



What Is Wyoming CarbonSAFE?

The University of Wyoming's Center for Economic Geology Research (CEGR) is leading the Wyoming CarbonSAFE project, an investigation of safe, permanent geologic storage of carbon dioxide (CO₂) from Basin Electric Power Cooperative's coal-based Dry Fork Station in Gillette, Wyoming. The research is one of six Phase II carbon capture and storage (CCS) projects supported by the U.S. Department of Energy's (DOE's) CarbonSAFE initiative sponsoring research and development of sites for permanent geologic storage of 50+ million metric tons of CO₂ deep underground. Major activities for Phase II include drilling an exploratory well to collect geologic information. No CO₂ will be injected during this phase.

What Is Carbon Capture and Storage, or CCS?

CCS involves capturing CO₂ from industrial process facilities, rather than releasing the gas to the atmosphere. The CO₂ is transported to an injection site, where it is injected deep underground for safe, permanent storage in a suitable rock layer. CCS is best-suited for large stationary facilities such as coal-fired power plants, ethanol plants, cement plants, oil and gas refineries, and agricultural processing plants.

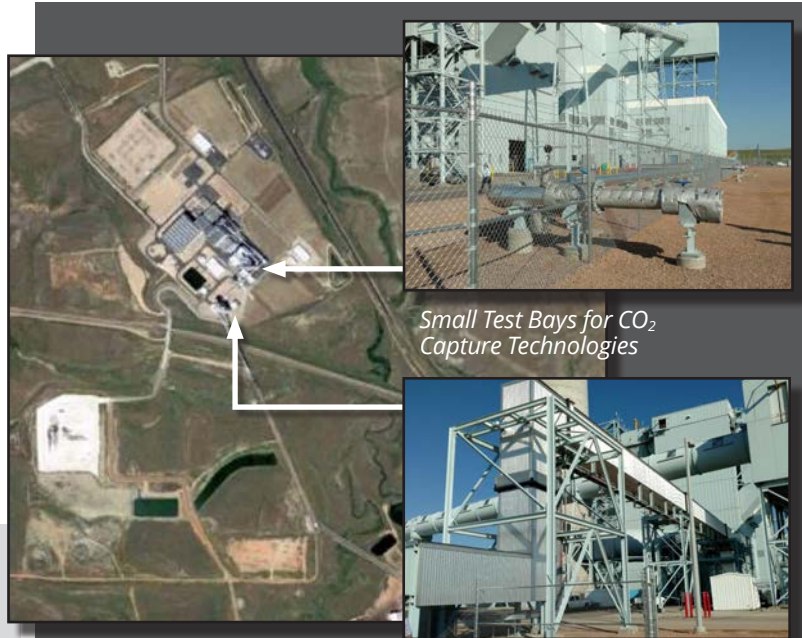
Why Wyoming CarbonSAFE?

Wyoming CarbonSAFE is focused on economic and sustainable CCS. CCS has the potential to reduce CO₂ emissions, foster sustainable use of natural resources, and allow for the transition to carbon-neutral uses of fossil fuels.

The objective of the project is to characterize the geology below Dry Fork Station to assess whether the deep rock formations, including potential CO₂ storage zones (reservoirs) and cap rocks (seals), could safely and permanently store CO₂.

To evaluate safe, permanent storage of 50+ million metric tons of CO₂, Wyoming CarbonSAFE researchers have analyzed geologic samples and used well data to refine geologic computer models to test CO₂ injection and storage simulations.

CEGR is working to address all aspects of CO₂ sequestration, including initial site characterization (drilling an exploratory well, for example), facility design, and legal and regulatory issues, providing information about carbon management and other challenges.



Dry Fork Station near
Gillette, WY

Small Test Bays for CO₂
Capture Technologies

Large Test Bay for CO₂
Capture Technologies

Where Is the Research Happening?

Dry Fork Station, a coal-based power plant in Campbell County near Gillette, Wyoming, is the host site for field activities. This site is located in the Powder River Basin, which accounts for 40% of U.S. coal production.¹ Potential storage zones being investigated are deep sandstone layers, including the Lakota and Fall River (Dakota Group), Lower Sundance, and Minnelusa Formations. These formations are overlain by thousands of feet of impermeable rock, which would ensure permanent containment of fluids within the potential storage zones.

The Integrated Test Center (ITC) is set up to test methods of CO₂ capture and use and is located at Dry Fork Station.

What is the Purpose of an Exploratory Well?

An exploratory well was drilled near Dry Fork Station in spring 2019 to collect geologic core samples, water samples, and other subsurface rock layer data. The geologic core samples are currently being analyzed by researchers at the University of Wyoming and the University of North Dakota's Energy & Environmental Research Center to determine the rock layer's characteristics and help assess their potential for safe, permanent geologic storage of CO₂. This information is combined with data from geophysical surveys and incorporated into 3D computer models for a comprehensive assessment.

Following data collection, the well was plugged with concrete. The well closure plan and permit were designed to allow researchers to reopen the well at a later date if needed. The site was restored to its predrilling condition in accordance with state regulations.



The Wyoming CarbonSAFE team at data collection site.

What Are the Next Steps?

Even if the rock layers are suitable, successful geologic CO₂ storage cannot occur without practical transport, injection, and monitoring systems. As part of Phase II, the Wyoming CarbonSAFE researchers are assessing the economic feasibility of transporting and injecting CO₂ into geologic storage zones, as well as making considerations vital to permitting and operation.

A geophysical survey was completed in August 2020 as part of the Wyoming CarbonSAFE research effort. The survey encompassed nearly 9 square miles around Dry Fork Station north of Gillette. The data will be processed and interpreted to improve the accuracy of computer-based models and enable simulation of CO₂ injection scenarios and assess CCS feasibility.

The University of Wyoming has been awarded funding to continue the research in a third phase that is expected to begin in fall 2020. Phase III work will include drilling a second exploratory well, collecting additional subsurface data, establishing a CO₂ injection monitoring plan, and developing supporting information for permitting processes.

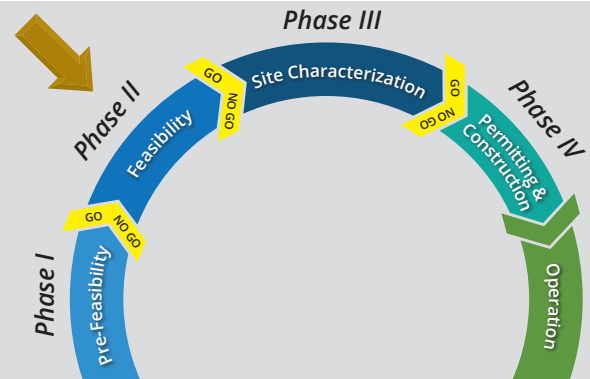
Reference

¹<https://www.eia.gov/todayinenergy/detail.php?id=41053> (accessed May 2020).

²<https://www.netl.doe.gov/coal/carbon-storage/storage-infrastructure/carbonsafe> (accessed May 2020).

Wyoming CarbonSAFE and DOE's CarbonSAFE Initiative

The Wyoming project is one of 19 projects funded under DOE's CarbonSAFE initiative.² DOE's CarbonSAFE initiative supports projects that address key research in the path toward the deployment of CCS technologies, including the development of safe, permanent, commercial-scale geologic storage sites for CO₂. The Wyoming CarbonSAFE project was awarded by DOE's Office of Fossil Energy through a competitive process.



DOE envisions four phases to have commercial-scale facilities ready to permanently store at least 50 million tonnes of CO₂ by 2025. Wyoming CarbonSAFE is a Phase II effort.



A closer look at core samples from more than 7000 feet below the surface: this shale is an example of a cap rock that will seal the CO₂ deep within the subsurface.

The Wyoming CarbonSAFE Project is focused on determining the feasibility of safe, permanent geologic storage of carbon dioxide and is led by the Center for Economic Geology Research (CEGR) within the School of Energy Resources (SER) at the University of Wyoming (UW). Project partners include the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL); Basin Electric Power Cooperative; the Energy & Environmental Research Center at the University of North Dakota; Advanced Resources International, Inc.; Enhanced Oil Recovery Institute at UW; Carbon Geocycle; Schlumberger; Computer Modelling Group Ltd.; and Wyoming Municipal Power Agency. The project is supported by DOE under Award No. DE-FE0031624.

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