The Big Idea

Q. How do you make a lot of deep holes in the ground useful again?

A. Bring up naturally heated water to provide renewable energy on the surface.

By Brian Brus

Retired oil and gas wells present something of a paradox to Saeed Salehi. To most people, the platforms sit idle because their work is finished—all accessible petroleum removed, leaving behind an empty hole. However, to the University of Oklahoma researcher and his partners, retired wells are full of untapped potential.

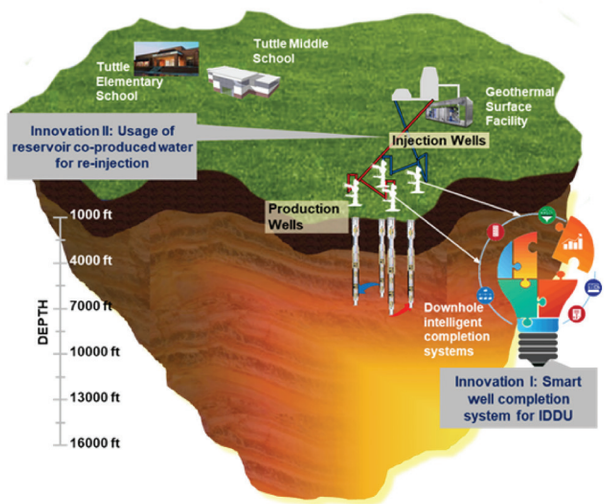
"We've been drilling for oil and gas for decades, leaving a lot of wells behind without considering how they can be productive in some other way," says Salehi, an associate professor in OU's Mewbourne College of Earth and Energy. "Now it seems obvious. The biggest surprise to me has been why it's taken so long to reach this stage."

The concept, as he explains it, is simple enough to appreciate over a short coffee shop chat. The relationship between pressure, volume and thermal energy means the deeper a well is drilled into the planet, the higher the temperature. Water in that space—whether pumped there or occurring naturally—will be warmer. The heated water can be moved to the surface and captured for use while more water is moved down the hole to repeat the cycle.

In short, Salehi says, "Geothermal energy works like a car radiator, but down very deep."

The trick is increasing the scale of that reverse-radiator model to prove its practicality and win over the public, says Brett Dawkins, co-founder of Blue Cedar Energy and a 1995 OU petroleum engineering graduate.

"Geothermal energy historically has been held back by high startup costs and uncertainty about drilling results. No one wants to spend a lot of money drilling, only to have the venture fail," he says.



Salehi and a team of graduate-student researchers will convert four retired oil wells in Tuttle, Okla. The proposed Intelligent Deep Direct Use system would heat a middle school and high school during the study's second phase.

That's where a recent, $1.7 million U.S. Department of Energy grant comes into play, with additional assistance from Blue Cedar Energy, Baker Hughes Oilfield Services and the

Travis Caperton

University of Oklahoma researcher Saeed Salehi believes that retired oil wells are full of untapped potential.

National Renewable Energy Laboratory.

Partnering with Runar Nygaard, Eberly Family Chair and director of OU's Mewbourne School of Petroleum and Geological Engineering, Salehi and a team of graduate-student researchers will convert four retired oil wells in Tuttle, Okla., that are each about 10,000 feet deep to test the viability of geothermal production. The output hopefully will heat a Tuttle middle school and high school during the study's second phase.

Dawkins and his Blue Cedar partner, 2006 OU energy management alum John Goss, say they were attracted to Salehi's proposal because it aligns so well with cultural shifts and industry circumstances.

By providing four already-drilled wells, Blue Cedar has helped Salehi's team sidestep the price tag that's been holding back geothermal industry development, Dawkins says.

The Tuttle site is not unique. According to Reuters news agency calculations, there are more than 29 million retired wells worldwide—already drilled and waiting to be put into use once more. The U.S. Energy Information Administration reports the average depth of natural gas wells has been trending to about 7,000 feet.

OU petroleum engineering doctoral student and team member Cesar Vivas sees a future for himself in geothermal, wherever the current project might take him.

"The world is changing, and I feel very fortunate to be part of this research. I can easily imagine working on this area of science for many years," says Vivas, who received a 2021 OU master's degree in petroleum engineering. "Science like this leads to new technologies and even jobs and lifestyle improvements. There's so much practical potential to explore."

He agrees with Dawkins' observation that properly retrofit geothermal wells in Oklahoma also could help keep farmers' and ranchers' costs down, having a direct impact on food production.

When the project proves itself, he says, "Its fundamentals can be developed anywhere and run 24/7. And unlike some other renewables, geothermal doesn't rely on sunny days for solar panels or windy days for air turbines."

In a related line of research, Salehi and the student-led OU Sooners Geothermal Team recently won first place in a national collegiate competition organized by the U.S. Department of Energy. Their proposed system would repurpose abandoned oil and gas wells in Shawnee, Okla., to provide geothermal energy to public buildings, including sites for the Absentee Shawnee Tribe and Citizen Potawatomi Nation.

Dawkins says he was pleased to contribute Blue Cedar assets to the Tuttle geothermal project. The OU experiment might seem like a drop in the ocean, but Dawkins expects a resulting wave. In that sense, retired wells hold another kind of potential, he says—that of cultural change.

"We need to look closely at all forms of energy to meet our needs on this planet, and that means oil and gas have a place next to renewables like geothermal," Dawkins says. "This project can show they're not separate concepts, that they overlap and can work in conjunction with each other. It's part of an answer to the question of how industry brings the best, least expensive, most accessible forms of energy to the consumer."

Brian Brus is a freelance writer who lives in Edmond, Okla.