

INDUSTRY

Future of coal, oil and gas depends how far ahead you look

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Coal has been an important part of West Virginia for more than a century and it remains a major contributor to the state's economy.

According to the U.S. Energy Information Administration (EIA), West Virginia is the nation's second-largest coal producer, after Wyoming, and accounts for about 14% of U.S. coal production with coal being mined in 21 of the state's 55 counties.

Since the Marcellus shale boom almost two decades ago, the state is also the nation's fourth-largest producer of marketed natural gas.

But with social movements emphasizing a reduction in carbon dioxide emissions and the environmental impact of oil, gas and coal, what does the future look like?

Sam Taylor, director of the WVU Institute for Sustainability and Energy Research, said that it really depends on how far in the future you are looking and even then, there isn't a clear answer.

"Those fuel sources are

going to be in the mix for a little while," he said. "Our grid is going to have some coal and some natural gas on it for at least a decade and that is the safest answer anyone will give you."

At that 10-year mark, the answers are pretty safe and relatively simple. But it's when you start getting into 20 or 30 years that Taylor said the answers get little bit harder.

Part of the reason it isn't really possible to answer is that we don't know what's coming.

"The Marcellus boom, revolution," he said was a recent example. "That's not quite 20 years old now. At the time, no one really saw that coming."

"So what things are out there? What technological change — and it could be in a lot of different places is the thing right now — but what technological change gives you an impact like the shale boom? That's the kind of thing that keeps us busy, keeps us working," he said.

West Virginia has already begun looking at alternative energy sources, with about 7% of the state's total net energy generation

coming from renewable resources, nearly all of it from wind energy and hydropower, according to EIA.

Taylor said that every big solution right now has some big downside they are trying to figure out and the current landscape is really open-ended, with a lot of things in the mix together.

"You've got your classic oil and gas and coal; nuclear is picking up interest in our region. We know what's going on with renewables like solar and wind. There's been a lot of exploration around hydropower," he said. "We have, here at the university, a pretty robust program looking at geothermal and think there's some potential there."

"The reason why all of that is in the mix at the same time is that it isn't 100% clear which one would you go spend your money on. There's a lot of advancement going in a lot of places right now — in every one of them you're seeing technological improvement."

There is discussion surrounding the cost of renewable energy as well, Taylor

said. While many are cheaper up front, additional costs begin to add up when it comes to storing and delivering the energy. There is also social pushback on things like large developments of solar and wind farms that will also play a role.

"It's such a huge sector. The scales of energy production and consumption in the U.S. are staggeringly big. So, it's tough to think about any of these solutions as your one-size fits all," Taylor said.

"Thirty years ago, it was a pretty straightforward conversation. You didn't have a ton of other options and all your R&D went into trying to improve these technologies and now you've just got such a big landscape."

While it is unclear how things will change over the next few decades, Taylor said he believes that coal and oil and gas will diminish, but not any time soon.

"Think of the transition from horses to cars, Taylor said, "that didn't happen in a decade, and for what it's worth, people still have horses."

NETL

Patent issued for laser technology

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Two NETL researchers were awarded a patent for improvements to laser technology that can be used to detect CO2 leaks more efficiently from underground carbon storage sites.

The technology also holds potential for use as an online sensor in a range of other hostile environmental monitoring.

NETL's Dustin McIntyre and Daniel Hartzler were awarded the fifth in a series of technology patents that cover aspects of a laser induced breakdown spectroscopy (LIBS) probe for underground storage site monitoring.

"Estimates are that carbon emissions should reach net-zero by 2050 to meet important climate targets," McIntyre said. "Carbon capture is likely necessary to reach these targets, requiring a long-term storage solution such as underground carbon sequestration in geologic formations. However, as with any subsurface activity, leakage can occur, potentially impact-

ing groundwater quality near storage sites. Rapid detection is essential to mitigate leakage."

A loss of containment at an underground storage site can cause subsurface brines or CO2 to migrate into aquifers and soils, potentially contaminating groundwater, a critical resource that millions in the United States rely on for drinking or for agriculture and industry.

Leakage can be detected by monitoring groundwater composition around underground storage sites known as geologic carbon sequestration (GCS) sites. A variety of analysis techniques are currently used to measure trace elements in groundwater. However, many of them have high equipment costs, operator training requirements and lack portability, requiring samples to be collected in the field and transported to a laboratory for analysis.

The technology is titled "Downhole Laser System with an Improved Laser Output Production and Data Collection." The patent number is 11885746 and became active Jan. 30,

PEKNEY

FROM PAGE 18

the atmosphere.

In an effort to find out if, in fact, methane emissions were present at abandoned wells, Pekney and her colleagues headed out to parks in Pennsylvania with a field computer loaded with coordinates from magnetic surveys and various tools to see what they could find and, "yes, indeed, some were leaking measurable quantities" of methane, she said. "Things grew from there."

These days, due in part to the Bipartisan Infrastructure Law — \$1.15 billion in federal funding made available to states in 2022 to create jobs cleaning up abandoned and orphaned oil and gas wells across the country — Pekney said NETL has seen an uptick in interest in their research. Many federal and state agencies are seeking the most efficient and cost-effective ways to find these sites, as well as determine those that release the most methane.

so, for instance, they can plug them in order of worst emitters.

She's traveled to several states, including Kentucky, Texas and New York, and the week of April 21, Pekney and a team from NETL headed to West Virginia for the first time to scan for possible well sites at Stonewall Jackson Lake.

The magnetic survey, conducted by the U.S. Bureau of Land Management and the U.S. Department of Energy, with the assistance of the U.S. Army

Corps of Engineers Pittsburgh District, uses drones to cover large swaths of land in search of possible metals buried in the area. If abandoned well sites are discovered, they will be monitored for possible emissions, said Jeff Toler, resource manager for Stonewall Jackson Lake.

There are roughly 6,300 orphaned and abandoned oil and gas wells already in the West Virginia Department of Environmental Protection's database. The state has plugged 236 wells since

2020, according to Terry Fletcher, WVDEP's chief communications officer.

Toler said a grant package in 2022 started the process at Stonewall Jackson Lake, with the goal to monitor and correct possible emissions.

Even if no abandoned wells are found, Scott Hannah, a park ranger at the lake, added that the data will be useful.

"We will end up with a detailed map of the area that will be so valuable," he said. "If we ever want to cut

a road, we will know where possible pipelines are located."

For NETL's part, Pekney said this latest project in the Mountain State will also be beneficial.

"I'm looking forward to it," she said, when interviewed the week before the project was slated to start. "It's a challenging area to cover because of the lake and the shores. It's a very hilly area, which will make it a little more complicated. ... If we can do it there, we can do it anywhere."

