

# Geothermal power could be solution for Indiana's abandoned coal mines

January 28 2010, by Kim Schoonmaker

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(PhysOrg.com) -- Vacant coal mines in southwest Indiana could once again generate energy, not from coal, but from the water reservoirs now found on their surface and deep underground.

That is the objective of Purdue University geologists studying how to transform old strip and shaft mines into new sources of geothermal power, a process that could conserve energy during peak power-usage times and cut electricity costs.

"Our plan is to find the locations in the state where underground mines and surface mines coincide," said Terry West, a professor of earth and atmospheric science.

When surface mines and underground mines coexist, water can be pumped back and forth between the two to create a heat exchange.

"Whenever you have water at two different elevations you have an opportunity to pump water back and forth from one elevation to another," West said. "In the process, there's a difference in temperature because the water in the mine is cold, so it has what is called a geothermal capability."

The concept of using water to create electricity is not new, but its application in vacant coal mines has not been widely explored. West and graduate student Richard Fisher hope to shed more light on its potential, especially when it comes to lowering energy costs during peak usage

hours.

"One of the big things about electrical generation is that electricity costs a lot more at certain times of the day than at other times," West said. "If you can somehow pump the water when you have extra energy, like at night, it can be stored and used later during peak flow hours."

The process could take shape in Indiana, home to 17 former coal-mining counties. The mines span 186,000 acres underground and 284,000 acres aboveground over an area in the southwest part of the state that stretches from Terre Haute to Evansville. Locations of interest - where surface and shaft mines overlap - occur primarily in five counties: Clay, Greene, Owen, Sullivan and Vigo.

The researchers are currently mapping the locations of surface and shaft mines in these counties.

"We take the overlay between the surface mines and the underground mines and we end up with a certain number of sites," West said. "Then, we look at the individual sites and see which ones have the most potential. We're most interested in being able to find a place where we can exchange the water from the underground mine with the surface water and use it to generate energy."

So far, it looks like West and Fisher will concentrate their efforts on an area near Terre Haute or just south of there.

A project of this scale is not without its share of complications.

"There are certain places in Indiana where the surface has collapsed because the underground mines have deteriorated and are starting to collapse," West said. "We have to be very careful not to try our operation where there is already a problem because it may make it

worse. There are restrictions about staying away from areas where the ground has already subsided from collapsing coal mines."

The potential for surface damage also makes it important to avoid heavily populated areas.

"It's kind of a two-edged sword because you want to generate electricity close to the cities where you can use it, but we appreciate the fact that they are the most susceptible to any damage that might happen," West said.

Water quality is another concern because water that is stored underground during off-peak hours could contain dissolved metals and chemicals left over from the mining process. The potential exists for these compounds to leach into groundwater.

"We're trying to work in natural situations and take a cautious approach," West said. "The heat exchange is certainly possible, but we have some environmental questions that have to be taken into account."

The project is a work in progress, but West expects to have some results from the initial mapping work by the end of next year.

Those results could spark further work to assess how any energy generated by geothermal power production would reach existing [power plants](#) and impact peak power usage.

"There are a lot of power plants that are quite close to the sites under consideration," West said. "The benefit of this is the transmission lines would not have to be very long to hook up to some of these power plants and take advantage of the extra energy generated at certain times of the day."

Provided by Purdue University

Citation: Geothermal power could be solution for Indiana's abandoned coal mines (2010, January 28) retrieved 10 April 2024 from <https://phys.org/news/2010-01-geothermal-power-solution-indiana-abandoned.html>

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