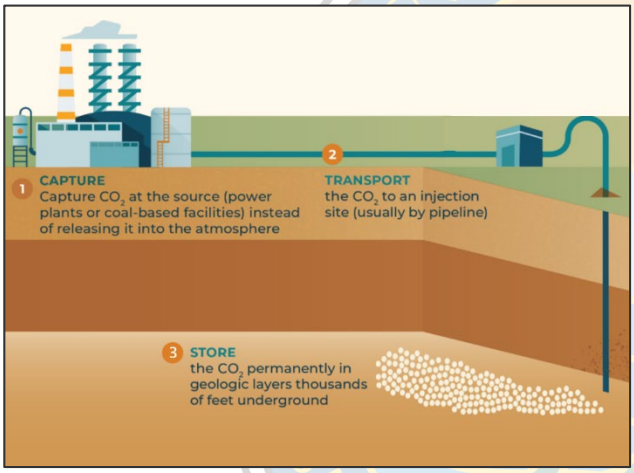
Geologic Sequestration and Class VI Wells in Louisiana

Geologic sequestration of carbon dioxide is the long-term containment of carbon dioxide in underground geologic formations as part of Carbon Capture and Storage (CCS) operations.

What is carbon sequestration?
Carbon sequestration, sometimes referred to as geologic or CO_2 sequestration, is the final step of CCS where CO_2 produced by emitters is captured, compressed for transportation, and injected into deep, underground rock formations for disposal to reduce the amount of CO_2 emissions that go into the atmosphere.



Modified from the Wyoming Department of Environmental Quality

How does it work?
Carbon sequestration requires extensive geologic and engineering assessments to determine if a site is appropriate for the safe storage of CO_2. There are two main types of formations used for this kind of sequestration:

- Deep saline aquifers where the water in the formation is too salty for human use
- Depleted oil and gas fields that aren't being produced anymore

What are Class VI injection wells?
Class VI wells are used to inject CO_2 into deep rock formations for long-term storage to reduce atmospheric CO_2 emissions. Class VI wells have the most complex, robust permitting requirements of any class of injection well.

What makes Class VI wells different?
Class VI requirements include detailed rules for siting, construction, operations, testing, monitoring, and closure of the sequestration project. These rules account for the unique challenges of permanently storing CO_2 underground, including:

- Buoyancy of CO_2
- Mobility of CO_2
- Corrosivity of CO_2 dissolving into water
- Large injection volumes.

A Class VI well application is a lengthy, highly technical document. Applicants must evaluate every aspect of the science and engineering that could impact the safety and effectiveness of a geologic sequestration project and must prove that underground sources of drinking water (USDWs) are always protected.

Who permits Class VI wells in Louisiana?
The Louisiana Department of Energy and Natural Resources (DENR) – Injection and Mining Division (IMD).

How can I check the status of a Class VI application in Louisiana?
A Class VI Application Tracker is available on the Permits and Applications section of DENR's Class VI Carbon Sequestration website. The tracker is regularly updated to reflect where each application is in the review process.

Are there any Class VI wells in Louisiana?
Not yet. The Environmental Protection Agency (EPA) began reviewing a number of Class VI permit applications before transferring permitting authority, known as primacy, to DENR in February 2024, but did not issue any permits. Reviews are currently underway at DENR, but no permits have been issued yet.

If CO_2 is going to be injected into aquifers, does that mean my water is going to be impacted?
No. When people talk about saline aquifers, they are referring to deep rock formations where the pores, or small gaps between the rock grains, are filled with ultra salty water that is too salty to be used by humans. These saline aquifers are usually thousands of feet deeper than the fresh water aquifers that we get our drinking water from.

The geologists and engineers at DENR who regulate Class VI wells are responsible for making sure that the CO_2 injection doesn't put Louisiana's drinking water or residents at risk. That is why it is so important for regulators to understand what the geology of the project looks like and how the Class VI project will operate over time. These details are vital to predicting and tracking how the CO_2 behaves after it has been injected into the rock formations.

How does the CO_2 stay underground?
Captured CO_2 is compressed to a stage known as supercritical phase where the CO_2 no longer behaves simply like a gas but actually shares physical properties of liquid and gas. Supercritical CO_2 can then be injected into the approved geologic formation where it becomes trapped.

There are several ways that CO_2 can be trapped underground:

- Structural trapping – low permeability rocks like shales act as barriers and prevent the relatively buoyant CO_2 from moving upwards
- Residual trapping – CO_2 becomes trapped in the tiny pore spaces within the rock
- Solution trapping – some of the CO_2 dissolves into the salty formation water
- Mineral trapping – depending on the type of the geology, the CO_2 can actually react with the rocks to form a new mineral and become part of the rock formation itself

Will any CO_2 be sequestered in salt caverns like the one at Bayou Corne?
No. Class VI wells will not be permitted to inject CO_2 in salt caverns.

How do we know where the CO_2 is once it's underground?
Tracking the CO_2 plume is one of the most important parts of a sequestration project. Applicants are required to use their proposed plans for injection and the geologic details from site characterization to build detailed computational models of the CO_2 plume. Creating reliable model based on accurate data is important because they help predict how the CO_2 will behave underground and how far a CO_2 plume will extend over the life of the project.

Applicants will use this model to design a monitoring system that will include methods like pressure monitoring, groundwater sampling, and different geophysical methods that can be used to track CO_2 in the subsurface. After data from these sources is collected and interpreted, it is fed back into the models as part of an ongoing process where the CO_2 is continually tracked and the models are repeatedly updated over the life of a project as shown in the diagram below.