



# Pipeline and Hazardous Materials Safety Administration Office of Pipeline Safety

## PHMSA and Pipeline Safety of Carbon Dioxide Pipelines

*Max Kieba*

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U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

PHMSA: Your Safety is Our Mission



# PHMSA's Safety 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.



# What We Do



## Inspection and Enforcement

Inspect pipeline facilities to determine compliance with our regulations.



## Accident Investigation

Investigate accidents and incidents involving pipeline failures or releases and share lessons learned.



## Risk Analysis

Analyze safety performance, improve data quality and analytical capabilities to identify, assess and manage safety risks.



# What We Do



## Outreach

Enhance safety and education through stakeholder outreach and engagement.



## Grants

Award safety grants to support pipeline safety inspection, enforcement and outreach programs by states, territories, and non-profits.



## Regulations and Standards

Develop effective regulations and standards to advance pipeline safety.



## Research and Development

Support research to improve pipeline safety.



# PHMSA Regulates CO2 Pipelines

- Statutory and Regulatory Authority for CO2 pipelines in a supercritical phase (Title 49 CFR Part 195). This means:
  - We currently have regulations for supercritical CO2 pipelines
  - We inspect & enforce for compliance and safety on CO2 pipelines as defined by Part 195



# PHMSA Regulates CO2 Pipelines

- Statutory Authority for CO2 pipelines in a gaseous phase. This means:
  - We do not currently have regulations for gaseous CO2 pipelines
  - We can investigate any identified safety concern on a gaseous CO2 pipeline and require corrective action



# Past Projections for CO<sub>2</sub> Pipeline Growth vs. Actual

Part 195 Regulated CO<sub>2</sub> Pipelines  
(From Annual Report Data)

CO <sub>2</sub>	Calendar Year	Total Miles
	2021	5,338.9
	2020	5,150.3
	2019	5,147.1
	2018	5,205.7
	2017	5,236.7
	2016	5,194.8
	2015	5,240.5
	2014	5,275.6
	2013	5,190.0
	2012	4,840.3
	2011	4,735.3

- PHMSA currently inspects over 5300 miles of CO<sub>2</sub> pipe (as of 10/13/22).
- Development of CO<sub>2</sub> pipelines was slow last decade but may pick-up.
- Shift from enhanced oil recovery to carbon capture sequestration/storage
- Several large systems are currently proposed – primarily in the Midwest – with discussion of hubs elsewhere



# Focus areas during project reviews

- Follow Part 195 as applicable
- Fracture Propagation Control to arrest a running crack - something like 192.112 to meet 195.111
- High Consequence Area considerations such as HL Integrity Management (IM) but take into consideration effects to people/dwellings near pipeline similar to Gas IM – including diameter, operating pressure and valve closure time and spacing.
- Valve Spacing, Pressure Monitoring, Flow Monitoring, Rupture Mitigation, and Monitoring/SCADA
  - Use New Valve rule
- Other Part 195 Requirements, including but not limited to
  - pipe manufacture, design and maximum operating pressure
  - welding procedures
  - overpressure protection
  - emergency response
  - public awareness





# CO<sub>2</sub> Pipeline Incident Data

Calendar Year	Number	Fatalities	Injuries	Total Cost as Reported	Barrels Spilled	Net Barrels Lost
2001	1	0	0	\$11,052	18	18
2002	4	0	0	\$12,383	317	317
2003	7	0	0	\$62,871	11	11
2004	3	0	0	\$74,101	8,128	8,182
2005	2	0	0	\$3,888	2,401	2,401
2006	7	0	0	\$763,912	25,086	25,086
2007	4	0	1	\$115,425	24,540	24,540
2008	7	0	0	\$11,444	103	103
2009	4	0	0	\$153,134	1,077	1,077
2010	6	0	0	\$212,521	329	329
2011	4	0	0	\$168,770	2,542	2,542
2012	2	0	0	\$5,823	19	19
2013	5	0	0	\$270,387	52	52
2014	5	0	0	\$32,948	2,190	2,190
2015	7	0	0	\$67,224	1,281	1,281
2016	9	0	0	\$71,029	1,709	1,709
2017	9	0	0	\$132,993	218	218
2018	5	0	0	\$299,047	406	406
2019	4	0	0	\$375,395	480	480
2020	6	0	0	\$4,035,553	50,903	50,903
<b>Total</b>	<b>101</b>	<b>0</b>	<b>1</b>	<b>\$6,879,900</b>	<b>121,866</b>	<b>121,866</b>

**PHMSA Pipeline Incidents:**  
(2001-2020)

**Incident Type:**  
All Reported

**System Type:**  
Hazardous Liquid

**State:**  
(All Column Values)

**Offshore Flag:**  
(All Column Values)

**Commodity:**  
CO<sub>2</sub>

2021 data as of 10/13/2022

- 4 incidents
- 0 Fatalities or injuries
- \$66,184 Cost
- 786.99 Barrels Spilled/Net Lost



# PHMSA May Press Release

- Initiating rulemaking
- Issuing notice of probable violation
- Completing failure investigation report for 2020 pipeline failure in Satartia, MS
- Issuing an updated nationwide advisory related to land movements and geohazards
- Conducting research solicitations

<https://www.phmsa.dot.gov/news/phmsa-announces-new-safety-measures-protect-americans-carbon-dioxide-pipeline-failures>



# Actions since PHMSA May Press Release

- Initiated rulemaking. Limited on providing additional details due to ex-parte. Summary of meetings required.

## 117. Pipeline Safety – Safety of Carbon Dioxide Pipelines

**Popular Title:** Carbon Dioxide Pipelines

**RIN 2137-AF60**

**Stage:** NPRM

**Abstract:** This Proposed rulemaking would amend PHMSA's Pipeline Safety Regulations (49 CFR parts 190-199) to adopt revisions that would enhance the safe transportation of carbon dioxide by pipelines to accommodate an anticipated increase in the number of carbon dioxide pipelines and volume of carbon dioxide transported. Also, this proposed rulemaking would include requirements related to emergency preparedness and response for carbon dioxide.

### Dates for NPRM:

Action	Publication Date	FR Cite
NPRM	10/00/2024	

- <https://www.transportation.gov/regulations/report-on-significant-rulemakings>

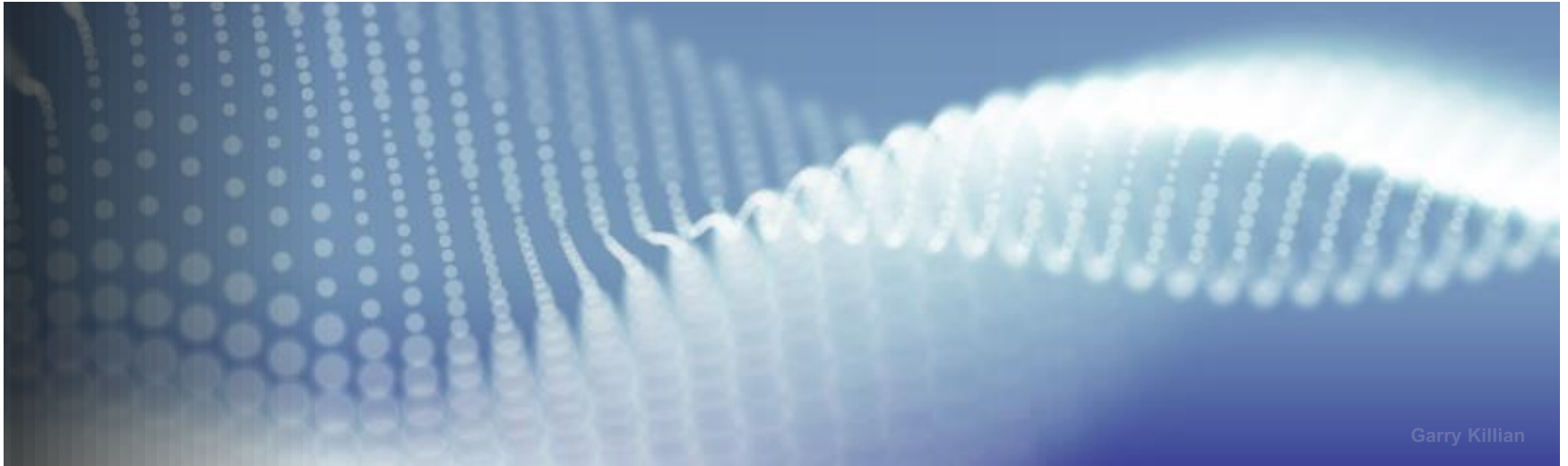


# Research awards since PHMSA May Press Release

- Competitive Academic Agreement Program (CAAP)
  - Texas A&M Engineering Experiment Station  
"Determination of Potential Impact Radius for CO2 Pipelines using Machine Learning Approach"
- Core program
  - BMT Commercial USA, Inc. "Developing Design and Welding Requirements Including Material Testing and Qualification of New and Existing Pipelines for Transporting CO2"



# Outreach and Engagement



Garry Killian

## RP-1162 Public Awareness

API RP 1162 is an industry consensus standard that provides guidance and recommendations to pipeline operators for the development and implementation of enhanced public awareness programs.

## RP-1185 Public Engagement

Provides guidance to natural gas and hazardous liquid pipeline operators, interested parties in the public, governments, and rights holders for effective stakeholder engagement.



# Public Engagement

## Effective Communication & Engagement



- During Siting And Permitting
- During Construction
- About Existing Pipelines
- After An Accident
- After Change In Pipeline Status



# Safety Management Systems (SMS)



- Regulations alone will not help us reach *zero incidents*.
- **SMS is the key to closing the safety gaps that cause incidents.**
- Implementation of a SMS underpinned by a culture of safety is needed to get us to our goal of *zero incidents*.



# Thank You

## Questions?

