

## ENERGY &amp; ENVIRONMENT

# New map shows vast potential for geothermal energy beneath entire US

BY [SAUL ELBEIN](#) - 06/04/24 2:24 PM ET

Much of the vast fleet of U.S. military bases, coal plants and industrial facilities sits atop a prime resource for clean energy: layers of hot rock deep within the earth.

That's according to [GeoMap](#), a new collaboration that combines the subsurface expertise of dozens of scientists organized by Project Innerspace, a nonprofit focused on building out the geothermal industry with the surface data of Google Maps.

The results released Tuesday show the sprawling expanse of U.S. potential for geothermal, which taps heat from deep within the earth for clean, on-demand energy. That potential is especially red-hot in the western U.S., with striking hot spots also seen across the colder, older regions of the East.

Geothermal is the focus of wide and bipartisan interest from entities ranging from the fossil fuel majors to climate groups to the U.S. Department of Energy — a focus that has led to a boom in new startups.

In March, Jigar Shah, head of the Energy Department's Loan Programs Office, told [The Hill](#) that \$25 billion in investment over the next five years — less than the cost of the last nuclear plant to be built — could begin a rolling snowball of funding that could power between 80 and 260 million households by midcentury with clean, reliable power from below.

But the next generation of geothermal is currently in its infancy, and the first few projects will be expensive and high-risk as the industry gets its feet under it. The point of GeoMap, its designers told The Hill, is to help planners, researchers and the general public identify the lowest-hanging fruit: the places where the best geothermal resources lie closest to both the surface and the industries that demand it.

"It's fine to say, 'Okay, well, Country X has better resources than country Y, but that doesn't tell you where to drill in country X,'" Drew Nelson of Project Innerspace told The Hill. "Nor does it tell you there's still plenty of places in Country Y where you can drill for the resource, it just may not be as good as Country X."

The purpose of GeoMap, Nelson said, is to “educate policymakers and the public about the potential for geothermal in any given jurisdiction — but more importantly, to then put it in the hands of people who are actually going to be building projects.”

For now, lead geologist and designer Helen Doran told The Hill, the resulting map is of interest to industries beyond geothermal: the oil and gas industry, which can use the map of the subsurface to find new sources of planet-heating fossil fuels, and the emerging geologic hydrogen industry, which draws on a resource often found alongside underground plumes of hot water.

And then there is lithium, the key material in mainstream batteries for both electrical storage and electric vehicle batteries. In regions like Central Texas, Doran said, “there’s great examples” of deposits of the metal — a colocation that helps “build the economic case as well for some of these geothermal projects.”

The map Doran and her team built paints a vivid picture of the potential for future geothermal exploitation. This potential is particularly strong beneath the hot, geologically active expanse of the American West, where forces within the earth are still driving the Rocky Mountains slowly upwards.

The GeoMap data shows that virtually every military base in the West, and most of those in Texas, sits atop geothermal resources suitable to generate electric power — a fact that has not been lost on the Department of Defense, which is funding pilot projects at six military bases across the West.

The data also shows that most of the active coal plants in the West — plants that rely on using heat from fossil fuels to generate electricity — sit atop hot rock within a mile of the surface.

That includes active coal plants like North Valmy in Nevada, Fayette in Texas or the California-supplying Intermountain power plant in Utah — plants where an active planet-heating resource could potentially be replaced with carbon-free heat from below.

But it also includes a broad array of decommissioned coal plants — sites that still sit in the center of webs of power lines that could onboard future clean power onto the grid while avoiding the roadblocks around permitting new transmission corridors.

The Geomap researchers found that many of the West’s other sites — greenhouses, meatpacking facilities, chemical plants and data centers — sit atop heat that could be tapped directly, without needing to generate electricity, which is a cheaper proposition.

But while the extent of geothermal resources in the West is considerable, and more widely recognized, the GeoMap project also shows pockets of great potential in the older, colder crust of the eastern U.S.

“There’s huge parts of Texas and the Gulf Coast that have far more potential than previously thought,” Nelson told The Hill. “Parts of South Carolina and into West Virginia, Pennsylvania and New York are some interesting hot spots.”

That, he said, “I think is one of the primary headlines: that oh my god, we can do geothermal [at] a lot more places than we previously thought.”

Texas in particular stands out: The data shows a hundred-mile-wide corridor of near-surface geothermal heat that cuts across the state from the Rio Grande Valley northwest past Houston to Shreveport, La. — encompassing not only a constellation of military bases and power plants but also one of the country’s greatest industrial heartlands.

Other industrial areas in the East displayed hot spots as well. For example, the Daniel coal generating plant in Mississippi sits atop a shallow layer of geothermal heat, according to the data, as does Hickling station in western New York, and the military complex at West Virginia’s Camp Dawson.

And even in Eastern regions where the use of geothermal power to generate electricity is currently impractical, the model shows wide potential for using the resources as a source of heating and cooling.

It suggests that would be possible, for example, beneath just about every military base in the country.

But it is around future projects, Doran said, where the model really shines. “If you’re thinking about building from scratch — where would you place your site? That’s kind of the exciting part of the tool: to look into the future.”

For example, she said, the model shows pockets of superheated lithium-rich brines beneath the I-35 corridor just south of Austin, Texas — places where geothermal heat could coincide with mining for the raw materials of clean energy.

One nearer-term site of future interest is the data center industry, which is at the leading edge of a boom in U.S. electricity demand that is pushing regional grids toward the breaking point — and which has an urgent need for cooling as well as electricity.

The map shows that several hubs of rising data center demand lie atop geothermal resources hot enough to potentially be tapped for electricity: San Francisco, Los Angeles and coastal California; intermountain cities like Reno, N.V., Albuquerque, N.M., Cheyenne, Wy., and Denver; and Texas cities like Houston.

But it also shows other data demand hot spots where new or existing data centers could defray their electricity costs by dumping their heat into the bedrock below — places like Kansas City, Miami, Dallas or the nation’s data-demand heartland of Northern Virginia.

Military bases and data centers offer one particular benefit for the geothermal industry as it seeks to get its legs under it: They are facilities that are willing to pay a premium for power that is both clean and always on, even if it is substantially more expensive than more intermittent sources like wind or solar.

That means they offer a promising early market for the first generation of new geothermal projects — a locus of new funding and development that can help drive costs down for the next generation.

But the public should see GeoMap as a sandbox to open up the subsurface world, Nelson said. “Anybody whether they’re Jane Doe, or the facilities manager for a giant greenhouse gas emitter or anywhere in between, they can get on there and figure out does it make sense for them to do geothermal at their facilities?”

Unlike wind or solar, Nelson said, that potential isn’t obvious to those standing on the surface. In the past, “the only way heretofore to figure out if your site was a match for geothermal was to go and drill a hole in the ground. And that gets really expensive really quick. But with this tool, the idea is that we’re significantly reducing the barriers to figure out does it make sense to do geothermal in your given area?”

— *Updated at 5:54 p.m.*

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