In The News; Hydrogen

Geologic storage critical for hydrogen, but more research needed

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* Texas has rich subterranean storage potential

* Research needed to understand leakage potential

Geologic storage options for hydrogen – be they in salt caverns, depleted oil fields or saline aquifers – are key to unleashing a future hydrogen economy, but more research is necessary to understand characteristics of underground formations for optimal hydrogen storage, University of Texas researchers said.

“Before we spend the money to store hydrogen, we need to be able to do simulations to understand how hydrogen is actually going to behave in the subsurface, and also be able to assess risk,” said Deputy Director of Research Mark Schuster, who leads a hydrogen research consortium within the university’s **Bureau of Economic Geology**.

“We need to be able to test sites before we go into commercial execution and be able to determine how we can best monitor these sites from a safety perspective,” he said during a Jan. 11 virtual event.

Texas is home to a rich array of naturally occurring subterranean geologic resources that could be utilized for hydrogen storage. Large salt domes, which can be up to a few thousand feet in depth and hundreds of feet in width, line the Gulf Coast and South Texas regions. And a number of bedded salt caverns, which are shallower, thinner formations, can be found in West Texas.

Add to that a number of saline aquifer formations and the large volumes of pore space within depleted oilfields that can store captured CO_2, and Texas is well positioned to become a hotbed for hydrogen activity, said Robert Hebner, director of the university’s Center for Electromechanics.

“We’re going to need to take advantage of the promise that hydrogen storage has,” Hebner said. “Because if we have these large underground caverns, which can store huge amounts of hydrogen for long periods of time, it changes your whole thinking about the grid. Suddenly you can start storing energy for half a year, or you can store hydrogen at one location and transport it to another location to generate electricity there.”

Many of these formations have already been used as natural gas storage facilities. But critical differences between natural gas and hydrogen, like hydrogen’s lower density and lower viscosity levels, mean that storage and injection processes can’t seamlessly transfer when switching from one gas to the other.

Texas salt domes

Hydrogen storage operations in Texas salt domes have long been ongoing. Three salt domes along the Gulf Coast have been utilized for hydrogen storage by the petrochemical and industrial gas industries for years.

In 2017, Air Liquide commissioned the Spindletop salt dome formation – which is roughly one mile deep and over 200 feet wide – to store more than 120 GWh of hydrogen, or enough to back up a large-scale steam methane reformer unit for 30 days. It’s the largest subterranean hydrogen storage cavern in the world.

ConocoPhillips also began storing hydrogen in 1983 in the Clemens Dome, a formation with a 92 GWh capacity located beneath Brazoria County, Texas. And the industrial gas company Praxair has used the Moss Bluff formation in Liberty County, Texas to store hydrogen since 2007, according to Engie data.

However, other subterranean storage options, aquifers, bedded caverns, and pore space of depleted oil fields, need more research, Schuster said. Hydrogen is a relatively diffusive gas, and scientists are working to better understand the way it might behave within these rock formations. The risk of hydrogen leakage, for instance, could have serious safety and economic implications.

“We need to understand how hydrogen might leak up either through faults or fractures in these systems,” he said. “This optimization work needs to be done to be sure that we’re addressing the right kinds of reservoirs for hydrogen storage.”

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