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A Stroll Through the Proposed CO2 Pipeline Safety Rule

The PHMSA Proposed CO2 Pipeline Rule

- On January 15, PHMSA released a pre-publication copy of its Notice of Proposed Rulemaking (NPRM) entitled “Pipeline Safety: Safety of Carbon Dioxide and Hazardous Liquid Pipelines,” and stated an intention to publish this proposed rule in the federal register for public comment
- Includes substantive and procedural safety standard improvements for both carbon dioxide (CO2) and hazardous Liquid (HL) pipelines
- The NPRM is 346 pages and includes an executive summary and sections on background, proposed amendments, a section-by-section analysis, and various legally required regulatory analyses and notices.
- Proposed Rule available at: <https://pipelinefighters.org/news/understanding-phmsas-draft-co2-pipeline-rules-webinar-1-28/>

The Effect of the Trump Hold

- On January 20, the Trump administration put a hold on PHMSA's proposed CO2 Pipeline Safety Rule, as well as all other pending rules
- The order did not expressly terminate all pending rules
- Presumably, the proposed CO2 pipeline safety rule will be reviewed by the President's political appointees in the Department of Transportation, Pipeline and Hazardous Materials Safety Administration, the Office of Management & Budget, and White House staff, who will determine its fate
- The Trump administration could publish this rule as is, amend it and publish, or terminate and abandon this rulemaking effort entirely

PHMSA's Proposed Changes to CO2 Pipeline Safety Standards

- Addresses 22 significant areas of CO2 pipeline safety
- Also includes administrative and “conforming” technical changes

Section-by-Section Review

PHMSA Jurisdictional Limits at Capture, Sequestration, EOR, and Use Facilities

- **New § 195.1(b)(11)**: Clarifies that PHMSA has no jurisdiction over piping or equipment used in the “production, extraction, recovery, lifting, stabilization, separation, or treatment of carbon dioxide or the preparation of carbon dioxide for transportation by pipeline at production, refining, or manufacturing facilities”
- However, PHMSA retains jurisdiction over all pumps, compressors, and other equipment “necessary to control pressure” downstream
- **New § 195.1(b)(10)(iii)**: PHMSA will not regulate pipelines downstream of “the outlet of the pipeline isolation valve located at the wellhead of an injection well used for long-term carbon dioxide storage.”
- PHMSA recognizes that the USEPA’s Underground Injection Control (UIC) Program regulates CO₂ injection into enhanced oil recovery and sequestration injection facilities

Proposed Rule at pages 55 - 57, 245-46, 309-10

Definition of “Carbon Dioxide”

- **Amend § 195.2:** The definition of “carbon dioxide” would be changed to “Carbon dioxide means a fluid consisting of more than 50 percent carbon dioxide molecules in any combination of the gas, liquid, or supercritical phases”
- If carbon dioxide constitutes the majority of a product stream then that pipeline would be regulated as a carbon dioxide pipeline
- Includes all phases of carbon dioxide that could be shipped via pipeline
- Does not regulate product streams with low amounts of CO₂, because the products shipped by natural gas and oil pipelines typically contain small amounts of CO₂

Proposed Rule at pages 12, 57-62, 66, 310

CO2 Included as a “Highly Volatile Liquid”

- **Amend § 195.2:** Adds carbon dioxide to the definition of “Highly Volatile Liquid” (HVL), a classification that currently includes potentially explosive liquids such as propane and gasoline, but not CO2
- HVL are materials that create a vapor cloud on release
- HVL pipelines are subject to heightened safety standards on valve spacing and location; pressure testing; emergency planning and notification procedures; pipe movement; overpressure safety devices and protection system testing; and integrity management; making CO2 an HVL adds these standards to CO2 Pipelines
- Related to Proposed Rule HVL requirements for safety-related condition reporting; vapor detection and alarm systems; and vapor dispersion analysis

Proposed Rule at pages 12, 62-67, 311

Expanded Reporting for “Safety-Related Conditions”

- **Amend § 195.55:** Currently pipeline operators must report “safety related conditions” to PHMSA, but only when the condition is closer than 220 yards from occupied buildings and places of assembly; within the right-of-way of a railroad, paved road, street, or highway; or where a release could cause water pollution
- Amendment would require reporting of safety related conditions for all HVL pipelines regardless of the distance to any building or assembly place
- This rule would increase PHMSA awareness and oversight of potentially dangerous conditions on CO2 pipelines

Accident Reporting

- **Amend Form F7000-1.1:** Proposed changes to PHMSA accident reporting Form F7000-1.1 to require disclosure of the phase of released CO₂, total annual identified CO₂ accidentally released, and estimated system leaks, including fugitive leaks

Proposed Rule at pages 72-75, 249, 285, 292-93, 317-18

Running Fractures

- **Amend § 195.111:** Enhanced safety standards to prevent running fractures, including pipe strength standards, and where pipe strength standards are not sufficient, crack arrestors must be installed
- Applicable to pipelines that are new, replaced, relocated, changed, or converted
- Requires operators to consider the full range of relevant parameters over a pipeline's lifetime to determine ongoing resistance to running fractures
- Pipe specifications must “ensure at least a 99 percent probability of fracture arrest within 8 pipe lengths (not to exceed 320 feet) and at least a 90 percent probability of fracture arrest within 5 pipe lengths (not to exceed 200 feet)”
- Compliance with API Spec 5L Annex G re steel toughness

Proposed Rule at pages 15, 84-91

Valve Design

- **Amend § 195.116:** require compatibility of carbon dioxide and hazardous liquid pipeline valve components with all constituents and contaminants in a product stream
- CO2 pipeline valves are exposed to potentially higher rates of corrosion, extreme cold, a variety of chemical contaminants, and other factors not found in other hazardous liquid pipelines
- Since the carbon capture industry is still relatively new, the potential content of CO2 product streams from various types of capture facilities is unknown such that conventional valve components may not be compatible with CO2 product streams

Computer Leak Detection Systems

- **Amend § 195.134:** Expand requirement for computational pipeline monitoring (CPM) leak detection systems to include all CO2 pipelines
- Existing CO2 pipelines that could affect a high consequence area are already required to have CPM leak detection systems
- Existing CO2 pipelines that do not potentially affect an HCA would have four years to install a CPM system

Proposed Rule at pages 81, 91-97, 252-3, 266, 321-22

Location-Based Safety Standards

- **Amend § 195.210:** enhance the location-based safety standards that apply “following a pipeline operator’s decision-making regarding the location of their facilities” that apply to newly constructed, relocated, replaced, or otherwise changed or converted pipelines transporting carbon dioxide within 2 miles of any residence, business, or place of public assembly
- Operators must retain their route decision making documents
- Requires population density surveys to catalog the location and needs of affected persons to inform pre-emergency public awareness initiatives and facilitate response
- Requires distribution of emergency info including specific precautions to every occupied building and place of public assembly

Proposed Rule at pages 99-109, 253-54, 323-24

Depth of Cover

- **Amend § 195.248:** Increases depth of cover over pipelines in agricultural lands to 48 inches
- Retains requirement that the depth be below the level of cultivation, which may exceed the minimum required depth

Leak Detection and Alarm Systems at Pump, Compressor, Meter, and Valve Stations

- **New § 195.263:** Requires vapor detection and alarm systems for new and HCA-adjacent CO₂ and HVL pipelines that are constructed, replaced, relocated, otherwise changed, or converted to service on or after the effective date of the final rule at all pump, compressor, meter, and valve stations
- **New § 195.452(i)(5):** Requires existing HVL pipelines to install similar detection and alarm equipment at with facilities that could affect an HCA
- Systems must detect and continuously monitor for HVL products and constituents at 25% of ILDH, and provide audible, visual, and operating software alarms
- **New § 195.429:** Provides for the regular maintenance and testing of facility vapor detection and alarm systems

Proposed Rule at pages 18-19, 113-24, 155-58, 225-28, 256, 264-65, 267-68, 326-27, 334

Remove CO2 as Approved Pressure Test Medium

- **Amend § 195.306:** Remove CO2 from the list of approved substances with which to perform pressure tests
- Operators perform hydrostatic pressure tests on new pipelines by filling them with water or another substance and increasing pressure to test whether they will break or stretch
- The proposed rule would prohibit use of CO2 to test pressure

Proposed Rule at pages 16, 83, 124-28, 257-58, 346

Spike Pressure Testing

- **New §§ 195.309 and 195.588**: Enhanced Spike pressure testing requirements including holding pressure at the lesser of 150% of maximum operating pressure (MOP) or 100 percent of sustained maximum yield strength (SMYS) for 30 minutes followed by 125% of maximum operating pressure for 8 hours, for new and converted CO2 pipelines
- Mostly consolidates existing requirements for spike testing into new sections

Proposed Rule at pages 15-16, 128-34, 258, 328-29

Geohazard Prevention

- **Amend § 195.412(a)**: Requires that CO2 and HL pipeline operators “examine the rights-of-way and adjacent land for “indications of leakage, construction activity, geologic hazards, reduced depth of cover, and other factors that may affect pipeline integrity, safety, and operation.”
- **New § 195.412(c)**: Requires CO2 and HL pipeline operators to (1) perform additional inspections and evaluations for geohazards; (2) determine the extent of geohazards and their potential impacts on pipelines; and (3) take remedial action to mitigate geohazards
- Current standards require nothing more than inspection

Proposed Rule at pages 16-17, 141-49, 151-54, 263-64, 333

Inspection and Maintenance of Depth of Cover

- **New § 195.412(d)**: When operators observe indications that depth of cover over a buried pipeline is less than required by § 195.248, they must (1) perform additional inspections and evaluations; (2) determine the extent of the reduced depth of cover and its impact on the pipeline; and (3) take remedial action
- Applicable to all lands and water crossings
- Remedial actions may include restoring depth of cover to the levels specified at § 195.248; re-grading the pipeline right-of-way to minimize scour and erosion; exposing and reburying the pipeline at a lower depth; reducing operating pressure temporarily or shutting-in the affected pipeline segment completely; and/or re-routing the pipeline
- **New § 195.412(e)**: Must retain records of geohazard inspections and remediation

Proposed Rule at pages 152, 264, 333

Conversion-to-Service

- **New § 195.5(a)(3):** Pipelines converted from natural gas service to either CO₂ or HL service must comply with PHMSA Part 195 design and construction standards before they start the new service
- **New § 195.5(a)(5):** Pipelines must be spike tested before conversion to CO₂ service
- **New § 195.5(c)(1) and (2):** Pipelines converted to CO₂ service must be surveyed for corrosion within 15 months after conversion, initiate a remediation plan within 6 months of the survey, and complete the plan with 12 months of the survey or 6 months after obtaining all permits
- **New § 195.5(d):** Coatings on pipelines converted to CO₂ service must be surveyed within 15 months after conversion in accordance with the deadlines in § 195.5(c)(2)
- **New § 195.5(e):** Operators must conduct an in-line inspection (ILI or pigging) within 12 months after conversion to CO₂ service

Proposed Rule at pages 16, 163-78, 248, 312-16

Support for Local Emergency Response Agencies

- **New § 195.402(c)(16):** Carbon dioxide pipeline operators must provide local emergency response organizations with equipment, instruments, tools, and materials needed to respond to CO2 pipeline emergencies, and train local responders in the use of these resources
- Equipment may include (1) personal safety devices, such as breathing apparatuses and fire-resistant clothing, (2) detection and monitoring equipment, (3) clean-up materials, (4) containment equipment, (5) access materials, such as gravel and mats, and (6) other needed materials

Company Emergency Response Capacity

- **New § 195.402(e)(3)**: Requires operators of CO₂ and HL pipelines to have detectors for flammable, asphyxiating, or toxic concentrations of hazardous liquid or carbon dioxide, as well as known deleterious constituents in the product stream, at the scene of an emergency
- **Amended § 195.402(c)(14)**: Requires construction site CO₂ and hazardous gas detection, fire control, and other safety equipment
- **Amended § 195.402(e)(8)**: The addition of CO₂ as a HVL would require CO₂ pipeline operators to have on-site equipment to assess vapor cloud extent
- **Amended § 195.403(a)(4)**: Adds asphyxiation to the list of dangers, triggering enhanced training and equipment for CO₂ pipeline operator personnel

Proposed Rule at pages 185-89, 259-62, 329-32

Emergency Communications

- **New § 195.402(c)(17)**: Requires operators of all onshore carbon dioxide pipelines to perform an annual population density survey and establish a 2-mile emergency planning zone on either side of the centerline of their pipelines
- For new pipelines, the survey would need to be completed before the start of operation and would include the number of potentially affected persons, their ages, languages, phone numbers, and evacuation information
- **New § 195.402(e)(9)**: Requires carbon dioxide pipeline operators to directly notify and update all affected entities and persons within the 2-mile emergency planning zone as soon as possible during an emergency

Plume Modeling

- **New § 195.456:** Prescribes requirements for initial and updated vapor dispersion modeling to identify CO₂ and HVL pipeline segments that could affect an HCA
- If dispersion modeling is performed it must consider (1) the properties and characteristics of the product and operating conditions, including but not limited to pressure, temperature, flow rate, hydraulic gradient of the pipeline, density, and vapor pressure; (2) diameter of the pipeline, potential release volume, and distance between isolation points; (3) release characteristics, including release rates, orientation of the release, and phase composition of the release; (4) concentrations of released product, in terms of flammability, asphyxiation, and toxicity; (5) terrain; (6) vegetation; and (7) typical weather conditions
- Instead of performing dispersion modeling, operators may use a default 2-mile distance on either side of the pipeline to identify potentially impacted HCAs

Proposed Rule at pages 9-10, 13, 198-208, 268, 337-39

Contaminant Control

- **New § 195.579(e)**: Requires operators of CO₂ pipelines to develop and implement a monitoring and mitigation program to manage and mitigate the corrosive effects of the constituents and contaminants in the product stream, including but not limited to microbes, water, oxygen, methane, hydrogen sulfide, carbon monoxide, sulfur oxides, and nitrogen oxides
- Specific limits for water (50 ppm) and hydrogen sulfide (20 ppm)
- Would apply to new and existing pipelines (existing must comply within 12 months) with product reviews 4x per year and program updates once per year; section becomes effective for existing pipelines 2 years after final rule, and for new pipelines one year after for new pipelines

Proposed Rule at pages 209-17, 268-69, 288, 294, 339-41

Emergency Flow Restricting Devices

- **Amend § 195.452(i)(4)**: Require carbon dioxide pipeline operators to install an emergency flow restricting device (EFRD) (check or remote-control valve) if an operator determines that one is needed on a pipeline segment to protect an HCA
- EFRD's are designed to automatically shut off CO₂ flows in the event of a rupture to isolate damaged pipeline segments

THANK YOU!

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