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Texas researchers push for geothermal's rise from obscurity

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* Texas has optimal geology for geothermal access

* Geothermal ideal for ERCOT grid reform

Geothermal energy has the potential to play an enormous role in Texas' decarbonization push but has been perplexingly ignored in energy transition strategies worldwide.

A group of Texas researchers believes, however, that, with the help of the state's oil and gas industry, geothermal energy could scale quickly enough to be a major climate solution within a decade, according to a Jan. 24 report.

Geothermal energy resources, which draw from subsurface heat several miles beneath the Earth's surface to generate electricity, are projected to generate just 1% of the global fuel mix by 2050. But researchers show that it has the potential to provide 77% of future global electricity demand by 2050 and 146% of global 2050 heat demand.

"Geothermal doesn't show up in the radar of models or in reports," said co-author Jamie Beard, founder of the geothermal accelerator nonprofit Project InnerSpace in Houston. "Did they talk about it at the World Economic Forum? No. But should they have? Absolutely."

Beard added, "I cannot for the life of me understand why geothermal is not on the tip of everyone's tongue right now, and that is something that we are certainly trying to solve with this report."

According to co-author Ken Wisian, associate director of the **Bureau of Economic Geology** at the University of Texas, about 44 TW of energy is continuously flowing out from the Earth into space. Some of that energy is trapped by the Earth's crust in the form of heat, causing the crust to act as a battery.

This heat can be tapped anywhere on the planet, although there are variations on how deep producers would need to drill until reaching temperatures viable for electricity production—about 150 degrees Celsius.

In Houston, for instance, 150 C can be found 2.5 to 3 miles deep, which Wisian considers relatively accessible. Regions along the state's eastern flank, along the coast, and far West Texas also have similarly optimal geothermal resources. In Austin, on the other hand, drillers would need to plunge down 3.5 to 5.5 miles before reaching those temperatures.

"The upper 10 kilometers of the crust of the Earth, as a battery of heat, holds an estimated thousands of years' worth of our energy needs in the form of accessible heat energy," Wisian said. "That's an immense resource to tap and one that gets us all excited."

And while tapping into geothermal resources in the deeper reaches of the Earth requires a whole new set of technological skills, but not ones wholly foreign to Texas' oil and gas industry, who've used hydraulic fracturing to plumb Texas' depths for decades. These technologies, often known as enhanced geothermal systems or closed loop systems, inject water thousands of feet below the surface where temperatures reach hundreds of degrees, then capture the steam that rises back up to power turbines.

While it's a technology that still needs a roadmap to commercialization, there are only a few incremental steps that need to be taken before exponential growth could occur.

"We don't need a sexy moonshot," Beard said, referring to the several clean energy research and development initiatives the Department of Energy recently launched. "This is really about transferring oil and gas technologies, learnings, and expertise, and building on that in incremental steps over the coming years instead of aiming for a 2050 moonshot, where we have to achieve some scientific breakthrough. Geothermal is deployable now, and we can be building power plants now."

Texas grid benefits

Although there are a number of geothermal pilot projects in the state, there is no utility-scale geothermal electric generation on the ERCOT grid. In the US, most geothermal generation is along fault lines, where tectonic activity brings geothermal heat closer to the surface. According to the National Renewable Energy Laboratory, California, Nevada, Utah, and Hawaii have the most installed geothermal generation capacity.

But, in addition to the state's optimal geology, the Texas power grid may be an ideal market for geothermal expansion, said University of Texas Professor of Energy Resources Michael Webber, who also co-authored the report.

As reforms to the Texas grid continue to be debated in the aftermath of the February 2021 blackout, one of the key priorities among the state's Republican leadership is to firm up grid reliability by adding more dispatchable power generation, mainly through natural gas producers.

But geothermal serves this same purpose, Webber says, in addition to its carbon-free benefits.

"If you care about [the] dispatchability or reliability, geothermal is an important option to consider that we haven't historically considered in Texas," Webber said. "If you consider the other factors, like emissions, geothermal is particularly relevant. And if you consider reliability in cold weather, it really looks great."

There may be some legal and regulatory barriers that need to be addressed before geothermal can scale, however. For instance, questions remain over ownership rights of underground heat resources. While laws over surface rights and mineral rights are crystal clear in the state code, Texas hasn't directly defined who owns underground heat.

The Texas Geothermal Energy Alliance, a coalition of oil companies, utilities, and geothermal start-ups formed last year, has already been wrestling with that question. According to the group's general counsel, Ben Sebree, geothermal energy resources should fall to the surface rights owner by default, but the state should still provide legal clarity.

"To provide business and legal certainty, we need to codify this conclusion in the law in order to avoid years of uncertainty and potential litigation," Sebree said.

He points to a bill State Representative Drew Darby, Republican of San Angelo, recently filed establishing geothermal ownership rights to the landowner. That bill, HB 1336, has not yet been assigned to a committee in the Texas House of Representatives.

"It's a very rare moment in the world where we have cats and dogs, right and left, red states and blue states all agreeing on the same thing," said Beard. "We ought to grab that and run with it. I'm not saying that it will be perfectly kumbaya—there's going to be some round-tabling and real collaboration that we need to do. But geothermal is really unique in its ability to bring everybody together and find a pathway forward to decarbonization."

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graph Source: SMU Node of the National Geothermal Data System, S&P Global Commodity Insights
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