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Democracy Dies in Darkness

POWER GRAB

AI is exhausting the power grid. Tech firms are seeking a miracle solution.

As power needs of AI push emissions up and put big tech in a bind, companies put their faith in elusive — some say improbable — technologies.

By Evan Halper and Caroline O'Donovan
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Microsoft hopes to generate power from atomic fusion and is partnering with Helion, which is testing prototypes at its headquarters in Everett, Wash. (Chona Kasinger for The Washington Post)

The mighty Columbia River has helped power the American West with hydroelectricity since the days of FDR's New Deal. But the artificial intelligence revolution will demand more. Much more.

So near the river's banks in Central Washington, Microsoft is betting on an effort to generate power from atomic fusion — the collision of atoms that powers the sun — a breakthrough that has eluded scientists for the past century. Physicists predict it will elude Microsoft, too.

The tech giant and its partners say they expect to harness fusion by 2028, an audacious claim that bolsters their promises to transition to green energy but distracts from current reality. In fact, the voracious electricity consumption of artificial intelligence is driving an expansion of fossil fuel use — including delaying the retirement of some coal-fired plants.

In the face of this dilemma, Big Tech is going all in on experimental clean-energy projects that have long odds of success anytime soon. In addition to fusion, they are hoping to generate power through such futuristic schemes as small nuclear reactors hooked to individual computing centers and machinery that taps geothermal energy by boring 10,000 feet into the Earth's crust.

Tech companies had promised "clean energy would be this magical, infinite resource," said Tamara Kneese, a project director at the nonprofit Data & Society, which tracks the effect of AI and accuses the tech industry of using "fuzzy math" in its climate claims.

"Coal plants are being reinvigorated because of the AI boom," Kneese said. "This should be alarming to anyone who cares about the environment."

Power Grab

The artificial intelligence industry is driving a nationwide data center building boom. These sprawling warehouses of computing infrastructure are creating explosive demand for power, water and other resources. Power Grab investigates the impacts on America and the risks AI infrastructure creates for the environment and the energy transition.

As the tech giants compete in a global AI arms race, a frenzy of data center construction is sweeping the country. Some computing campuses require as much energy as a modest-sized city, turning tech firms that promised to lead the way into a clean energy future into some of the world's most insatiable guzzlers of power. Their projected energy needs are so huge, some worry whether there will be enough electricity to meet them from any source.

Data centers, the nondescript warehouses packed with racks of servers that power the modern internet, have been around for decades. But the amount of electricity they need now is soaring because of AI. Training artificial intelligence models and using AI to execute even simple tasks involves ever more complicated, faster and voluminous computations that are straining the electricity system.

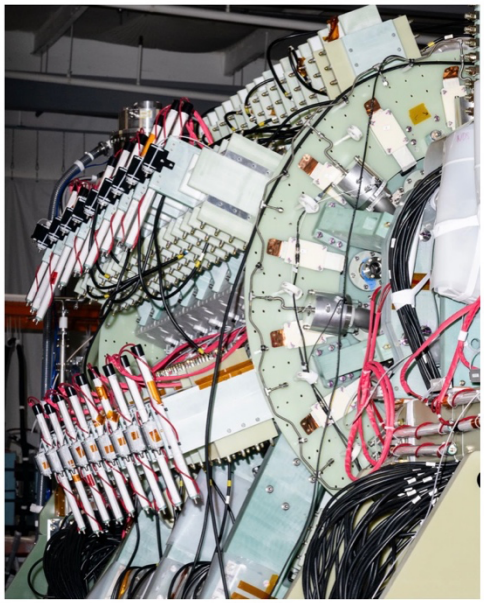
A ChatGPT-powered search, according to the International Energy Agency, consumes almost 10 times the amount of electricity as a search on Google. One large data center complex in Iowa owned by Meta burns the annual equivalent amount of power as 7 million laptops running eight hours every day, based on data shared publicly by the company.

The data-center-driven resurgence in fossil fuel power contrasts starkly with the sustainability commitments of tech giants Microsoft, Google, Amazon and Meta, all of which say they will erase their emissions entirely as soon as 2030. The companies are the most prominent players in a constellation of more than 2,700 data centers nationwide, many of them run by more obscure firms that rent out computing power to the tech giants.

“They are starting to think like cement and chemical plants. The ones who have approached us are agnostic as to where the power is coming from,” said Ganesh Sakshi, chief financial officer of Mountain V Oil & Gas, which provides natural gas to industrial customers in Eastern states.

Tech companies are confronting this dilemma with bravado. Artificial intelligence thinkers like OpenAI CEO Sam Altman, a major backer of Microsoft’s fusion start-up partner Helion, and Microsoft co-founder Bill Gates, who invests big in other fusion efforts, say breakthroughs in energy are achievable.

Scientists have been chasing the fusion dream for decades but have yet to overcome the extraordinary technical challenges. (Chona Kasinger for The Washington Post))



Helion hopes to capture the energy created by fusing atoms — in the start-up’s case, in a magnetized vacuum chamber — and then channeling that energy into a usable form. (Chona Kasinger for The Washington Post)

The companies also argue advancing AI now could prove more beneficial to the environment than curbing electricity consumption. They say AI is already being harnessed to make the power grid smarter, speed up innovation of new nuclear technologies and track emissions.

Microsoft was the only one of the four major firms driving the AI boom to answer detailed questions from The Washington Post about their energy needs and plans. Google, Amazon and Meta offered limited statements.

“If we work together, we can unlock AI’s game-changing abilities to help create the net zero, climate resilient and nature positive works that we so urgently need,” Microsoft said in a statement.

The tech giants say they buy enough wind, solar or geothermal power every time a big data center comes online to cancel out its emissions. But critics see a shell game with these contracts: The companies are operating off the same power grid as everyone else, while claiming for themselves much of the finite amount of green energy. Utilities are then backfilling those purchases with fossil fuel expansions, regulatory filings show.
Amazon says it has been “the world’s largest corporate purchaser of renewable energy for four straight years.” Google wrote that it is using AI “to accelerate climate action,” which is “just as crucial as solving for the environmental impact associated with it.”
As for Microsoft, the company said that “by 2030, we will have 100% of our electricity consumption, 100% of the time, matched by zero carbon energy purchases.”
Left unmentioned are the heavily polluting fossil fuel plants that become necessary to stabilize the power grid overall because of these purchases, making sure everyone has enough electricity.

In the Salt Lake City region, utility executives and lawmakers scaled back plans for big investments in clean energy and doubled down on coal. The retirement of a large coal plant has been pushed back a decade, to 2042, and the closure of another has been delayed to 2036.

Rig operators in November connect drills to access heat reservoirs near Milford, Utah, as part of a Fervo Energy project that expects to be fully operational in 2028. Google recently powered up a futuristic geothermal Fervo power plant in Nevada. (Ellen Schmidt/AP)

Among the region’s mega energy users is Meta. It’s building a $1.5 billion data center campus outside Salt Lake City that consumes as much power as can be generated by a large nuclear reactor. Google has purchased 300 acres across the street from Meta’s data center and plans its own data center campus. Other data center developers are frantically searching for power in the area.

The region was supposed to be a “breakthrough” technology launchpad, with utility PacifiCorp declaring it would aim to replace coal infrastructure with next-generation small nuclear plants built by a company that Gates chairs. But that plan was put on the shelf when PacifiCorp announced in April that it will prolong coal burning, citing regulatory developments that make it viable.

“This is very quickly becoming an issue of, don’t get left behind locking down the power you need, and you can figure out the climate issues later,” said Aaron Zubaty, CEO of California-based Eolian, a major developer of clean energy projects. “Ability to find power right now will determine the winners and losers in the AI arms race. It has left us with a map bleeding with places where the retirement of fossil plants are being delayed.”

A spike in tech-related energy needs in Georgia moved regulators in April to green-light an expansion of fossil fuel use, including purchasing power from Mississippi that will delay closure of a half-century-old coal plant there. In the suburbs of Milwaukee, Microsoft’s announcement in March that it is building a $3.3 billion data center campus followed the local utility pushing back by one year the retirement of coal units, and unveiling plans for a vast expansion of gas power that regional energy executives say is necessary to stabilize the grid amid soaring data center demand and other growth.

In Omaha, where Google and Meta recently set up sprawling data center operations, a coal plant that was supposed to go offline in 2022 will now be operational through at least 2026. The local utility has scrapped plans to install large batteries to store solar power.

These concrete developments in energy markets contrast with tech companies’ futuristic promises. A recent Goldman Sachs analysis of energy that will power the AI boom into 2030 did not even considersmall nuclear plants or futuristic fusion generators.

It found data centers will account for 8 percent of total electricity use in the United States by 2030, a near tripling of their share today. New solar and wind energy will meet about 40 percent of that new power demand from data centers, the forecast said, while the rest will come from a vast expansion in the burning of natural gas. The new emissions created would be comparable to that of putting 15.7 million additional gas-powered cars on the road.

“We all want to be cleaner,” Brian Bird, president of NorthWestern Energy, a utility serving Montana, South Dakota and Nebraska, told a recent gathering of data center executives in Washington, D.C. “But you guys aren’t going to wait 10 years … My only

choice today, other than keeping coal plants open longer than all of us want, is natural gas. And so you're going see a lot of natural gas build out in this country."

The big name tech firms try to inoculate themselves from blame for contributing to global warming with accounting techniques. They claim that all the new clean energy they buy has the effect of wiping out emissions that otherwise could be attributed to their operations.

Critics charge the arrangements often fall short.

"If data centers are claiming to be clean, but utilities are using their presence to justify adding more gas capacity, people should be skeptical of those claims," said Wilson Ricks, an energy systems researcher at Princeton University's Zero Lab, which focuses on decarbonization.

One example is an agreement announced in March, after Amazon signed a contract to buy more than a third of the electricity generated by one of the nation's largest nuclear facilities, the Susquehanna power plant in Luzerne County, Pa.

The Susquehanna Steam Electric Station, one of the nation's largest nuclear facilities, in Luzerne County, Pa., on June 13, 2007. (Kristen Mullen/ Citizens' Voice/AP)

"That deal disturbed a lot of people," Zubaty said. "When massive data centers show up and start claiming the output of a nuclear plant, you basically have to replace that electricity with something else."

Tech companies acknowledge big new sources of clean power need to be found. At the World Economic Forum conference in Davos, Switzerland in January, Altman said at a

Bloomberg event that, when it comes to finding enough energy to fuel expected AI growth, “there is no way to get there without a breakthrough.”

It remains unclear where, or when, those breakthroughs will arrive. Google recently powered up a futuristic geothermal power plant in the northern Nevada desert that harnesses heat from deep underground.

The developer of the geothermal plant, Fervo Energy, credits Google with jump-starting a promising energy solution that some day might provide the electricity equivalent of multiple nuclear plants. But Fervo CEO Tim Lattimer acknowledges that kind of output is not likely until well into the 2030s.

Fervo’s Nevada plant produces about the amount of power it takes to keep the lights on at a few thousand homes. The next Fervo plant, in Utah, is expected to be fully operational in 2028 and will generate roughly the amount of energy it takes to run one large data center.

Altman, meanwhile, is spending hundreds of millions of dollars to develop small nuclear plants that could be built right on or near data center campuses. Altman’s AltC Acquisition Corp. bankrolled a company Altman now chairs called Oklo, which says it wants to build the first such plant by 2027.

Gates is the founder of his own nuclear company, called TerraPower. It has targeted a former coal mine in Wyoming to be the demonstration site of an advanced reactor that proponents claim would deliver energy more efficiently and with less waste than traditional reactors. The project has been saddled with setbacks, most recently because the type of enriched uranium needed to fuel its reactor is not available in the United States.

Bill Gates's energy company is starting construction next to the Naughton Power Plant in Kemmerer, Wyo., for a next-generation nuclear power plant. (Natalie Behring/AP)

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Some experts point to these developments in arguing the electricity needs of the tech companies will speed up the energy transition away from fossil fuels rather than undermine it.

“Companies like this that make aggressive climate commitments have historically accelerated deployment of clean electricity,” said Melissa Lott, a professor at the Climate School at Columbia University.

Microsoft hopes to supercharge that deployment through its partnership with fusion start-up Helion. The site being considered for the generator in Chelan County, Wash., is just a plot of sagebrush so far. It’s not certain the unit will be built.

For now, Helion is building and testing prototypes at its headquarters in Everett, Wash. Scientists have been chasing the fusion dream for decades but have yet to overcome the extraordinary technical challenges. It requires capturing the energy created by fusing atoms in a magnetic chamber — or in Helion’s case, a magnetized vacuum chamber — and then channeling that energy into a usable form. And to make it commercially viable, more energy must be produced than is put in.
Helion’s assembly facility features floor-to-ceiling shelves stacked with endless boxes of capacitors, aluminum-coated devices that store energy, some of which Helion employees spend hours a day assembling by hand. The floors and walls are stark white. Massive, sea-foam green fusion generator components dot the factory floor.

A sense of optimism infuses the experimental work. “I know it can make electricity,” said Helion CEO David Kirtley. “The question is, can we take that electricity out of fusion and do it such that the cost of electricity is lower than everything else.”

On a video screen in the space where Helion is building its control room is a live feed from a camera in a neighboring warehouse where the seventh Helion prototype, Polaris, will be tested. It is surrounded by borated concrete walls that block neutrons from escaping.

Helion, among several fusion start-ups, uses helium-3, a molecule that is rare on Earth but abundant on the moon. Kirtley says the company’s process actually generates more of the molecule as a byproduct, creating fuel to make yet more fusion electricity.

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But there is deep skepticism in the scientific community that Helion or other fusion start-ups will be sending juice to the power grid within a decade, much less the kind of too-cheap-to-meter, safe electricity the tech companies are chasing.

"Predictions of commercial fusion by 2030 or 2035 are hype at this point," said John Holdren, a Harvard physicist who was White House science adviser during the Obama era. "We haven't even yet seen a true energy break-even where the fusion reaction is generating more energy than had to be supplied to facilitate it."

Promises that commercial fusion is around the corner, he said, "feeds the public's belief in technological miracles that will save us from the difficult task of dealing with climate change … with the options that are closer to practical reality."

But Chelan County, known for its apple orchards and abundant hydro power, has another problem. While there is enough hydropower generated there to send electricity throughout the West Coast, most of it has already been claimed decades into the future. In their quest to sustain the data center boom fueled by Microsoft and its competitors, county planners are hopeful Helion will actually beat the odds and start sending electricity to the region's power grid, which Microsoft would then purchase.

Helion has raised expectations with assurances that its contract with Microsoft is binding, and it will have to pay serious financial penalties to the tech giant if it does not quickly create fusion electricity. But pressed for the particulars of the contract, Kirtley responds with a measure of opacity that is typical among tech leaders chasing historic clean-energy breakthroughs.

"We're past the details I can talk publicly about," he said.

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