

The Sleeping Giant: Can Geothermal Power the AI Revolution?

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The conversation surrounding renewable energy has long been dominated by towering wind turbines or rows of solar panels parked on the roofs of homes. Yet, beneath us lies a vast, untapped reservoir of thermal energy that remains largely invisible to the public eye. As the global economy enters a period of unprecedented expansion, driven by the ever-increasing energy-intensive demands of artificial intelligence, geothermal energy is emerging from its niche status.

Traditionally, to take advantage of geothermal resources, systems had to be located near a naturally occurring hot spot like a volcano, geyser, or hot spring. Recent breakthroughs in Enhanced Geothermal Systems (EGS) are shifting the narrative. Geothermal power is no

longer just a volcanic curiosity; it is increasingly viewed as a critical infrastructure solution for the 2020s, offering the enticing combination of 24/7 reliability and a near-zero carbon footprint.

What is Geothermal Energy?

Geothermal energy leverages the Earth's natural internal heat—a reliable power source that humanity has utilized for thousands of years. Archaeological evidence suggests that approximately 10,000 years ago, indigenous peoples utilized hot springs for cooking, bathing, and ritualistic purposes in North America. Romans famously engineered geothermal water for space heating in Pompeii and established grand public baths, such as

Aquae Sulis in England, where today the same naturally heated waters flow through the historic site¹.

How Does Geothermal Energy Work?

The primary difference between "traditional" and "enhanced" geothermal systems lies in whether the underground conditions are naturally occurring or human-made. Traditional systems rely on naturally occurring "sweet spots" that possess three specific elements: heat, fluid, and permeability (natural pathways in the rock that allow fluid to circulate and absorb heat). EGS is described as "human-made" geothermal, designed to harvest heat from areas lacking fluid or permeability by carefully injecting fluid underground to create or reopen existing pathways for the heat to travel. Rather than relying on rare naturally occurring conditions, we are now able to generate geothermal energy from anywhere.

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The Industrial Shift: Power Generation

Geothermal's shift toward power generation began in Larderello, Italy, where steam was first used industrially in 1827. The sector reached a pivotal milestone in 1904 with the first successful geothermal power test, and by 1960, achieved commercial maturity in the U.S. with the commissioning of the largest geothermal power complex in the world, The Geysers, located in the Mayacamas Mountains, approximately 70 miles north of San Francisco, California.

Marking the beginning of utility-scale geothermal integration, The Geysers produced 11 megawatts of electricity in 1960². Today it is capable of producing 725 megawatts, enough electricity to power hundreds of thousands of homes, all while emitting no greenhouse gases.

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The Pros and Cons of Geothermal Energy

The case for geothermal energy, particularly for sustainable investors, boils down to three main advantages: reliability, environmental footprint, and longevity.

- **Reliability:** Unlike intermittent wind and solar energy, geothermal has a capacity factor of approximately 90%³ and provides baseload power that runs regardless of weather or time of day.
- **Environmental Footprint:** It has the smallest land-use footprint per gigawatt-hour (GWh) of any major renewable energy source and emits roughly 99% less CO₂ than fossil fuel plants⁴.
- **Longevity:** Although geothermal plants do typically require higher upfront investments, its long plant lifespan of 30–50 years and low operational expenses ensure competitive lifecycle costs⁵.

The primary limitation of geothermal energy is the previously mentioned high upfront costs. With investment for geothermal projects front loaded by exploration and drilling costs, accounting for 40–60% of total costs, recent projects such as the Hellisheiði Power Station in Iceland (2006), came with a price tag of \$450 million for a 303 MW facility, translating to roughly \$1.5 million per MW⁶. While this figure is on par with wind energy (\$1.2–1.7 million per MW⁷), and significantly cheaper than coal-fired plants (\$3.2 million per MW⁸), it remains more expensive than solar (\$0.8–1.3 million per MW⁹) and modern natural gas facilities (\$0.97 million per MW¹⁰).

The Global Landscape: Who Brings the Heat?

By the end of 2025, global geothermal power capacity exceeded 17,000 MW, with generation active in 35 countries. The top 10 global producers in 2025 are as follows:

| Country | Capacity (MW) |
|---------------|---------------|
| United States | ~3,953 MW |
| Indonesia | ~2,742 MW |
| Philippines | ~2,034 MW |
| Türkiye | ~1,797 MW |
| New Zealand | ~1,259 MW |
| Kenya | ~980 MW |
| Mexico | ~976 MW |
| Italy | ~916 MW |
| Iceland | ~808 MW |
| Japan | ~607 MW |

The National Renewable Energy Laboratory, a national laboratory for the U.S. Department of Energy Office of Energy Efficiency & Renewable Energy, projects the potential for at least 90,000 MW of geothermal electricity-generating capacity by 2050¹¹, including in states east of the Mississippi where no geothermal power generation currently exists. That's the equivalent of powering more than 65 million American homes.

The New Frontier: Hyperscalers and AI Data Centers

While climate policy is a major driver for geothermal energy, it isn't the only one. The recent explosion of AI-driven data centers is creating massive new energy needs, with U.S. data center consumption projected to hit 12% of total electricity demand by 2028¹².

In response to this skyrocketing demand, electric utilities nationwide have postponed the already-announced retirements of 15 coal-fired power plants, which, in total, emitted almost 65 million metric tons of greenhouse gases in 2023¹³.

AI models require massive, 24/7 "firm" power. Alternates like solar and wind struggle to meet this constant load at scale without significant overbuilding. Geothermal provides a grid-firming solution that aligns with the carbon-neutral goals of tech giants; a few of which have already started to take note. Google partnered with Fervo Energy in Nevada to power its data centers via enhanced geothermal systems (EGS) and in late 2025 transitioned from a customer to an equity investor, joining a \$462 million funding round¹⁴ enabling Fervo to accelerate geothermal developments. Following suit, Meta announced a deal with XGS energy to provide carbon-free power to support the tech company's New Mexico data center operations¹⁵.

Conclusion

In a political landscape defined by the aggressive rollback of renewable incentives, geothermal energy has emerged as a rare "bipartisan unicorn." While the One Big Beautiful Bill accelerated the phase-out of wind and solar credits, it preserves tax credits for geothermal projects through 2036.

Once considered a niche resource limited to the edges of tectonic plates, geothermal energy is being reimaged as a globally scalable, undeniable pillar of the clean energy transition. While high upfront costs and technical risks remain, the alignment between geothermal developers and tech hyperscalers suggests that this "sleeping giant" is finally waking up. Its unique combination of reliability, small physical footprint, and 24/7 availability positions it as a critical asset for both the climate and the digital economy.

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¹ [How the people of Aquae Sulis kept warm](#)

² [History of The Geysers - The Geysers](#)

³ [Geothermal FAQs | Department of Energy](#)

⁴ [Geothermal Energy Factsheet | Center for Sustainable Systems](#)

⁵ [Geothermal energy: A sustainable and cost-effective alternative for clean energy production and climate change mitigation - ScienceDirect2025](#)

⁶ <https://www.sciencedirect.com/science/article/pii/S2666188825008081#sec0014>

⁷ <https://www.sciencedirect.com/science/article/pii/S2666188825008081#sec0014>

⁸ <https://www.fossilconsulting.com/blog/operations/power-industry-economics/>

⁹ <https://www.sciencedirect.com/science/article/pii/S2666188825008081#sec0014>

¹⁰ <https://www.fossilconsulting.com/blog/operations/power-industry-economics/>

¹¹ [Geothermal Energy | Department of Energy](#)

¹² <https://www.energy.gov/articles/doe-releases-new-report-evaluating-increase-electricity-demand-data-centers>

¹³ <https://www.eesi.org/articles/view/data-center-buildout-is-hungry-for-fossil-fuels>

¹⁴ [Fervo Energy Raises \\$462 Million Series E to Accelerate Geothermal Development and Meet Surging Energy Demand with Clean, Firm Power - Fervo Energy](#)

¹⁵ [Meta signs geothermal power deal for New Mexico data centers | ESG Dive](#)