 1987
- > Electricity production capacity: 964 megawatts
- > Location: New Hill, NC (20 mi. SW of Raleigh, NC)
- > Operator: Duke Energy Progress, LLC

12. **Byron Station, IL**

- > Start of commercial operations, newest active reactor: Aug. 2, 1987
- > Electricity production capacity: 2,300 megawatts
- > Location: Byron, IL (17 mi. SW of Rockford, IL)
- > Operator: Exelon Generation Co., LLC

11. **Perry Nuclear Power Plant, OH**

- > Start of commercial operations, newest active reactor: Nov. 18, 1987
- > Electricity production capacity: 1,240 megawatts
- > Location: Perry, OH (35 mi. NE of Cleveland, OH)
- > Operator: Energy Harbor Nuclear Generation LLC and Energy Harbor Nuclear Corp.

10. **Clinton Power Station, IL**

- > Start of commercial operations, newest active reactor: Nov. 24, 1987
- > Electricity production capacity: 1,065 megawatts
- > Location: Clinton, IL (23 mi. SSE of Bloomington, IL)
- > Operator: Exelon Generation Co., LLC

9. **Palo Verde Nuclear Generating Station, AZ**

- > Start of commercial operations, newest active reactor: Jan. 8, 1988
- > Electricity production capacity: 3,937 megawatts
- > Location: Wintersburg, AZ (50 mi. W of Phoenix, AZ)
- > Operator: Arizona Public Service Company

8. **Fermi, MI**

- > Start of commercial operations, newest active reactor: Jan. 23, 1988
- > Electricity production capacity: 1,141 megawatts
- > Location: Newport, MI (25 mi. NE of Toledo, OH)
- > Operator: DTE Electric Company

7. **Braidwood Station, IL**

- > Start of commercial operations, newest active reactor: Oct. 17, 1988
- > Electricity production capacity: 2,337 megawatts
- > Location: Braceville, IL (20 mi. SSW of Joliet, IL)
- > Operator: Exelon Generation Co., LLC

6. **South Texas Project, TX**

- > Start of commercial operations, newest active reactor: June 19, 1989
- > Electricity production capacity: 2,560 megawatts
- > Location: Bay City, TX (90 mi. SW of Houston, TX)
- > Operator: STP Nuclear Operating Co.

5. **Limerick Generating Station, PA**

- > Start of commercial operations, newest active reactor: Jan. 8, 1990
- > Electricity production capacity: 2,242 megawatts
- > Location: Limerick, PA (21 mi. NW of Philadelphia, PA)
- > Operator: Exelon Generation Co., LLC

4. **Seabrook Station, NH**

- > Start of commercial operations, newest active reactor: Aug. 19, 1990
- > Electricity production capacity: 1,250 megawatts
- > Location: Seabrook, NH (13 mi. S of Portsmouth, NH)
- > Operator: NextEra Energy Seabrook, LLC

3. **Comanche Peak Nuclear Power Plant, TX**

- > Start of commercial operations, newest active reactor: Aug. 3, 1993
- > Electricity production capacity: 2,400 megawatts
- > Location: Glen Rose, TX (40 mi. SW of Fort Worth, TX)

2. **Watts Bar Nuclear Plant, TN**

- > Start of commercial operations, newest active reactor: Oct. 19, 2016
- > Electricity production capacity: 2,245 megawatts
- > Location: Spring City, TN (60 mi. SW of Knoxville, TN)
- > Operator: Tennessee Valley Authority

1. **Vogtle Electric Generating Plant, GA**

- > Start of commercial operations, newest active reactor: March, 2024
- > Electricity production capacity: 4,536 megawatts
- > Location: Waynesboro, GA (26 mi. SE of Augusta, GA)
- > Operator: Southern Nuclear Operating Co.

2.1. Newest Reactor

Georgia Power announced this week (May 1, 2024) that the 1,114-megawatt (MW) Unit 4 nuclear power reactor at Plant Vogtle near Waynesboro, Georgia, entered into commercial operation after connecting to the power grid in March 2024. The commercial start of Unit 4 completes the 11-year expansion project at Plant Vogtle. No nuclear reactors are under construction now in the United States.³

Vogtle Unit 3 began commercial operation in July 2023. The plant's first two reactors, with a combined 2,430 MW of nameplate capacity, began operations in 1987 and 1989. The two new reactors bring Plant Vogtle's total generating capacity to nearly 5 gigawatts (GW, gross), surpassing the 4,210-MW Palo Verde plant in Arizona and making Vogtle's four units the largest nuclear power plant in the United States.

Construction at the two new reactor sites began in 2009. Originally expected to cost \$14 billion and begin commercial operation in 2016 (Vogtle 3) and in 2017 (Vogtle 4), the project ran into significant construction delays and cost overruns. Georgia Power now estimates the total cost of the project to be more than \$30 billion.

The commercial operating date is when builders hand over a reactor to the plant owner or operator, declaring the reactor to be officially in commercial operation.

With a total installed capacity of about 97 GW, the largest commercial nuclear generating fleet of any country is located in the United States. The fleet of operating nuclear power reactors accounted for nearly 19% of domestic electricity production in 2023, making nuclear the second-largest source of U.S. electricity generation after natural gas, which accounted for 43% of electricity generation in the United States last year.

Electricity generation from nuclear reactors doesn't produce CO₂ emissions and can provide baseload power that would otherwise largely come from coal- and natural gas-fired plants. Although a number of nuclear reactors have retired in recent years, interest in nuclear power as an energy resource to help reduce the carbon footprint of the U.S. electric power sector has increased recently.

Both Vogtle Units 3 and 4 use a newer reactor design, the Westinghouse AP1000. This reactor has a smaller footprint and simpler design than previous generation reactor technologies. It also features passive safety systems that are intended to shut down the reactor without any operator action or external power source.

Vogtle Units 3 and 4 are the first and only U.S. deployments of the AP1000 Generation III+ reactor. Two other Westinghouse AP1000 reactors were planned for a nuclear power plant in South Carolina, but sponsor-utilities halted construction in 2017...

3. TMI and Another Restart

If you didn't recognize the section title-acronym, then you probably (1) are not in the nuclear industry and/or (2) you probably don't live anywhere close to Pennsylvania.

³ Slade Johnson, U.S. Energy Information Administration (EIA), "Plant Vogtle Unit 4 begins commercial operation," May 1, 2024, <https://www.eia.gov/todayinenergy/detail.php?id=61963>

3.1. The Story & Benefit

It might have seemed like one of the weirder headlines of 2024: Microsoft is paying \$1.6 billion to restart Three Mile Island (TMI). That's the nuclear power plant in Pennsylvania whose reactor #2 had a partial meltdown in 1979. There were no injuries, and nobody died, but it set the nuclear industry back years. Only two new plants have been started since that accident.⁴



Three Mile Island Nuclear Power Plant: Microsoft is paying \$1.6 billion to restart Three Mile Island.

Author's comment: Also being restarted is Palisades Nuclear Plant in Michigan.⁵

"This is hallowed ground in the nuclear industry," said Joe Dominguez, the CEO of Constellation Energy, which owns about half of America's 54 nuclear plants (including Three Mile Island). "This is a place where we learned and got better."

He says that, as a result of the 1979 accident, there have been thousands of changes in protocols and procedures regarding nuclear power. "The thing that people forget is that there was another reactor at the site," he said. "That site, that reactor, continued to operate until 2019, when it was closed for economic reasons. Cheap natural gas, low demand, subsidization of different technologies in the business, [and] no policy supporting nuclear caused plants to start retiring."

So, what is Microsoft's interest?

All of the Big Tech companies have ambitious goals to fight the climate crisis. That includes Google, Apple and Microsoft, which have each pledged to reach net zero carbon emissions. They were making progress, too; each has invested billions in wind and solar energy.

⁴ David Pogue, CBS News via MSN. "Big Tech's big bet on nuclear power to fuel artificial intelligence," March 9, 2025, <https://www.msn.com/en-us/money/companies/big-techs-big-bet-on-nuclear-power-to-fuel-artificial-intelligence/ar-AA1AyqPW?ocid=BingNewsBrowse>

⁵ <https://thebulletin.org/2024/10/what-it-will-take-to-restart-decommissioned-us-nuclear-plants-a-primer/>

And then, then artificial intelligence came along. AI data centers require huge amounts of electricity. Big Tech realized that they wouldn't make their emissions goals without taking power into their own hands.

Dominguez said, "Microsoft is going to enjoy the benefit of the reliable, clean energy for 20 years."

He says reopening the existing Three Mile Island facility would be quicker and less expensive than constructing a brand-new nuclear plant. "At least 10 times cheaper than building a new plant," he said. "And we think we could get it going in about three years, versus the last plant that was built, [which] took almost 10 years."

3.2. Google & Amazon

But if you're a tech company, what do you do if you don't have a recently-retired nuclear plant handy? You develop new ones. Only weeks after Microsoft's announcement, both Amazon and Google announced major investments in nuclear power.

Google is supplementing its already enormous green energy investments with a new kind of nuclear, called small modular reactors. "These are not the nuclear power plants of yesterday, with the very large cooling towers," said Michael Terrell, who heads Google's decarbonization efforts. "These are much smaller facilities. But because they're modular, you can stack them together to make bigger power plants.

He anticipates the first advanced nuclear reactor will be online by 2030. "And we're not going to do just one reactor, but we hope to buy from what will be a series of reactors that follow that," Terrell said.

Nuclear power still isn't perfect; it still produces waste that has to be safely stored. But unlike solar and wind, nuclear power is always on, which is essential to those AI data centers.

Author's comment: *Don't let the perfect be the enemy of the good. –Voltaire*
"Nuclear waste" is a problem solved, using any one (or all) of several methods.

So, Google is funding a company called Kairos Power to design and build this new generation of reactors. Kairos is building three small demonstration plants in Oak Ridge, Tennessee, on the very spot where uranium was processed for the first atomic bomb.

CEO Mike Laufer says that his reactors don't use fuel rods; they use fuel pebbles, about the size of golf balls – mostly graphite, with tiny kernels of uranium. And each pebble has as much power capacity as four tons of coal.

Author's comment: Look at the post summarized and linked below for more information on Kairos Power.

Nuclear Power Partnerships: I have covered several emerging nuclear power technologies in the past. Since the nuclear industry has a long history (the first fission reactors were built during WWII, in the early 1940s), there have been many flavors of advanced reactors. In this post we will look at Kairos Power, who is developing a "Pebble Bed" Reactor using an advanced "Flibe" coolant/heat transfer fluid. This ends up being an ideal design for future Artificial Intelligence (AI) server farms. Thus, Kairos Power, a US-based nuclear engineering company, recently inked a long-term deal with Google to develop and bring the company's first SMR online "quickly and safely by 2030," with continuing rollouts planned through 2035.

<https://energycentral.com/c/gn/nuclear-power-partnerships>

And how much carbon dioxide emissions, compared to coal? "Zero," Laufer said.

The Kairos reactors also run at lower power and lower pressure than traditional reactors, which means lower risk.

Well, this all sounds great! But what's the catch?

"There's only one problem with small modular reactors: They don't really exist," said George Washington University professor Sharon Squassoni, who spent 15 years researching nuclear safety for the government. She thinks Big Tech companies might be in over their heads. "I think they're going to find out pretty quickly that it takes way too long and it's way too expensive," she said. "I think we're going to see just how strong their commitments are to clean energy futures."

"So, you're saying they may have to turn to burning stuff [for power]?" I asked.

"I'm pretty sure they will," Squassoni replied.

"Do you think there's a little bit of tech-bro overconfidence therein?"

"Oh, completely, completely!" she laughed.

Kairos' Mike Laufer admitted, "Yes, it's really hard. I will totally agree with anyone. But we're doing it at smaller scale to start, and then building on that in the future."

Joe Dominguez's team is getting Three Mile Island ready for Microsoft, including renaming the plant the Crane Clean Energy Center. And if AI is igniting a renaissance in American nuclear, he says: full steam ahead.

I asked, "Why do all new plants take so much longer and cost so much more than projected?"

"Honest answer? We don't build enough of them," Dominguez said. "You don't want to build a unique design; you want to do kind of a cookie-cutter, one-after-another design."

See the start of section 2 of this paper.

"Is it well understood in government and the industry that if you start doing the same design over and over, we can get there faster and cheaper?"

"It's probably the best understood idea," Dominguez said. "It's understood by both Republicans and Democrats, which is a hard thing to say about anything! Everybody understands that if you build a common design, you build a bunch of them."

"So, you think we'll get there?"

"I do."

Google's Michael Terrell agrees, and believes his company will make its zero-carbon goal by 2030. "It is an incredibly ambitious goal: 24/7 carbon-free energy everywhere we operate every way around the world," he said. "But it's something we're working very hard to achieve, and we hope to get there."

Final author's comment: The text immediately above does describe a market shift from really huge plants (look at the size of each plant listed in section 2) to serve a number of regional utilities, to smaller plants, each of which will serve one or two large facilities owned by a single very-large technology company in a given area or region. Since each module is much smaller than "utility-scale," each module can be sited in or near a particular facility. I believe this is very healthy for the nuclear-power industry.

The following bullets list potential solutions for climate change driven by greenhouse gas produced by burning hydrocarbons:

- Renewables, especially when combined with modern rechargeable batteries for intermittent renewables (Wind and PV)
- Nuclear reactors
- Converting existing natural gas (a.k.a. methane) fueled generators to burn green-hydrogen. This is hydrogen produced through electrolysis powered with near-zero-carbon electricity.
- Large hydro-electric generation

We just need to deploy the above technologies at scale. However, that does not include any government control of this process. The good news about our capitalistic economy is that it decides on the best approach for any solution based on functional and economic considerations only.

The ability of any energy technology to contribute to the world's energy needs depends on the existence of laws, policies, and financial environments that are fair and that facilitate the goals that must be met for the world to have an adequate, safe, affordable, low-carbon energy supply. Laws that mandate or exclude particular solutions tend to subvert the ability of the marketplace to operate freely and are not conducive to achieving the optimal outcome. Further, intrinsic to the approach of further developing all technologies is the possibility that some will ultimately surpass others. Therefore, the future contribution of all of the above bulleted solutions depends not only on advances in nuclear power technology, but also on whether some of the problems of other technology options can be solved.⁶

⁶ Gail H. Markus, Nuclear First: Milestones on the Road to Nuclear Power Development, © 2010 American Nuclear Society, <https://www.amazon.com/Nuclear-Firsts-Milestones-Power-Development/dp/0894485768>
The above excerpt was edited by the author for context.