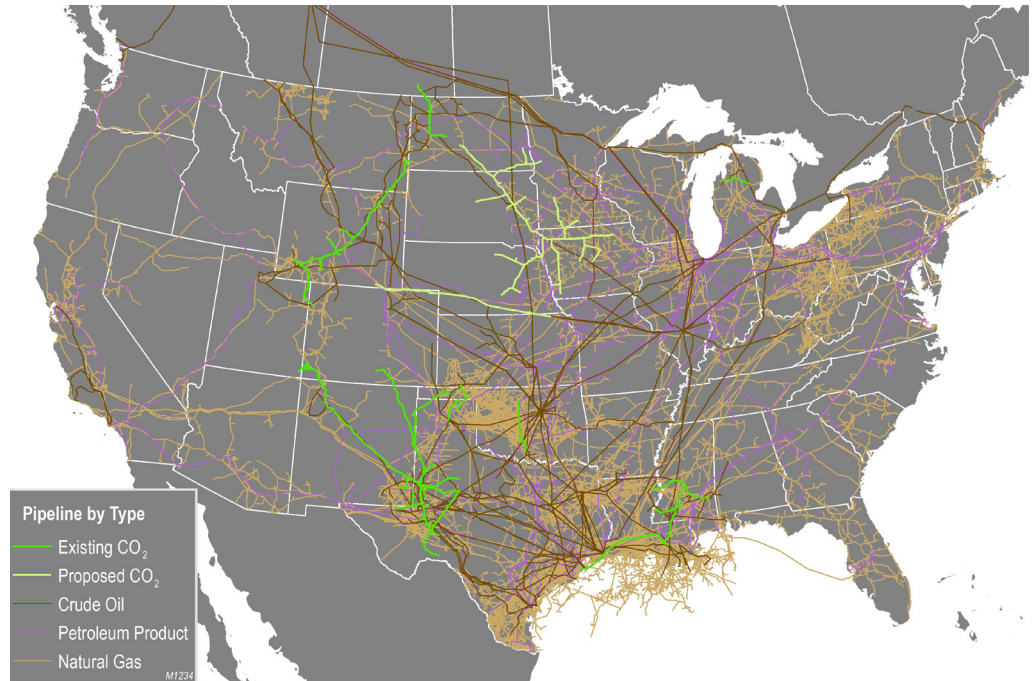


What to Know about Pipeline Safety

ENSURING THE SAFETY OF CO₂ PIPELINES



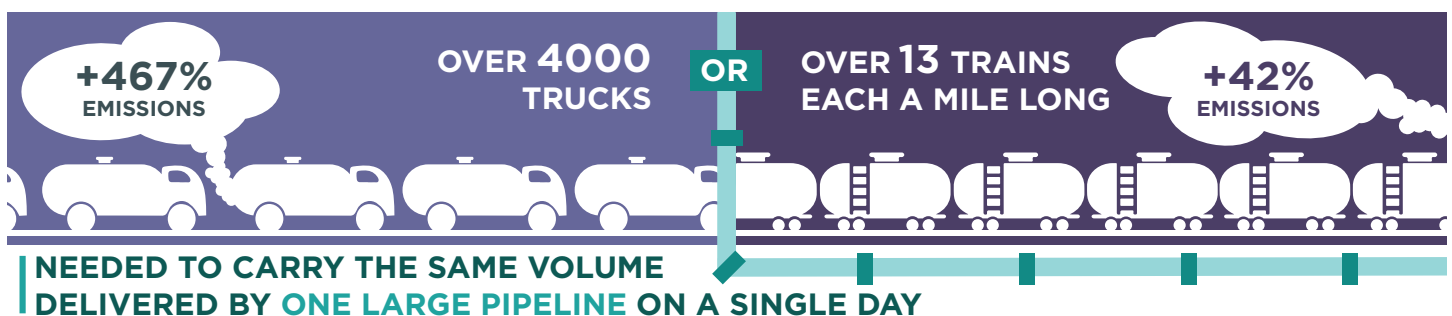
CO₂ has been safely transported via pipeline since the 1970s. The United States has over 5000 miles of CO₂ pipelines, primarily supporting enhanced oil recovery projects. As the nation focuses on reducing carbon emissions, demand will rise for permanent CO₂ storage solutions and lower carbon intensity oil production, necessitating a significant expansion of pipeline infrastructure. Ensuring the safety and reliability of these pipelines is crucial as we move toward a more sustainable future.



LEADING THE WAY IN SAFE TRANSPORT

The United States has almost 230,000 miles of pipelines for oil and petroleum products and another 3 million miles of natural gas pipelines.¹ When it comes to transporting CO₂, pipelines have consistently demonstrated the highest safety standards compared to trucks and trains. With significantly lower incident rates, the controlled environment of pipeline systems, along with their regular maintenance and monitoring, makes pipelines a reliable option for CO₂ transportation. There are about 50 pipelines across the United States, transporting about 66 million tonnes of CO₂ per year, which is equivalent to about 54 million gallons of CO₂ each day.

According to the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA), from 2010 to June 2024, 76 incidents were reported and documented on CO₂ pipelines and related facilities. These incidents resulted in zero fatalities.² During this period, 68% of incidents were small releases (unintentional release of 50 barrels/2100 gallons or less) that were quickly identified and addressed. The successful containment of small incidents is in part due to the stringent design specifications, robust monitoring and safety systems by pipeline operators, and detailed operational and response plans required by federal regulations for constructing and operating CO₂ pipelines. Furthermore, federal rules are being refined for new CO₂ pipelines as part of an ongoing update.



GOVERNMENT REVIEW HAS FOUND THE
PROBABILITY
OF AN INCIDENT FROM A PIPELINE IS
LOWER ↓ ↓ ↓
THAN OTHER TRANSPORT METHODS.

1 INCIDENT
PER
720
MILLION
GALLONS

1 INCIDENT
PER
55 MILLION
GALLONS

1 INCIDENT
PER
50 MILLION
GALLONS



Modified from the Liquid Energy Pipeline Association.

ENSURING SAFETY AND COMPLIANCE

CO₂ pipelines are regulated at both the state and federal levels. In general, states will oversee the placement and permitting of the pipelines, while safety regulations are enforced at the federal level. CO₂ pipelines are federally regulated by PHMSA. This organization is responsible for overseeing any incident responses, including investigations and reporting.

PHMSA'S PIPELINE RULES AND REGULATIONS

- Regulations, expanded in 1989 to cover CO₂ pipelines, require pipelines to be buried at least 3 ft below the surface, ensuring they are below plow depth.
- Pipelines must be set back a minimum 50 ft from existing dwellings.
- Safety measures include 24/7 monitoring, high-grade steel and protective coatings, proactive and routine inspection and preventative maintenance by pipeline operators, and high-tech inspection tools.
- Each pipeline system must have a manual of written procedures to cover normal operations, maintenance, incidents, interruptions, and emergencies.
- Operators must inform and train first responders on the specific composition of the fluid in the pipeline, including any emergency response plans.
- Operators must notify and work with local government and private bodies to incorporate all the requirements and regulations necessary to safely operate.

QUICK FACTS ABOUT CO₂

- Carbon dioxide (CO₂) naturally exists in our atmosphere and is contained in the exhaled breath of humans and animals.
- CO₂ is nonexplosive, nonflammable, and used in everyday applications like fire extinguishers, soda carbonation, and beer dispensers.
- CO₂ typically exists as a gas or a solid (e.g., dry ice). When compressed into a supercritical fluid, CO₂ behaves like a liquid, making it ideal for pipeline transport.
- CO₂ pressures in a pipeline are typically 1100–2200 psi. By comparison, CO₂ canisters for paintball guns or fire extinguishers are around 800 psi.
- If CO₂ leaks from a pipeline, it becomes gas or dry ice and evaporates, requiring minimal cleanup compared to oil or saltwater leaks.



¹. <https://www.eia.gov/energyexplained/natural-gas/natural-gas-pipelines.php>.

². <https://www.globalccsinstitute.com/wp-content/uploads/2024/05/Building-Our-Way-to-Net-Zero-Carbon-Dioxide-Pipelines-in-the-United-States.pdf>.

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