CCS – A Safe and Proven Technology

At Tenaska, our commitment to safety starts in the control room, on the plant site and well before any daily task is considered. Our projects incorporate safe engineering design, employee awareness and ongoing training to build records for safety that are among the best in the industry.

Carbon capture and storage (CCS) technology is one of the safest, cleanest and most efficient ways to prevent carbon dioxide (CO2) emissions from going into the atmosphere. Storage sites and pipeline networks are permitted and regulated by federal and state agencies, and many years of planning are required to ensure these projects are designed and operated in a safe manner.

FAQs

1. What is CCS?

Carbon capture and storage (CCS), also known as carbon capture and sequestration, helps manufacturers, industrial producers and power-generating facilities meet increasingly stringent environmental requirements in a cost-effective, responsible manner. CCS captures carbon dioxide (CO2) emissions produced by these plants before they enter the atmosphere. The captured CO2 is liquified, transported and permanently stored deep underground beneath a thick layer of impermeable cap rock. The CO2 then naturally mineralizes and dissolves over time.

2. Is CCS a new technology?

No. According to the Global CCS Institute, CCS projects have been operating since the mid-1990s with proven results. Today, there are operational 41 CCS facilities in the world, with 26 in construction and more than 300 others in development. About half of these are in the United States.

3. How does a CCS project impact above-ground land use?

A CCS project utilizes pore space deep below ground to store CO2. Except for the relatively small number of above-ground injection wells, monitoring equipment and monitoring wells, nothing changes above the surface. Farmers and landowners can continue to use their land just as they always have.

4. Can CCS impact drinking water?

The U.S. Environmental Protection Agency (EPA) has developed extensive criteria to ensure that carbon storage does not threaten underground drinking water. These requirements address: siting, construction, operation, testing and ongoing monitoring. Sequestered CO2 is stored deep underground (3,000- 12,000 feet), far below the water table (350 feet), and is sealed in place by thick layers of caprock. Seismic imaging will be used to determine the location of the CO2 in the storage field and deep monitoring will confirm no CO2 is migrating upward. Shallow groundwater monitoring wells will ensure local drinking water is protected.

5. Is CCS safe?

Yes, CO2 is odorless, colorless and incombustible, which means it can be safely transferred through pipelines to injection wells into geologically secure storage areas. Injection wells are rigorously permitted by the EPA, which also governs the siting, operation, testing and long-term maintenance of the wells.

6. What happens if there's a leak?

The deep underground storage sites where CO2 is being injected are chosen specifically for their proven geologic ability to hold water, oil or gas for millions of years. The CO2 will reside in porous rock and is sealed in place by a layer of cap rock. These storage sites are monitored 24/7, 365 days a year by pressure sensors that can detect upward migration of CO2 and immediately implement measures to address it. If this happens, we will – as required by our permits – stop injecting CO2. We will then work to identify and repair the leak. In these rare instances, leaks generally are found in the casing near the injection site and are easy to repair. Regardless, we will work with local first responders to ensure they have the training and equipment needed to respond to any unexpected situations related to this project.

7. Can CO2 storage sites or pipelines explode?

CO2 is neither explosive nor flammable.

8. Is CO2 hazardous?

Carbon dioxide (CO2) is an inert gas that occurs both naturally and as a byproduct of industrial processes. It is non-flammable. CO2 is exhaled when humans breath out and is emitted into the atmosphere at refineries, manufacturing facilities and power plants. Due to growing environmental regulations and climate mandates, these businesses must reduce their CO2 emissions. At extremely high concentrations, carbon dioxide temporarily displaces oxygen. However, carbon dioxide dissipates very, very quickly.

9. Can CCS facilities be located near sink holes or salt domes?

Sinkholes are surface features that occur primarily near salt domes due to salt dissolution on the surface. When planning well locations and injection sites, Tenaska takes into account the geological factors that could cause sinkholes and plans around those areas to ensure safe, lasting facilities. In fact, proximity to sink holes and other geologic features will be considered by the U.S. Environmental Protection Agency (EPA) as it reviews the project's Class VI application. The EPA will not permit a CCS project if it believes it will be substantially impacted by, or impactful to, a relevant salt dome.

Salt domes are not viable areas to inject C.

10. What about blow-outs?

A blow-out is a term used to describe when CO2 quickly surfaces at high pressure. As with all deep oil or gas wells, blow-outs are possible at CO2 injection sites. Incidents are rare with minimal amounts of CO2 released which quickly disperses into the atmosphere. Comprehensive precautions are in place to ensure that our team and local emergency personnel are provided with dedicated training and protocol plans to recognize and respond to this scenario.

11. Is CCS regulated?

Yes. CCS storage fields are regulated by the U.S. Environmental Protection Agency (EPA)'s Underground Injection Control Program. This program sets and monitors regulations for injection well siting, construction and operation to ensure drinking water and human health are protected. The U.S. Department of Energy (DOE) also oversees development and technology field testing to ensure that the regulations relating to the safe storage of CO2 underground are met. Additionally, CCS pipelines must meet requirements laid out by the Pipeline and Hazardous Materials Safety Administration (U.S. Department of Transportation).

12. How will the storage field be maintained long-term to ensure safe operation?

The facility will have maintenance personnel. The workers will perform line locates, monitoring and maintenance and, if required, emergency response.

The storage field will have continuous monitoring to alert us to changes in pressure or other anomalies that would indicate a leak. It will also alert us to the upward migration of CO2 well before it reaches the water table or the surface. If this happens, we will – as required by our permits – stop injecting CO2. We will then work to identify and repair the leak. In these rare instances, leaks generally are found in the casing near the injection site and are easy to repair.

In the rare instance that CO2 leaves the storage field, it will travel into other deep formations. The robust design features of the storage field and its deep, deep underground location will prevent it from reaching the groundwater level or the surface.

13. Are the pipelines used to transport carbon dioxide safe?

Pipelines continue to be the safest means of transport, with over 5,000 miles of CO2 pipeline infrastructure in operation across the United States today. There have been only a few instances of leaks on these lines, with the most notable being in Mississippi in 2020. There are a number of design and operational specifications that distinguish our project. The first being the purity of the CO2 that we will transport. In the well-documented incident in Mississippi, the pipeline also contained hydrogen sulfide in levels harmful to humans that aggravated the impacts of the release.

14. What additional standards are in place to ensure safety and efficiency?

Our carbon dioxide pipelines will be designed to exceed federal safety requirements and the operating standards of other carbon projects already in operation. The carbon dioxide transported will be required to be a very pure stream of CO2, coupled with additional purification equipment on-site to ensure we are reaching the threshold of 98% pure product. Another distinguishing design factor is component parts, as we are using a different composition of carbon steel that can better withstand the kinds of external stresses that caused the incident in Mississippi.

15. How do we know your pipelines won't rupture?

There are more than 5,000 miles of active CO2 pipelines in the U.S. today. Modern pipelines are incredibly safe. In most instances of pipeline failure, the fault lies with third-party damages, such as someone digging a deep hole and rupturing the pipeline. This pipeline will have warning tape. In addition, this pipeline will be monitored to detect corrosion. It will have constant monitoring and use real-time data so we can shut down the pipeline immediately if we detect a pressure drop or other anomaly that might indicate a problem. We'll have the ability to locate where the problem is, dispatch crews to the site, determine the extent of the problem, and begin any necessary repairs.