RegSafe

Safety of CO2 and Hazardous Liquid Pipelines NPRM Current Rules and What to Expect

Texas Railroad Commission
Regulatory Conference
Round Rock TX
July 14, 2025

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Outline

1. The NPRM process in general
2. The impact of the current administration's policies
3. The proposed Part 195 definition of carbon dioxide
4. Proposed changes in reporting requirements
5. Significant changes regarding the regulation of liquid gathering lines
6. CO2 specific regulatory changes
7. Additional requirements regarding conversion of service
8. Recent ANPRMs
9. Conclusions

Introduction

- In January 2025, PHMSA sent a Safety of Carbon Dioxide and Hazardous Pipelines Notice of Proposed Rulemaking (NPRM) to the Federal Register for publication.

- On his first day in office, January 20, 2025, President Trump issued a memorandum, “Regulatory Freeze Pending Review” which required all Federal Agencies to “Immediately withdraw any rules that have been sent to the OFR [Office of the Federal Register] but not published in the Federal Register . . .”

- On January 31, 2025, President Trump issued Executive Order 14192, “Unleashing Prosperity Through Deregulation,” which included the requirement that “. . . any new incremental costs associated with new regulations shall, to the extent permitted by law, be offset by the elimination of existing costs associated with at least 10 prior regulations.”

Disclaimer

- This presentation is based on the contents of the withdrawn NPRM - Docket No. PHMSA-2022-0125, RIN 2137-AF60.

- Most, if not all, final rules end up looking very similar to the underlying NPRM.

The opinions expressed in this presentation are those of the author and may or may not reflect the ultimate outcome of the rulemaking – either in terms of content or in terms of timing.

The Administrative Procedure Act (APA) 5 USC §551 et seq. (1946)

- The APA governs the process by which federal agencies develop and issue regulations. It includes requirements for publishing notices of proposed and final rulemaking in the Federal Register and provides opportunities for the public to comment on notices of proposed rulemaking. The APA requires most rules to have a 30-day delayed effective date.

- In addition to setting forth rulemaking procedures, the APA addresses other agency actions such as issuance of policy statements, licenses, and permits. It also provides standards for judicial review if a person has been adversely affected or aggrieved by an agency action.

The NPRM Process

- PHMSA decides to address a “problem”:
  - Problems recognized by PHMSA
  - Petitions (industry, public, states)
  - National Transportation Safety Board (NTSB)
  - Congressional Mandate
  - Advancing Technology
- PHMSA decides how to address the problem
- PHMSA issues a Notice of Proposed Rulemaking
- There is usually a Public Comment Period
- PHMSA addresses each and every comment
- PHMSA issues a Final Rule
- Technical Corrections

The NPRM Process

- The Rulemaking process may take years depending on the magnitude of the rulemaking, the number of public comments, and litigation.
- The original rulemaking may be broken down into segments.
- The effective dates of any new rules or changes to existing rules may vary from the date the “final” rule is published to a year or more after the publication date.
- Each final rule should have a preamble explaining how each and every comment has been addressed.
- Each final rule should have an economic impact statement
- PHMSA typically appears to underestimate costs and over estimate benefits.

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The Impact of the Current Administration

- One cost that PHMSA has, to my knowledge, NEVER considered, is the cost of the rulemaking process itself. More specifically, the cost to the agency itself as well as the cost to industry in evaluating and commenting concerning proposed changes.

- It is too early to tell how long the “Regulatory Freeze Pending Review” will last.

- It is also too early to tell how Executive Order 14192, “. . . any new incremental costs associated with new regulations shall, to the extent permitted by law, be offset by the elimination of existing costs associated with at least 10 prior regulations.” will be enforced.

Definition of Carbon Dioxide
(§195.2)

Current

Carbon dioxide means a fluid consisting of more than 90 percent carbon dioxide molecules compressed to a supercritical state.

Proposed

Carbon dioxide means a fluid consisting of more than 50 percent carbon dioxide molecules in any combination of the **gas**, liquid, or supercritical phases.

Definition of Hazardous Liquid
(§195.2)

Current (Unchanged)

Hazardous liquid means petroleum, petroleum products, anhydrous ammonia, and ethanol or other non- petroleum fuel, including biofuel, which is flammable, toxic, or would be harmful to the environment if released in significant quantities.

Issue

Carbon dioxide “would be harmful to the environment if released in significant quantities.”

Definition of Highly Volatile Liquid
(§195.2)

Current

Highly Volatile Liquid or HVL means a hazardous liquid which will form a vapor cloud when released to the atmosphere and which has a vapor pressure exceeding 276 kPa (40 psia) at 37.8 °C (100 °F).

Proposed would simply add "Carbon Dioxide"

Carbon dioxide would become, by definition, a highly volatile liquid.

Apparent Rationale

Carbon dioxide is an asphyxiant and is not regulated under 49 CFR Part 192.

Proposed changes in Reporting Requirements

§ 195.49 Annual report

Would segregate non-carbon dioxide HVLs and carbon dioxide (insignificant)

§ 195.54 Accident reports

Required for gaseous carbon dioxide lines

§195.55 Reporting safety-related conditions

Exemption under §195.55(b) no longer available for HVL pipelines (220-yard buffer)

§196.109 Excavation Damage Report

Would be required for gaseous CO2 lines

Liquid Gathering Lines

- Would no longer be exempt from §§ 195.258, 195.260, and 195.418 (2 or more miles of pipe entirely replaced, §195.2)
- Would no longer be exempt from notification of potential rupture (§195.2)
- Would no longer be exempt from rupture mitigation valve requirements (§195.2)

Liquid Gathering Lines

- Regulated gathering would be subject to §195.54 Accident reporting
- Would no longer be exempt from §195.134 Leak detection
- Would granted minor relief under §195.402(c)(5) – accident and failure investigation (probably insignificant) but would be subject to the rest of §195.402 (§195.402(g) exemption would be eliminated)
- Would no longer be exempt from notification of potential rupture (§195.417)

Liquid Gathering Lines

- Would no longer be exempt from rupture mitigation valve requirements (§195.2)
- Would no longer be exempt from §195.444 Leak detection
- Would be subject to §195.444(c) CPM leak detection systems if CPM is installed and API RP 1130 even if transporting gaseous carbon dioxide
- Would no longer be exempt from §195.452(i)(4) - Emergency Flow Restricting Devices (EFRD)

Carbon Dioxide Specific Changes

- §190.3 Definitions – Emergency Orders and Imminent Hazards would expressly apply to carbon dioxide facilities
- §190.236 Emergency orders would expressly apply to carbon dioxide facilities
- §195.1(b)(8) would be revised to eliminate the words “or carbon dioxide” in an exemption from Part 195 (meaningless if carbon dioxide is considered a hazardous liquid)
- §195.1(b)(10) would be revised to exempt transportation of carbon dioxide downstream from the outlet of the pipeline isolation valve located at the wellhead of an injection well used for long-term carbon dioxide storage.

Exemption

- §195.1(b)(11) would be added: “Transportation of carbon dioxide through **piping or equipment used in the production (including flow lines), extraction, recovery, lifting, stabilization, separation, or treatment of carbon dioxide or the preparation of carbon dioxide for transportation by pipeline at production (including flow lines), refining, or manufacturing facilities** [would be excepted]**.** This exception does not apply to any device and associated piping that are necessary to control pressure in the pipeline under §195.406(b).”

Proximity

§195.210(c) would be added to impose additional requirements for onshore carbon dioxide pipelines located within 2 miles of any residence, business, or place of public assembly in which persons work, congregate, or assemble.

- Records that demonstrate the reasons the location was impracticable to avoid would have to be maintained for the life of the pipeline. ((c)(i))

- A very detailed emergency planning zone analysis would be required based on an extremely detailed population density survey. ((c)(ii))

Proximity

- Emergency response information must be provided to each building intended for human occupancy (including residences and businesses) and places of public assembly (identified site) before initial operations commence. ((c)(iii))

- The emergency response information must meet the requirements of the Public Awareness Program. ((c)(iii))

Proximity

- If an identified site is determined to be within a location that could be affected by the release of carbon dioxide pursuant to the vapor dispersion analysis required under §195.452(f)(1) or the default 2-mile distance noted at §195.456(a), emergency response information should include an explicit statement of that determination and identify any precautions the public in those locations should take in the event of an emergency. ((c)(iii))

Query: What is an adequate explicit statement of determination?

Vapor Dispersion Analysis

New §195.456

- A vapor dispersion analysis may use a validated engineering-based model to determine extent of potentially impacted area **OR** simply conclude that everything within 2 miles of the pipeline is a High Consequence Area (HCA). ((a))

- A validated, engineering-based model must include in its analysis, each of 7 listed elements to determine the distance a release could affect an HCA for each pipeline segment. ((b))

Query: What is considered a "validated engineering-based model" by PHMSA?

Vapor Dispersion Analysis

Comment: The 7 elements appear generally rational, useful in developing a sound emergency response plan, and essential to developing a risk assessment addressing carbon dioxide pipeline systems.

- Operators using a validated, engineering-based model must review and update the analysis at least once each calendar year NTE 15 months, including evaluating and documenting material changes made to the model or elements used in the analysis. ((c))

- Each operator must make and maintain records of the analysis, review, and any update performed pursuant to this section in accordance with § 195.452(l). ((d))

Vapor Dispersion Analysis

Comment:

The effect of the proposed §195.456 Vapor dispersion analysis would be to declare every carbon dioxide pipeline system as in or affecting a High Consequence Area and subject to essentially all the requirements of §195.452 Pipeline integrity management in high consequence areas.

Failure Propagation

§195.111 would be completely revised and enhanced.

Current version: “A carbon dioxide pipeline system must be designed to mitigate the effects of fracture propagation.”

Replacement language: Legacy pipelines. A carbon dioxide pipeline system transporting a fluid consisting of more than 90 percent carbon dioxide molecules compressed to a supercritical state and constructed prior to [DATE OF PROPOSED FINAL RULE] must be designed to mitigate the effects of fracture propagation. (§195.111(d))

Failure Propagation

Why is failure propagation important?

Higher pressures and physical characteristics of Carbon Dioxide.

Running Ductile Failure

Running Ductile Failure

Failure Propagation

The proposed §195.111(a) would apply to carbon dioxide pipeline constructed, replaced, relocated, otherwise changed, or converted to service after the effective date of the proposed rule and is incredibly detailed.

- Fracture initiation must be evaluated and dealt with under every conceivable combination and permutation of operating conditions and materials. ((a)(1))

- Toughness of pipe for each grade used and the decompression behavior of the carbon dioxide at operating parameters must be considered and documented. ((a)(2))

Failure Propagation

- An operator must ensure at least 99-percent probability of fracture arrest within eight pipe lengths with a probability of not less than 90-percent within five pipe lengths. ((a)(3))

- Fracture toughness testing (including shear fracture area, Charpy v-notch impact test, and drop weight tear tests) to ensure ductile fracture arrest. ((a)(4))

Failure Propagation

- **Toughness**. The toughness properties for pipe must address the potential for initiation, propagation and arrest of fractures in accordance with Annex G of API Specification 5L **AND** any correction factors needed to address pipe grades, pressures, temperatures, or product compositions not expressly addressed in Annex G of API Specification 5L!! (§195.111(b))

- **Alternative measures**. If it is not physically possible to achieve the pipeline toughness properties of paragraphs (a) and (b) of this section, additional design features, such as mechanical or composite crack arrestors, heavier walled pipe of proper design and spacing, must be used to ensure fracture arrest as described in paragraph (a)(3) of this section. (§195.111(c))

Failure Propagation

Failure Propagation is a BIG DEAL with respect to Carbon Dioxide systems!!

If you plan to design, operate, or maintain a CO2 system, you will need significant expertise to deal with §195.111!!

Glaring Omission: Breakout Tanks

Definition

Per §195.2, “Breakout tank means a tank used to (a) relieve surges in a hazardous liquid pipeline system or (b) receive and store hazardous liquid transported by a pipeline for reinjection and continued transportation by pipeline.”

Problem

Carbon Dioxide is a completely different animal than the vast majority of other Hazardous liquids (“petroleum, petroleum products, anhydrous ammonia, and ethanol or other non-petroleum fuel, including biofuel, which is flammable, toxic, or would be harmful to the environment if released in significant quantities”).

Catch 22

Under the proposed rules, carbon dioxide would be expressly identified as a Highly Volatile Liquid (HVL) subject to Part 195.

Issues

- Part 195 addresses only aboveground breakout tanks. There are no proposed regulations regarding underground storage of carbon dioxide.

- Virtually all aboveground carbon dioxide storage tanks will be high pressure steel tanks (greater than 15 psig). Part 195 addresses only high pressure tanks containing liquified petroleum gas (LPG) – not carbon dioxide.

- Per Part 195, High pressure steel tanks must be designed and maintained according to API Standard 2510, “Design and Construction of **LPG** Installations.” (emphasis added)

Breakout Tanks Bottom Line

PHMSA has a **LOT** of work to do with respect to Carbon Dioxide Breakout tanks.

Conversion of Service

There are several changes specific to conversion of service to carbon dioxide and several that are generally applicable to all conversions to Part 195 service:

- All §195.5(a) requirements would have to be completed PRIOR to placing the converted pipeline in service
- New §195.5(a)(3) – All conversions would have to meet the design and construction requirements in effect at the time of the conversion for all segments that are new, replaced or otherwise changed.
- Each pipeline converted to carbon dioxide would have to be spike tested in accordance with §195.309

Conversion of Service

- §195.5(c) – completely revised – lines converted to carbon dioxide would require a close interval survey (CIS) w/in 15 months of service date unless it is documented that a CIS is not possible for geographical, technical or safety reasons.
- New §195.5(c)(1) – would require the CIS to be performed using interrupted protective current method unless impossible for technical or safety reasons.
- New §195.5(c)(2) – would require correction of any §195.5(c) issues. (plan & permits w/in 6 months, complete w/in earliest of 12 months of discovery or ASAP NTE 6 months after securing permits).

Conversion of Service

- §195.5(d) – completely revised – lines converted to carbon dioxide would require a coating survey (ACVG or DCVG or other technology) w/in 15 months of service date unless it is documented that a survey is not possible for geographical, technical or safety reasons.
- New §195.5(d)(1) – would require 90 days notice to PHMSA if other technology is proposed
- New §195.5(d)(2) – would require repair of any coating damage classified as severe (indicated by a voltage drop greater than 60 percent for DCVG or 70 dBµV for ACVG) in accordance with the requirements of §195.5(d)(2).

Conversion of Service

- New §195.5(e) –lines converted to carbon dioxide would require ILI w/in 12 months of service date per §195.416 or §195.452 (as applicable) and then follow §195.401 if anything is discovered.
- Still must keep for the life of the pipeline a record of the investigations, tests, repairs, replacements, and alterations made under conversion of service.
- Still must notify PHMSA 60 days before the conversion occurs as required by §195.64.

Notifications

- Notifications requesting use of a different integrity assessment method, analytical method, sampling approach, compliance timeline, or technique (e.g., “other technology” or “alternative equivalent technology”) must still be submitted at least 90 days in advance.

- May proceed on 91st day unless, in writing, PHMSA objects or notifies requester that more time or information is needed for review

§195.18(c)

Three Final CO2 Issues

- **Pigging:** Smart pigs are typically designed for hydrocarbon rich environments. Carbon Dioxide has no natural lubricity. CO2 pigs must be specially designed to resist the CO2 environment.

- **Dewatering:** CO2 and water combine to form carbonic acid. CO2 lines must be thoroughly dried after a hydro test.

- **Test Pressure:** Subpart E of Part 195 sets the requirements. Water is the default test medium. CO2 may be used if certain rigorous requirements are met. The test pressure must be 125% of MOP. If the system is in uneven (mountainous) terrain, the test sections will most likely be shorter than normal – especially because of the higher pressures associated with CO2.

Repair Criteria ANPRM (RCA)

- May 21, 2025, PHMSA issued its first ANPRM since the new administration took over: Repair Criteria for Hazardous Liquid and Gas Transmission Pipelines (RCA)
- The RCA appears completely unrelated to the withdrawn January 4 ANPRM discussed above.
- The RCA addresses numerous topics: Balance between safety benefits and compliance costs; innovative technologies & methods; risk-based v. prescriptive methods; discovery of anomalies; repair methods; impact on small businesses; extraneous reporting information; prioritization of public safety; HCAs v. non-HCAs; timelines; unknown material properties; predicted failure pressure-based criteria; Engineering Critical Assessments (ECAs); interacting threats; and finally, breakout tanks.
- "Are there any PHMSA interpretations . . . [that] impose unjustified compliance costs for different categories of pipeline facilities?"

Comment: Ya think??!!

Regulatory Review ANPRM

- June 4, 2025, PHMSA issued its second ANPRM since the new administration took over: Mandatory Regulatory Reviews To Unleash American Energy and Improve Government Efficiency
- PHMSA is soliciting "stakeholder feedback on whether to repeal or amend any requirements in the Pipeline Safety Regulations to eliminate undue burdens on the identification, development, and use of domestic energy resources and to improve government efficiency."

Comment: This ANPRM clearly appears to be in response to the change in administration. Only 3.3 pages in the Federal Register, it is, however, extremely broad. Eighteen questions are posed.

- Example question: "Are there any interpretations (§190.11), approvals (§190.9), or special permits (§190.341) that should be incorporated into the PSR [Pipeline Safety Regulations] to eliminate undue burdens or improve government efficiency?"

Observation: This ANPRM appears to have been generated by Artificial Intelligence (AI). That said, each and every question is relevant. Problem: Fully addressing each question under the Administrative Procedures Act will, in this writer's opinion, require far more rulemaking resources than PHMSA has or will obtain in order to achieve meaningful results in the reasonably foreseeable future.

Conclusions

I have tried to hit some of the high (low??) points.

There is a LOT of sausage that must be ground before anything discussed here becomes a final rule.

It may (almost certainly will) take years.

The change in administration appears to have changed the direction of PHMSA – a good thing!! (Note that this is not a criticism of prior senior management of PHMSA.)

There has been significant recent turnover in senior management at PHMSA. The ability of new senior management at PHMSA to implement the policies of the current administration remains to be seen.

If the pipeline industry fails to adequately comment when offered the opportunity, there is little hope that there will be meaningful improvements.

Good LUCK!!

Questions

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