Pipeline and Hazardous Materials Safety Administration

Office of Pipeline Safety

PHMSA's Research and Development Forum 2023

Ashley Kroon – General Engineer

Engineering and Research Division

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PHMSA's Mission

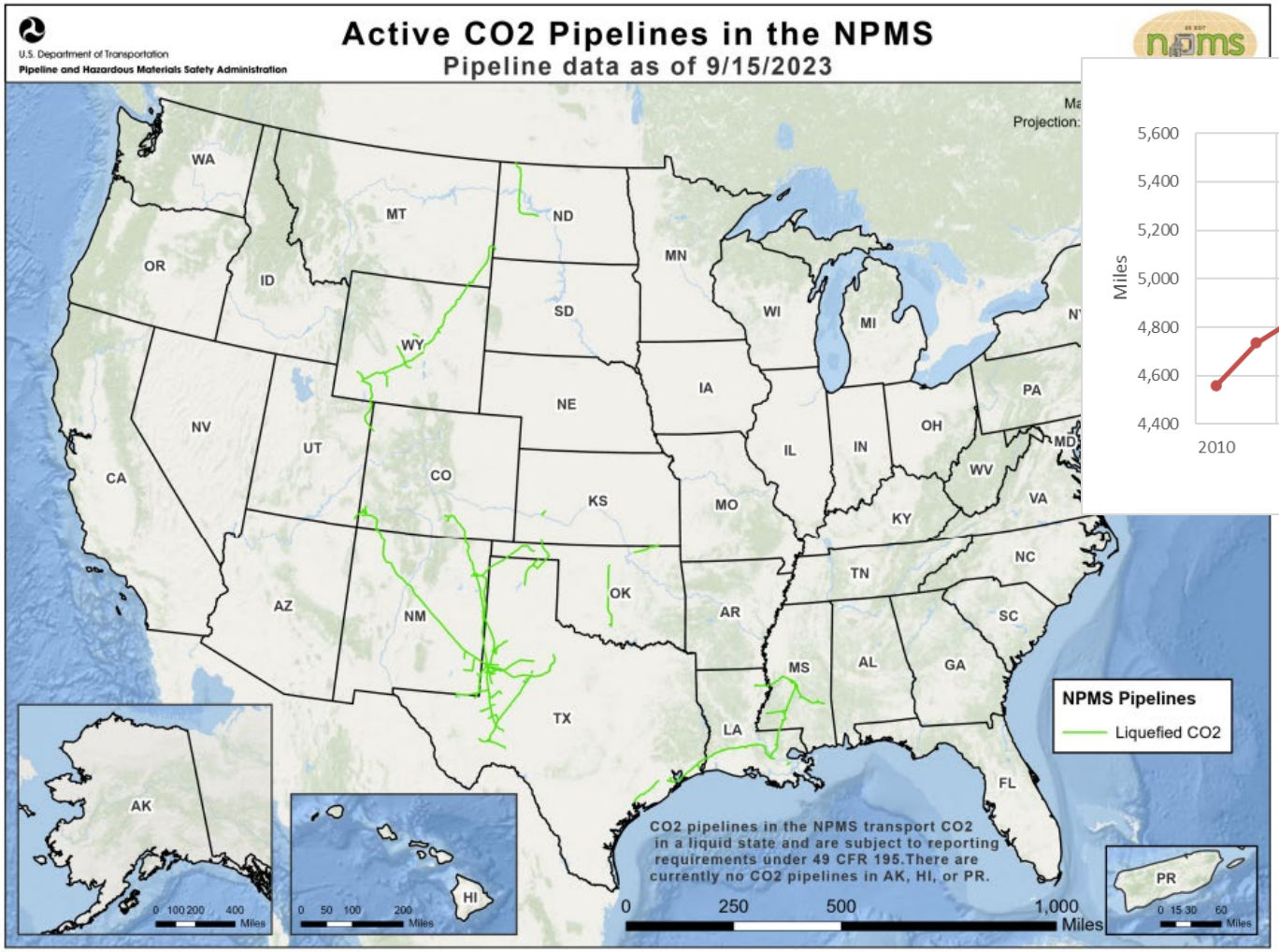
To protect people and the environment by **advancing the safe transportation of energy and other hazardous materials** that are essential to our daily lives. To do this, the agency establishes national policy, sets and enforces standards, educates, and conducts research to prevent incidents. We also prepare the public and first responders to reduce consequences if an incident does occur.

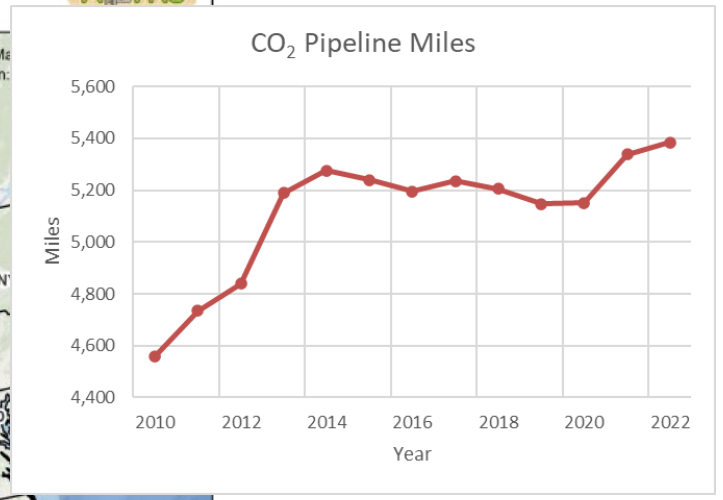
PHMSA By the Numbers

3.3 Million	1.2 Million	16,700	1.6 Billion	64%
Miles of Regulated Pipelines	Daily Shipments of Hazardous Materials	Underground Natural Gas Storage Wells	Tons of Hazardous Materials Shipped Annually by All Modes	Of U.S. Energy Commodities Transported by Pipeline

Carbon Dioxide Pipelines (CO_2)

CO_2 Pipeline Network





5,385 Miles

All Pipelines: PHMSA Regulates 3.4 M Miles Total

https://www.npms.phmsa.dot.gov/Documents/NPMS_CO2_Pipelines_Map.pdf

Developing Design and Welding Requirements Including Material Testing and Qualification of New and Existing Pipelines for Transporting CO_2

Researcher: BMT Commercial USA

Project Cost: $1,500,000 ($1,200,000 PHMSA + $300,000 cost sharing)

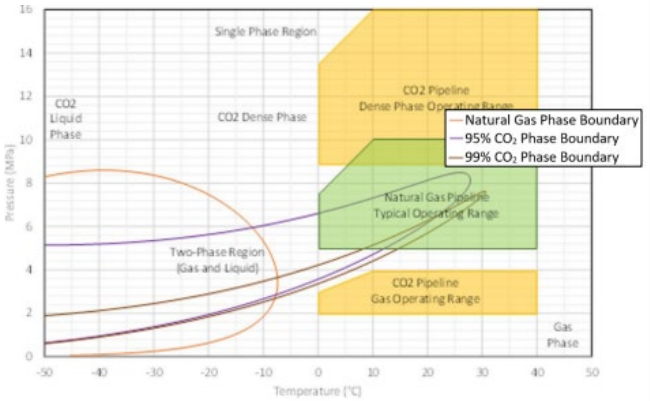
Public Page: https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=996

Project Objective:

- Identify unique aspects of CO_2 pipeline design, integrity, and operational considerations currently not well supported by existing knowledge.
- Define processes and procedures to fill these safety gaps.
- Identify performance-based safety targets for CO_2 pipelines.

Project End Date: 9/29/2024

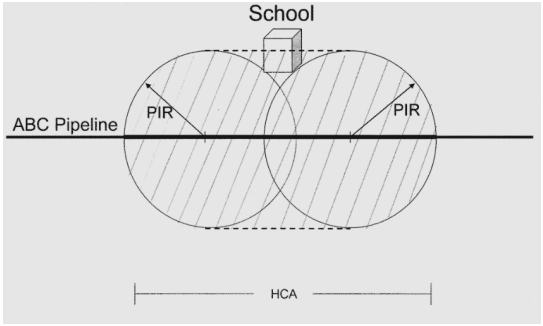
Potential Impact on Safety: Will advance the safe transportation of impure CO_2 at both low pressure (gas phase) and high pressure (supercritical and dense phase), by defining the state of knowledge and how it can be applied in CO_2 pipeline design, operation, and maintenance.



Pictures courtesy BMT

Determination of Potential Impact Radius (PIR) for CO_2 Pipelines Using Machine Learning Approach

Researcher: Texas A&M Engineering Experiment Station
Project Cost: $359,560 ($279,754 PHMSA + $79,806 cost sharing)
Public Page: https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=987



Project Objective:

- Establish a computational fluid dynamics model to simulate the release and dispersion of supercritical CO_2 from full pipeline ruptures.
- Use the simulation results to construct a database comprising CO_2 dispersion data under different scenarios.
- Use the resulting scenario data in a machine learning analysis for predicting dispersion ranges and health consequences.
- Develop a rapid, universally applicable tool to assess the consequences of accidental CO_2 dispersion from high-pressure pipelines.

Project End Date: 9/29/2025

Potential Impact on Safety: A tool to measure the impact radius will aid in the development of effective response planning.

Past CO2 Projects

Design, Development, and Testing of Optimized Composite Crack Arrestors – Two Phase Project

Researcher: Engineering Mechanics Corporation of Columbus

Project Objective: The development of the "Soft Crack Arrestor" validated design procedure will allow this device to be used for a wide variety of natural gas and liquid CO2, pipeline projects. This device will reduce the risk associated with catastrophic fracture of large-diameter natural gas or liquid CO2, pipelines.

Phase 1
Project Cost: $100,000
Public Page: https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=228
Phase 1 End Date: 2008

Phase 2
Project Cost: $750,000
Public Page: https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=290
Phase 2 End Date: 2013

R&D Links

About Pipeline Research & Development

The mission of PHMSA's Pipeline Safety Research & Development Program is to sponsor projects focused on providing technical solutions that will improve pipeline safety, reduce the environmental impact of failures, and enhance the reliability of the Nation's pipeline transportation system.

The research program has the following objectives:

- Employ a coordinated and collaborative approach to address mutual pipeline challenges with a wide set of pipeline stakeholders
- Help remove technical and sometimes regulatory barriers on a given challenge
- Tell the research story by measuring our research results, outputs, and impacts
- Promote transparency by posting online R&D program/project actions and products.

R&D Program Website: https://www.phmsa.dot.gov/research-and-development/pipeline/about-pipeline-research-development

R&D program awards and sortable features: https://primis.phmsa.dot.gov/matrix/

Submit a research gap suggestion: https://primis.phmsa.dot.gov/rd/gapsuggestions.htm

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