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Updated May 7, 2025

Congressional Research Service
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R44201

CRS REPORT
Prepared for Members and
Committees of Congress

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SUMMARY

R44201

May 7, 2025

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DOT's Federal Pipeline Safety Program: Background and Issues for Congress

The U.S. energy pipeline network includes 3.3 million miles of onshore pipeline transporting natural gas, crude oil, and other hazardous liquids. Over the past decade, major safety incidents in California, Texas, Pennsylvania, and other states have drawn criticism from stakeholders and have raised concerns in Congress about pipeline safety regulation. The 2021 ransomware attack on the Colonial Pipeline has also drawn attention to federal pipeline security activities, including agency roles and the linkage between pipeline safety and security.

The federal safety program for onshore pipelines is administered by the Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA), which relies heavily on state partnerships for inspection and enforcement. PHMSA's pipeline safety program was authorized through FY2023 under the Protecting Our Infrastructure of Pipelines and Enhancing Safety Act of 2020 (PIPES Act; P.L. 116-260, Div. R). Although this authorization has expired, Congress has appropriated funds for PHMSA's continued operation. The Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) appropriated $200 million annually through FY2026 for PHMSA's Natural Gas Distribution Infrastructure Safety and Modernization Grant Program.

To promote regulatory compliance, PHMSA conducts programmatic inspections of management systems and procedures; inspects facilities and construction; investigates safety incidents; and maintains a dialogue with pipeline operators. The agency clarifies its expectations through orders, guidance manuals, and public meetings. It also administers a pipeline safety research and development (R&D) program to address emerging risks and new technologies. PHMSA works with the Transportation Security Administration (TSA) on pipeline security and incident response.

As Congress considers reauthorizing PHMSA's pipeline safety program, Congress may examine PHMSA staffing, which faces persistent shortfalls affecting the agency's ability to conduct inspections and revise regulations. Other potential topics of congressional interest could include

- the implementation of PHMSA's distribution modernization grant program;
- the effects of the agency's 2021 rule for natural gas gathering lines, bringing 425,000 miles of gathering lines under regulation;
- PHMSA's implementation of the PIPES Act mandate regarding its regulation of methane leaks and emissions;
- what role PHMSA might play in any future TSA pipeline security initiatives;
- updates to safety standards for liquefied natural gas facilities; for pipelines carrying carbon dioxide, hydrogen, or hydrogen-methane blends; for gas pipeline class location changes; and for pipeline repair criteria;
- PHMSA's issuance and oversight of standards exemptions via special permits; and
- PHMSA's implementation and coordination of pipeline safety R&D through its own grants, operator demonstrations, and programs at other federal agencies.

In addition to these issues, Congress may assess how the many elements of U.S. pipeline safety fit together in the nation's overall approach to protecting the public and the environment. Pipeline safety necessarily involves various groups: federal and state agencies, tribal governments, pipeline associations, large and small pipeline operators, local communities, and other interest groups. Reviewing how these groups work together to achieve common goals or resolve conflicting approaches could be an overarching concern for Congress.

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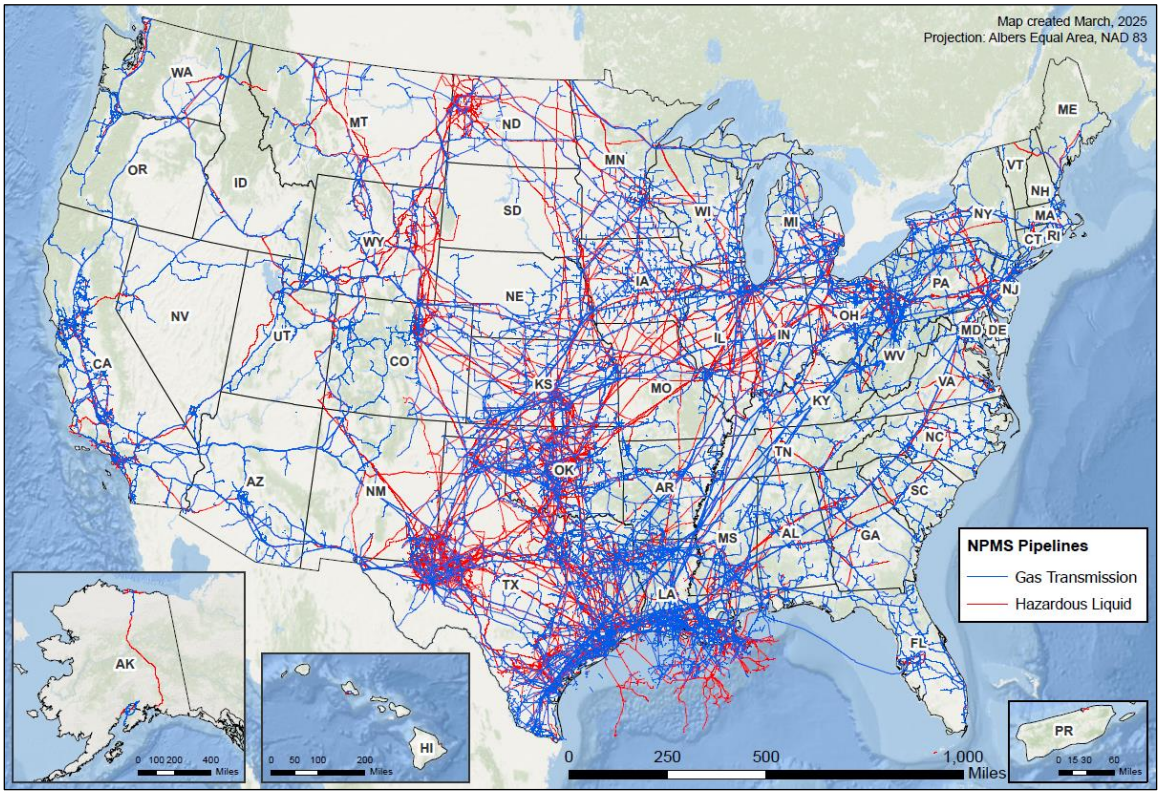
Introduction

The U.S. energy pipeline network is integral to the nation's energy supply and provides vital links to other critical infrastructure, such as power plants, airports, and military bases. These pipelines are geographically widespread, running alternately through remote and densely populated regions—from Arctic Alaska to Florida and nearly everywhere in between (**Figure 1**). Because energy pipelines carry volatile, flammable, or toxic materials, they have the potential to injure the public, destroy property, and harm the environment. Although they are considered an efficient and comparatively safe means of transport, pipeline systems are also vulnerable to accidents, operational failure, and malicious attacks. Recent major incidents in California, Texas, and Pennsylvania, among other places, have demonstrated the risks of pipeline failure and have heightened congressional concern about U.S. pipeline safety. A 2021 cyberattack on the Colonial Pipeline likewise demonstrated the economic impacts of a major pipeline disruption and put a focus on the linkage between pipeline safety and security.

Figure 1. U.S. Natural Gas Transmission and Hazardous Liquid Pipelines



Source: National Pipeline Mapping System (NPMS), March 2025, https://www.npms.phmsa.dot.gov/Documents/NPMS_Pipelines_Map.pdf.

Notes: Map does not show gas distribution or gas gathering pipelines. Hazardous liquids primarily include crude oil, gasoline, jet fuel, diesel fuel, home heating oil, propane, and butane. Other hazardous materials transported by pipeline and regulated as liquids include anhydrous ammonia, carbon dioxide, kerosene, liquefied ethylene, and petrochemical feedstock.

The federal safety program for onshore pipelines resides primarily within the Department of Transportation's (DOT's) Pipeline and Hazardous Materials Safety Administration (PHMSA), although its inspection and enforcement activities rely heavily upon partnerships with the states. Together, the federal and state pipeline safety agencies administer a comprehensive set of

regulatory authorities that continues to evolve. DOT's pipeline safety program was authorized through the fiscal year ending September 30, 2023, under the Protecting Our Infrastructure of Pipelines and Enhancing Safety Act of 2020 (PIPES Act; P.L. 116-260, Div. R) signed by President Trump on December 27, 2020. Although this authorization has expired, Congress has appropriated funds for PHMSA's continued operation.

This report reviews the history and role of the federal program for pipeline safety, including a discussion of pipeline safety trends and major accidents. It discusses significant regulatory changes in reauthorization statutes and summarizes ongoing developments in key policy areas. It discusses PHMSA's relationship with other federal agencies involved in pipeline safety. Although pipeline security is not mainly under PHMSA's jurisdiction, the report examines the agency's role in pipeline security and its recent work on security-related issues with other agencies.

The U.S. Pipeline Network

The onshore U.S. energy pipeline network is composed of 3.3 million miles of pipeline transporting natural gas, oil, and other hazardous liquids (**Table 1**). Of the nation's approximately half-million miles of long-distance transmission pipeline, roughly 230,000 miles carry hazardous liquids—over 83% of the nation's crude oil and refined products—along with carbon dioxide (CO_2) and other products.[1] The U.S. natural gas pipeline network consists of around 300,000 miles of transmission and 380,000 miles of gathering lines. The natural gas transmission pipelines feed around 2.4 million miles of regional pipeline mains and service lines in some 1,300 local distribution networks serving over 72 million customers.[2] A relatively small network of dedicated hydrogen pipelines, with around 1,600 total miles of pipe, is also in operation.

Table 1. U.S. Hazardous Liquid and Natural Gas Pipeline Mileage, 2023

Category	Miles
Hazardous Liquids Transmission	225,637
Hazardous Liquids Gathering	40,635
Carbon Dioxide	5,331
Natural Gas Transmission	298,851
Natural Gas Gathering	378,242
Natural Gas Distribution Mains and Service Lines	2,350,258
Hydrogen	1,612
TOTAL	**3,300,566**

Sources: Pipeline and Hazardous Materials Safety Administration (PHMSA), "Pipeline Miles and Facilities 2010+," online database, accessed April 7, 2025, https://portal.phmsa.dot.gov/analytics/saw.dll?Portalpages&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FPublic%20Reports&Page=Infrastructure.

Notes: Hazardous liquids primarily include crude oil, gasoline, jet fuel, diesel fuel, home heating oil, propane, and butane. Other hazardous liquids transported by pipeline include anhydrous ammonia, kerosene, liquefied ethylene, and petrochemical feedstock.

[1] Bureau of Transportation Statistics, "Crude Oil and Petroleum Products Transported in the United States by Mode," https://www.bts.gov/content/crude-oil-and-petroleum-products-transported-united-states-mode, accessed April 8, 2025.

[2] Pipeline and Hazardous Materials Safety Administration (PHMSA), "Annual Report Mileage for Gas Distribution Systems," April 1, 2025, https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-gas-distribution-systems.

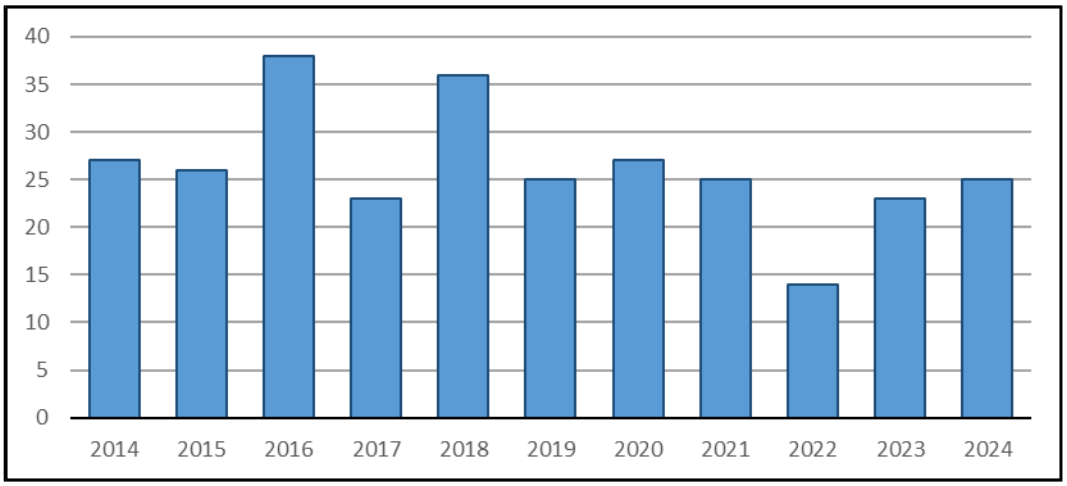
Natural gas pipelines also connect to 176 active liquefied natural gas (LNG) storage sites, as well as underground storage facilities, both of which can augment pipeline gas supplies during peak demand periods.[3]

Safety in the Pipeline Industry

Uncontrolled pipeline releases can result from a variety of causes, including third-party excavation, corrosion, mechanical failure, control system failure, operator error, and malicious acts. Natural forces, such as floods and earthquakes, can also damage pipelines. Taken as a whole, releases from pipelines cause few annual injuries or fatalities compared to other product transportation modes.[4] According to PHMSA statistics, there were, on average, 11 deaths and 48 injuries caused by 26 pipeline incidents annually in all U.S. pipeline systems from 2014 through 2024.[5] During this period, the yearly incident count has fluctuated, with no clear trend (**Figure 2**). A total of 25 serious pipeline incidents was reported for 2024.

Figure 2. Pipeline Incidents Causing Injuries or Fatalities, 2014-2024

(Annual "Serious" Incidents)



Source: PHMSA, "Pipeline Incident 20 Year Trends," online database, accessed April 9, 2025, https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends.

Note: PHMSA defines "serious" incidents as those causing a fatality or injury requiring inpatient hospitalization.

Apart from injury to people, some accidents may cause local environmental damage or other physical impacts, which may be significant, particularly in the case of oil spills or fires. PHMSA requires the reporting of such incidents involving

- $50,000 or more in total costs, measured in 1984 dollars;
- highly volatile liquid releases of 5 barrels or more or other liquid releases of 50 barrels or more; or

[3] PHMSA, "Liquefied Natural Gas (LNG) Facilities and Total Storage Capacities," April 1, 2025, https://www.phmsa.dot.gov/data-and-statistics/pipeline/liquefied-natural-gas-lng-facilities-and-total-storage-capacities.

[4] Bureau of Transportation Statistics, *National Transportation Statistics: 2021*, "Distribution of Transportation Fatalities by Mode," Table 2-4, accessed April 10, 2025, https://www.bts.gov/content/distribution-transportation-fatalities-mode.

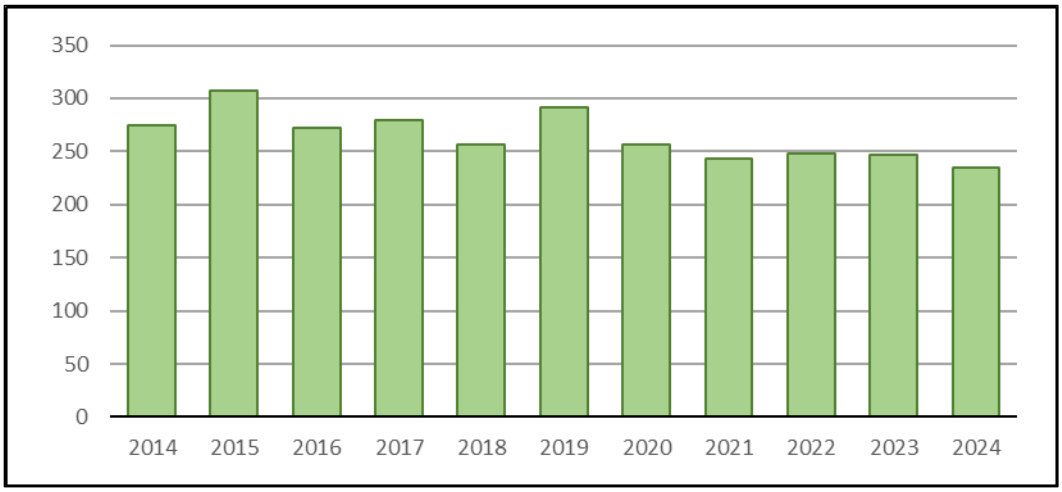
[5] PHMSA, "Pipeline Incident 20 Year Trends," online database, accessed April 9, 2025, https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends.

- liquid releases resulting in an unintentional fire or explosion.[6]

On average there were 265 such "significant" incidents (those not involving injury or fatality) per year from 2014 through 2024. The average significant incident count has fluctuated since 2014, with a declining overall trend (**Figure 3**). A total of 235 significant pipeline incidents were reported for 2024. It should be noted that federally regulated pipeline mileage overall rose approximately 8% over this period; neither the annual statistics for injury nor environmental incidents are adjusted on a per-mile basis.[7]

Figure 3. Pipeline Incidents Causing Environmental or Property Damage, 2014-2024

(Annual "Significant" Incidents)



Source: PHMSA, "Pipeline Incident 20 Year Trends," online database, accessed April 9, 2025, https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends.

Notes: Includes "significant" incidents, with $50,000 or more in total costs (1984 dollars), highly volatile liquid releases of 5 barrels or more or other liquid releases of 50 barrels or more, or liquid releases resulting in an unintentional fire or explosion. Excludes incidents causing a fatality or injury requiring inpatient hospitalization; these are categorized as "serious" incidents (see **Figure 2**).

Although pipeline releases have caused relatively few fatalities in absolute numbers, a single pipeline accident can be catastrophic in terms of public safety and environmental damage. For example, in 2015, the Aliso Canyon Underground Storage Facility near the Porter Ranch community in Los Angeles County, CA, began experiencing an uncontrolled natural gas leak that ultimately released an estimated 5.4 billion cubic feet of natural gas, an asphyxiant and a potent greenhouse gas (GHG).[8] The risk to safety from the fugitive methane and the presence of odorants and other chemicals in the gas led to the temporary relocation of over 8,000 households and two schools in nearby Porter Ranch. In 2018, overpressure in a natural gas distribution main in Merrimack Valley, MA, killed one person, injured 21 others, damaged 131 structures, and

[6] PHMSA, "Pipeline Incident Flagged Files," February 28, 2023, https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-flagged-files. The definition excludes natural gas distribution incidents caused by a nearby fire or explosion impacting the pipeline system.

[7] The 8% value is for mileage increase from 2014-2023 for hazardous liquid, natural gas transmission, and natural gas distribution systems. For detailed annual pipeline mileage statistics, see PHMSA, "Annual Report Mileage Summary Statistics," April 1, 2025, https://www.phmsa.dot.gov/data-and-statistics/pipeline/annual-report-mileage-summary-statistics.

[8] County of Los Angeles, Department of Public Health, "Aliso Canyon Disaster Health Research Study," 2021, http://publichealth.lacounty.gov/eh/healthresearch/background.htm.

caused 30,000 residents to evacuate their homes for several days.[9] In 2023, a natural gas pipeline-related explosion and fire at a West Reading, PA, candy factory destroyed the factory, killed 7 people, caused 10 other people to be hospitalized, and severely damaged nearby buildings.[10] Such incidents have generated persistent scrutiny of pipeline risks and have increased federal, state, and community activity related to pipeline safety.

Notable Pipeline Safety Incidents Since 2010

- **2010**—A pipeline spill in Marshall, MI, released 19,500 barrels of crude oil into a Kalamazoo River tributary.
- **2010**—A pipeline explosion in San Bruno, CA, killed 8 people, injured 60 others, and destroyed 37 homes.
- **2011**—An explosion caused by a natural gas pipeline in Allentown, PA, killed 5 people, damaged 50 buildings, and caused 500 people to be evacuated.
- **2011**—A pipeline near Laurel, MT, spilled an estimated 1,000 barrels of crude oil into the Yellowstone River.
- **2012**—A natural gas pipeline explosion in Springfield, MA, injured 21 people and damaged over 12 buildings.
- **2014**—An explosion caused by a natural gas distribution pipeline in New York City killed 8 people, injured 50 others, and destroyed two 5-story buildings.
- **2015**—A pipeline in Santa Barbara County, CA, spilled 3,400 barrels of crude oil, including 500 barrels reaching Refugio State Beach on the Pacific Ocean.
- **2015**—The Aliso Canyon natural gas storage facility in Los Angeles County, CA, released 5.4 billion cubic feet of gas, causing the temporary relocation of over 2,000 households and two schools in Porter Ranch.
- **2016**—An explosion caused by a natural gas distribution pipeline in Canton, OH, killed one person, injured 11 others, and damaged over 50 buildings.
- **2018**—Explosions and fires caused by natural gas distribution pipelines in Merrimack Valley, MA, killed one person, injured 21 others, damaged 131 structures, and caused 30,000 residents to evacuate.
- **2020**—A carbon dioxide pipeline ruptured near Satartia, MS, leading to a local evacuation and causing 45 people to be hospitalized.
- **2021**—An underwater oil pipeline off of Long Beach, CA, was damaged by a ship's anchor and spilled over 500 barrels of oil into San Pedro Bay.
- **2022**—An explosion and fire at an LNG export terminal in Freeport, TX, resulted in a months-long facility shutdown and temporarily stopped approximately 20% of U.S. LNG exports.
- **2022**—A pipeline rupture near Washington, KS, spilled an estimated 13,000 barrels of crude oil, some of which reached a nearby creek.
- **2023**—A natural gas pipeline-related explosion at a West Reading, PA, factory killed 7 people, injured 10 others, and damaged several buildings.
- **2024**—A vehicle struck a natural gas liquids pipeline in Deer Park, TX, causing a 3-day fire that killed the driver of the vehicle, burned nearby homes, damaged electric transmission lines, and required 1,500 people to evacuate.
- **2025**—A jet fuel pipeline was found to have been leaking for 16 months in a Bucks County, PA, residential subdivision, contaminating the local aquifer and nearby drinking water wells.

PHMSA's Pipeline Safety Program

PHMSA has the primary responsibility for the formulation, administration, and oversight of onshore pipeline safety regulations in the United States. The agency does so through its Office of

[9] National Transportation Safety Board (NTSB), "Overpressurization of Natural Gas Distribution System, Explosions, and Fires in Merrimack Valley, Massachusetts, September 13, 2018," Accident Report NTSB/PAR-19/02, September 24, 2019, https://www.ntsb.gov/investigations/AccidentReports/Reports/PAR1902.pdf.

[10] NTSB, "UGI Corporation Natural Gas-Fueled Explosion and Fire, West Reading, Pennsylvania, March 24, 2023," Pipeline Investigation Report PIR-25-01, March 18, 2025, https://www.ntsb.gov/investigations/AccidentReports/Reports/PIR2501.pdf.

Pipeline Safety (OPS), whose functions include oversight of pipeline operators, support of state pipeline safety agencies, and cooperation with other federal agencies that have pipeline safety responsibilities. The latter include the Department of the Interior's Bureau of Safety and Environmental Enforcement (BSEE), which regulates offshore oil and natural gas facilities, and the Federal Energy Regulatory Commission (FERC), which has siting authority for interstate natural gas pipelines. PHMSA also cooperates with the National Transportation Safety Board (NTSB), an independent agency that investigates accidents and issues safety recommendations.

Pipeline and Hazardous Materials Safety Administration

The Natural Gas Pipeline Safety Act of 1968 (P.L. 90-481) and the Hazardous Liquid Pipeline Safety Act of 1979 (P.L. 96-129) are the principal acts establishing the federal role in pipeline safety. Under both statutes, the Secretary of Transportation has primary authority to regulate key aspects of pipeline safety: design, construction, operation and maintenance, and spill response planning. Pipeline safety regulations are covered in Title 49 of the *Code of Federal Regulations*.[11]

Organization and Funding

As of February 14, 2025, PHMSA's organizational chart listed 326 full-time equivalent (FTE) staff in OPS—including 113 staff listed as "inspectors" and 12 staff listed as "accident investigators."[12] There are also agency positions outside of OPS that support certain pipeline safety functions.[13] In addition to federal staff, PHMSA's enabling legislation allows the agency to delegate authority to state pipeline safety offices, enabling them to act as "agents" administering pipeline safety programs for *intra*state pipelines and allowing them to perform inspections (but not enforcement) of *inter*state pipeline segments within their boundaries.[14] According to DOT, "States inspect and enforce pipeline safety regulations for over 85 percent of the infrastructure under PHMSA's safety authority."[15] A few states serve as agents for inspection of interstate pipelines as well. There were 444 state inspectors in 2024.[16] PHMSA may reimburse states for up to 80% of their pipeline safety expenditures through State Pipeline Safety Grants. In 2023 (the latest year with published data), actual grant awards to states covered approximately 53% of state expenditures, on average.[17] PHMSA may also fund states through Underground Natural Storage Grants, State Damage Prevention Grants, State One-Call Grants, and Natural Gas Distribution Infrastructure Safety and Modernization Grants, discussed further below.

[11] Safety and security of LNG facilities used in gas pipeline transportation is regulated under Title 49, Part 193, of the *Code of Federal Regulations*.

[12] PHMSA, "Office of Pipeline Safety Organization Chart," web page, February 14, 2025, https://www.phmsa.dot.gov/about-phmsa/offices/office-pipeline-safety-organization-chart.

[13] Damon Hill, PHMSA, personal communication, March 23, 2023. Those staff include attorneys, data analysts, information technology specialists, and regulatory specialists required for certain enforcement actions, promulgating regulations, issuing pipeline safety grants, and issuing agreements for pipeline safety research and development.

[14] 49 U.S.C. §60107.

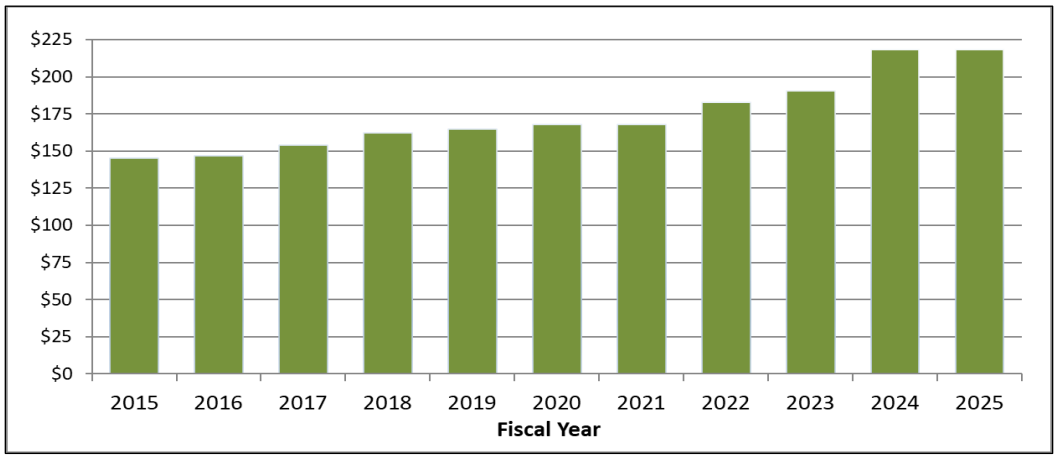
[15] Department of Transportation (DOT), *Budget Estimates, Fiscal Year 2025: Pipeline and Hazardous Materials Safety Administration*, 2024, p. 29, https://www.transportation.gov/sites/dot.gov/files/2024-03/PHMSA_FY_2025_CJ_508_Compliant.pdf.

[16] Ibid.

[17] PHMSA, "Base Grant Payment Info 2013-2023," July 18, 2024, https://www.phmsa.dot.gov/about-phmsa/working-phmsa/grants/pipeline/base-grant-payment-information.

Figure 4. PHMSA Pipeline Safety Total Annual Budget Authority, 2015-2025

(Millions of Dollars)



Source: U.S. Office of Management and Budget, *Budget of the United States Government, Appendix*, Fiscal Years 2015 through 2023, "Pipeline Safety," Line 1900 "Budget authority (total)"; Consolidated Appropriations Act, 2024 (P.L. 118-42); Full-Year Continuing Appropriations and Extensions Act, 2025 (P.L. 119-4).

Notes: Column values are "actual" budget authority totals except for 2024, which is "estimated," and 2025, which is based on funding as provided under a continuing resolution. Values are not adjusted for inflation.

PHMSA's pipeline safety program is funded primarily by user fees assessed on a per-mile basis on each regulated pipeline operator.[18] The agency's total annual budget authority has grown over the last decade (**Figure 4**). PHMSA's pipeline safety budget in FY2025 is approximately $218 million, roughly $73 million more than the FY2023 budget authority (in nominal dollars).

Regulatory Activities

PHMSA uses a variety of strategies to promote compliance with its safety standards. The agency conducts programmatic inspections of management systems, procedures, and processes; conducts physical inspections of facilities and construction projects; investigates safety incidents; and maintains a dialogue with pipeline operators. The agency clarifies its regulatory expectations through published protocols and regulatory orders, guidance manuals, and public meetings.

In 1997, PHMSA began requiring industry to implement "integrity management" programs on pipeline segments near "high consequence areas" (HCAs). Integrity management provides for continual evaluation of pipeline condition, assessment of risks to the pipeline, inspection or testing, data analysis, and follow-up repair as well as preventive or mitigative actions. High consequence areas include population centers, commercially navigable waters, and environmentally sensitive areas, such as drinking water supplies or ecological reserves. The integrity management approach is intended to prioritize resources to locations of highest consequence rather than applying uniform treatment to the entire pipeline network. PHMSA made integrity management programs mandatory for most oil pipeline operators with 500 or more miles of regulated pipeline as of March 31, 2001 (49 C.F.R. §195). Congress subsequently mandated the expansion of integrity management to natural gas pipelines and has continued to make other significant changes to federal pipeline safety requirements through PHMSA budget reauthorizations, as discussed below.

[18] 49 U.S.C. §60125.

Regulation of Offshore Pipelines

Offshore pipelines are regulated primarily by BSEE, which is responsible for the safety and environmental oversight of oil and gas operations, as well as oil spill response on the Outer Continental Shelf.[19] PHMSA shares with BSEE oversight of certain offshore pipeline facilities. Under the terms of a December 2020 Memorandum of Understanding (MOU) between the two agencies, PHMSA is responsible for "all OCS pipelines beginning downstream of the point at which operating responsibility transfers from a producing operator to a transporting operator, or downstream of the last valve on the last production facility on the OCS for pipelines that cross into State waters."[20] In addition, BSEE regulations allow a producer to petition to have its pipeline operate under PHMSA regulations for pipeline design, construction, operation, and maintenance.[21] Likewise, a transporter who operates a PHMSA-regulated pipeline may petition to operate under BSEE regulations for pipeline operation and maintenance.[22] Policy issues related primarily to BSEE or to pipelines under its jurisdiction are outside the scope of this report.

Pipeline Safety Enforcement

PHMSA relies upon a range of enforcement actions, including administrative actions such as safety orders and civil penalties, to try to ensure that operators correct safety violations and take measures to preclude future safety problems. From 2020 through 2024, PHMSA initiated 1,081 enforcement actions against pipeline operators.[23] Of these cases, 376 involved notices of probable violation, which allege specific regulatory violations, and 15 involved corrective action orders, which "usually address urgent situations arising out of an accident, spill, or other significant, immediate, or imminent safety or environmental concern."[24] Civil penalties proposed by PHMSA for safety violations during this period totaled approximately $44 million.[25] PHMSA also conducts accident investigations and system-wide reviews focusing on high-risk operational or procedural problems and areas of the pipeline near sensitive environmental areas, high-density populations, or navigable waters.

[19] BSEE was established in 2011 under a secretarial order reorganizing the former Minerals Management Service. See Secretary of the Interior, Order No. 3299, Amendment No. 2, August 29, 2011, https://www.doi.gov/sites/doi.gov/files/elips/documents/3299a2-establishment_of_the_bureau_of_ocean_energy_management_the_bureau_of_safety_and_environmental_enforcement_and_the_office_of_natural_resources_revenue.pdf. BSEE's regulations are found under Title 30 (Mineral Resources) of the *Code of Federal Regulations*.

[20] BSEE and PHMSA, "Memorandum of Understanding Between the U.S. Department of Transportation and the U.S. Department of the Interior Regarding Outer Continental Shelf Pipelines," December 22, 2020, p. 3, https://www.bsee.gov/sites/bsee.gov/files/mou-est-17430-doi-dot-outer-continental-shelf-pipelines-mou-2020-12-22.pdf.

[21] 30 C.F.R. §250.1000(c)(12).

[22] 30 C.F.R. §250.1000(c)(13).

[23] PHMSA, "PHMSA Pipeline Safety Program: Summary of Enforcement Actions," April 15, 2025, https://primis.phmsa.dot.gov/enforcement-data/actions/cases-initiated.

[24] PHMSA, "PHMSA Pipeline Safety Program: Summary of Enforcement Actions," April 15, 2025.

[25] PHMSA, "PHMSA Pipeline Safety Program: Summary of Cases Involving Civil Penalties," April 15, 2025, https://primis.phmsa.dot.gov/enforcement-data/civil-penalties/cases-initiated. Proposed penalties may change in the resolution of a case.

Reauthorization and Pipeline Safety Statutes

The PIPES Act was preceded by a periodic series of pipeline safety statutes, each of which reauthorized funding for PHMSA's pipeline safety program and included other provisions related to PHMSA's authorities, administration, or regulatory activities.

Pipeline Safety Improvement Act of 2002

On December 12, 2002, President George W. Bush signed into law the Pipeline Safety Improvement Act of 2002 (P.L. 107-355). The act strengthened federal pipeline safety programs, state oversight of pipeline operators, and public education regarding pipeline safety.[26] Among other provisions, P.L. 107-355 required operators of regulated natural gas pipelines in high consequence areas to conduct risk analysis and implement integrity management programs similar to those required for oil pipelines. The act authorized DOT to order safety actions for pipelines with potential safety problems and increased violation penalties. The act streamlined the permitting process for emergency pipeline restoration by establishing an interagency committee—including DOT, the Environmental Protection Agency, the Bureau of Land Management, FERC, and other agencies—to ensure coordinated review and permitting of pipeline repairs. The act required DOT to study ways to limit pipeline safety risks from population encroachment and ways to preserve environmental resources in pipeline rights-of-way. P.L. 107-355 also included provisions for public education, grants for community pipeline safety studies, "whistleblower" and other employee protection, employee qualification programs, and mapping data submission.

Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006

On December 29, 2006, President Bush signed into law the Pipeline Inspection, Protection, Enforcement and Safety Act of 2006 (P.L. 109-468). The main provisions of the act address pipeline damage prevention, integrity management, corrosion control, and enforcement transparency. The act created a national focus on pipeline damage prevention through grants to states for improving damage prevention programs, establishing 811 as the national "call before you dig" one-call telephone number, and giving PHMSA limited "backstop" authority to conduct civil enforcement against one-call violators in states that have failed to conduct such enforcement. The act mandated the promulgation by PHMSA of minimum standards for integrity management programs for natural gas distribution pipelines.[27] It also mandated a review of the adequacy of federal pipeline safety regulations related to internal corrosion control and required PHMSA to increase the transparency of enforcement actions by issuing monthly summaries including violation and penalty information and a mechanism for pipeline operators to make response information available to the public.

Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011

On January 3, 2012, President Obama signed the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (Pipeline Safety Act; P.L. 112-90). The act contains a broad range of provisions addressing pipeline safety. Among the most significant are provisions to increase the

[26] P.L. 107-355 encourages the implementation of state "one-call" excavation notification programs (§2) and allows states to enforce "one-call" program requirements. The act expands criminal responsibility for pipeline damage to cases where damage was not caused "knowingly and willfully" (§3). The act adds provisions for ending federal-state pipeline oversight partnerships if states do not comply with federal requirements (§4).

[27] PHMSA issued final regulations requiring operators of natural gas distribution pipelines to adopt integrity management programs similar to existing requirements for gas transmission pipelines on December 4, 2009.

number of federal pipeline safety inspectors, require automatic shutoff valves for transmission pipelines, mandate verification of maximum allowable operating pressure for gas transmission pipelines, increase civil penalties for pipeline safety violations, and mandate reviews of diluted bitumen pipeline regulation. Altogether, the act imposed 42 mandates on PHMSA regarding studies, rules, maps, and other elements of the federal pipeline safety program. P.L. 112-90 authorized the federal pipeline safety program through the fiscal year ending September 30, 2015.

Protecting Our Infrastructure of Pipelines and Enhancing Safety Act of 2016

On June 22, 2016, President Obama signed the Protecting Our Infrastructure of Pipelines and Enhancing Safety Act (PIPES Act) of 2016 (P.L. 114-183). Among other provisions, the act requires PHMSA to promulgate federal safety standards for underground natural gas storage facilities and grants PHMSA emergency order authority to address urgent "industry-wide safety conditions" without prior notice. The act also requires PHMSA to report regularly on the progress of outstanding statutory mandates. The act authorized the federal pipeline safety program through FY2019.

Protecting Our Infrastructure of Pipelines and Enhancing Safety Act of 2020

On December 27, 2020, President Trump signed the PIPES Act of 2020 (P.L. 116-260, Div. R).[28] The act authorized the federal pipeline safety program through FY2023. Among its key provisions, the act required PHMSA to review and update its safety standards for large-scale LNG facilities, adopting a risk-based regulatory approach. The act also imposed stricter standards for natural gas pipeline leak detection and repair, requiring repair of all leaks hazardous to human safety or the environment or with the potential to become hazardous. It also mandated new safety requirements for natural gas distribution systems in response to the 2018 Merrimack Valley incident.[29] These requirements include updates to distribution integrity management, emergency response plans to address overpressurization risks, and a requirement for PHMSA to report on industry adoption of pipeline safety management systems. The act also included provisions intended to help PHMSA attract and maintain a sufficient workforce of pipeline inspection and enforcement personnel.

In addition to the authorization in the PIPES Act of 2020, the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) appropriates annual funding through FY2026 for a new Natural Gas Distribution Infrastructure Safety and Modernization Grant Program administered by PHMSA.[30]

Cooperation with FERC

One area related to pipeline safety not under PHMSA's primary jurisdiction is the siting approval of interstate natural gas pipelines, which is the responsibility of FERC. Companies building interstate natural gas pipelines must first obtain from FERC certificates of public convenience and necessity. (FERC does not oversee oil pipeline siting or construction.) FERC must also approve the abandonment of gas facility use and services. These approvals may include safety provisions with respect to pipeline routing, safety standards, and other factors.[31] In particular,

[28] P.L. 116-260 is the Consolidated Appropriations Act, 2021.

[29] These provisions are included as the "Leonel Rondon Pipeline Safety Act," Title II of the PIPES Act.

[30] P.L. 117-58, Division J, Title VIII.

[31] In making permitting decisions for oil and natural gas pipelines that cross the U.S. border, the State Department or FERC, respectively, must also consult with the Secretary of Transportation regarding pipeline safety, among other matters, in accordance with directives in Executive Order 13337.

pipeline and aboveground facilities associated with a proposed pipeline project must be designed in accordance with PHMSA's safety standards regarding material selection and qualification, design requirements, and protection from corrosion.[32]

PHMSA and FERC cooperate on pipeline safety-related matters, according to an MOU signed in 1993. According to the MOU, PHMSA agrees to

- promptly alert FERC when safety activities may impact commission responsibilities;
- notify FERC of major accidents or significant enforcement actions involving pipelines under FERC's jurisdiction;
- refer to FERC any complaints and inquiries by state and local governments and the public about environmental or certificate matters related to FERC-jurisdictional pipelines; and,
- when requested by FERC, review draft mitigation conditions considered by the commission for potential conflicts with PHMSA's regulations.

Under the MOU, FERC agrees to

- promptly alert PHMSA when the commission learns of an existing or potential safety problem involving natural gas transmission facilities;
- notify PHMSA of future pipeline construction;
- periodically provide PHMSA with updates to the environmental compliance inspection schedule and coordinate site inspections, upon request, with PHMSA officials;
- notify PHMSA when significant safety issues have been raised during the preparation of environmental assessments or environmental impact statements for pipeline projects; and
- refer to PHMSA complaints and inquiries made by state and local governments and the public involving safety matters related to FERC-jurisdictional pipelines.[33]

FERC may also serve as a member of PHMSA's Technical Pipeline Safety Standards Committee, which determines whether proposed safety regulations are technically feasible, reasonable, cost-effective, and practicable.

In April 2015, FERC issued a policy statement to provide "greater certainty regarding the ability of interstate natural gas pipelines to recover the costs of modernizing their facilities and infrastructure to enhance the efficient and safe operation of their systems."[34] FERC's policy statement was motivated by the commission's expectation that governmental safety and environmental initiatives could cause greater safety and reliability costs for interstate gas pipeline systems.[35]

[32] 18 C.F.R. §157.

[33] DOT and Federal Energy Regulatory Commission (FERC), "Memorandum of Understanding Between the Department of Transportation and Federal Energy Regulatory Commission Regarding Natural Gas Transportation Facilities," January 15, 1993. Note that the MOU refers to DOT's Research and Special Programs Administration, the predecessor agency to PHMSA.

[34] FERC, *Cost Recovery Mechanisms for Modernization of Natural Gas Facilities*, 151 FERC ¶ 61,047, April 16, 2015, http://www.ferc.gov/whats-new/comm-meet/2015/041615/G-1.pdf.

[35] FERC, April 16, 2015, p. 1.

PHMSA and the NTSB

The NTSB is an independent federal agency charged with determining the probable cause of transportation incidents—including pipeline releases—and promoting transportation safety. The board's experts investigate significant incidents, develop factual records, and issue safety recommendations to prevent similar events from reoccurring. The NTSB has no statutory authority to regulate transportation, however, and it does not perform cost-benefit analyses of regulatory changes; its safety recommendations to industry or government agencies are not mandatory. Nonetheless, because of the board's strong reputation for thoroughness and objectivity, 82% of the NTSB's safety recommendations have been implemented across all transportation modes.[36]

In the pipeline sector, the NTSB's past safety recommendations have led to changes in pipeline safety regulation regarding one-call systems before excavation ("call before you dig"), use of pipeline internal inspection devices, facility response plan effectiveness, hydrostatic pressure testing of older pipelines, and other safety improvements.[37] As of April 15, 2025, the NTSB listed 11 open pipeline safety recommendations to PHMSA. In eight cases, the NTSB has classified PHMSA's responses to these recommendations as "Acceptable" because they are being incorporated satisfactorily in ongoing PHMSA rulemakings or because PHMSA is implementing other measures to meet the same objectives. In three cases (all stemming from the 2023 West Reading accident), the NTSB is awaiting PHMSA's response to its recommendations. Detailed discussion of NTSB pipeline accident investigations and safety recommendations are publicly available through the NTSB's Case Analysis and Reporting Online query tool.[38] In addition to making specific safety recommendations, the NTSB may also comment on proposed changes to PHMSA's pipeline safety regulations, such as those involving pipeline hazard class locations and standards for valve installation and rupture detection, among other standards.[39]

PHMSA's Role in Pipeline Security

Pipeline safety and security are distinct issues involving different threats, statutory authorities, and regulatory frameworks. Nonetheless, aspects of pipeline safety and security can be intertwined. PHMSA has historically played a significant role in pipeline security and continues to be involved in pipeline security oversight and incident response. The 2021 ransomware attack on the Colonial Pipeline Company, which disrupted gasoline supplies throughout the East Coast, elevated concern in Congress about federal oversight of pipeline security, including PHMSA's role within the nation's pipeline security framework.[40]

DOT's Early Role in Pipeline Security

DOT played the leading role in pipeline security through the late 1990s. Presidential Decision Directive 63 (PDD-63), issued during the Clinton Administration, assigned lead responsibility for

[36] NTSB, *Annual Report to Congress 2023*, 2024, p. 12, https://data.ntsb.gov/about/reports/Documents/NTSB-2023-Annual-Report-to-Congress.pdf. The 82% applies to recommendations closed by NTSB.

[37] See, for example, NTSB, *Annual Report to Congress 2017*, 2018, p. 15.

[38] NTSB, "CAROL Query," online database, at https://data.ntsb.gov/carol-main-public/landing-page.

[39] See, for example, NTSB, *Annual Report to Congress 2021*, 2022, p. 17, https://www.ntsb.gov/about/reports/Documents/2021_AnnualReport.pdf.

[40] Colonial Pipeline, "Media Statement Update: Colonial Pipeline System Disruption," May 17, 2021, https://www.colpipe.com/news-insights/media-resources/post/media-statement-update-colonial-pipeline-system-disruption/.

pipeline security to DOT.[41] These responsibilities fell to OPS, at that time a part of DOT's Research and Special Programs Administration, because the agency was already addressing some elements of pipeline security in its role as safety regulator.[42] DOT's pipeline (and LNG) safety regulations already included provisions related to physical security, such as requirements to protect surface facilities (e.g., pumping stations) from vandalism and unauthorized entry.[43] Other regulations required continuing surveillance, patrolling pipeline rights-of-way, damage prevention, and emergency procedures.[44]

On September 5, 2002, OPS circulated formal guidance developed in cooperation with the pipeline industry associations defining the agency's security program recommendations and implementation expectations. This guidance recommended that operators identify critical facilities, develop security plans consistent with prior trade association security guidance, implement these plans, and review them annually.[45] While the guidance was voluntary, OPS expected compliance and informed operators of its intent to begin reviewing security programs and to test their effectiveness.[46]

PHMSA Cooperation with TSA

In November 2001, President Bush signed the Aviation and Transportation Security Act (P.L. 107-71) establishing the Transportation Security Administration (TSA) within DOT. According to TSA, the act placed DOT's pipeline security authority (under PDD-63) within TSA. The act specified for TSA a range of duties and powers related to general transportation security, such as intelligence management, threat assessment, mitigation, security measure oversight, and enforcement. On November 25, 2002, President Bush signed the Homeland Security Act of 2002 (P.L. 107-296) creating the Department of Homeland Security (DHS). Among other provisions, the act transferred TSA from DOT to DHS (§403). On December 17, 2003, President Bush issued Homeland Security Presidential Directive 7 (HSPD-7), clarifying executive agency responsibilities for identifying, prioritizing, and protecting critical infrastructure.[47] HSPD-7 maintained DHS as the lead agency for pipeline security (paragraph 15) and instructed DOT to "collaborate in regulating the transportation of hazardous materials by all modes (including pipelines)" (paragraph 22h).

In 2004, DOT and DHS entered into an MOU concerning their respective security roles in all modes of transportation. The MOU notes that DHS has the primary responsibility for transportation security with support from DOT and establishes a general framework for cooperation and coordination. The MOU states that "specific tasks and areas of responsibility that are appropriate for cooperation will be documented in annexes … individually approved and

[41] PDD-63, *Protecting the Nation's Critical Infrastructures*, May 22, 1998.

[42] In November 2004, President George W. Bush signed the Norman Y. Mineta Research and Special Programs Improvement Act (P.L. 108-426), which eliminated the Research and Special Programs Administration (RSPA) and placed OPS within the newly established PHMSA. This administrative restructuring did not significantly affect the authorities or activities of OPS.

[43] 49 C.F.R. §195.436, "Security of Facilities."

[44] 49 C.F.R. §§192.613, 192.614, 192.705, 193.2509.

[45] James K. O'Steen, RSPA, *Implementation of RSPA Security Guidance*, presentation to the National Association of Regulatory Utility Commissioners, February 25, 2003.

[46] PHMSA, "Briefing: Addressing Pipeline Security Issues," https://primis.phmsa.dot.gov/comm/pipelinesecurityissuesbrief.htm.

[47] HSPD-7 supersedes PDD-63 (paragraph 37).

signed by appropriate representatives of DHS and DOT."[48] On August 9, 2006, the departments signed an annex "to delineate clear lines of authority and responsibility and promote communications, efficiency, and nonduplication of effort through cooperation and collaboration between the parties in the area of transportation security."[49]

In January 2007, the PHMSA administrator testified before Congress that the agency had established a joint working group with TSA "to improve interagency coordination on transportation security and safety matters, and to develop and advance plans for improving transportation security," presumably including pipeline security.[50] According to TSA, the working group developed a multiyear action plan specifically delineating roles, responsibilities, resources, and actions to execute 11 program elements: identification of critical infrastructure/key resources and risk assessments, strategic planning, developing regulations and guidelines, conducting inspections and enforcement, providing technical support, sharing information during emergencies, communications, stakeholder relations, research and development, legislative matters, and budgeting.[51]

Clarifying PHMSA and TSA Security Roles

P.L. 109-468 required the DOT inspector general (IG) to assess the pipeline security actions taken by DOT in implementing its 2004 MOU with DHS (§23). The IG published this assessment in May 2008. The IG report stated,

> PHMSA and TSA have taken initial steps toward formulating an action plan to implement the provisions of the pipeline security annex…. However, further actions need to be taken with a sense of urgency because the current situation is far from an "end state" for enhancing the security of the Nation's pipelines.[52]

The report recommended that PHMSA and TSA finalize and execute their security annex action plan, clarify their respective roles, and jointly develop a pipeline security strategy that maximizes the effectiveness of their respective capabilities and efforts.[53] According to TSA, working with PHMSA "improved drastically" after the release of the IG report; the two agencies began to maintain daily contact, share information in a timely manner, and collaborate on security guidelines and incident response planning.[54] Consistent with this assertion, in March 2010, TSA published a *Pipeline Security and Incident Recovery Protocol Plan*, which lays out in detail the separate and cooperative responsibilities of the two agencies with respect to a pipeline security incident. Among other notes, the plan states,

> DOT has statutory tools that may be useful during a security incident, such as special permits, safety orders, and corrective action orders. DOT/PHMSA also has access to the Regional Emergency Transportation Coordinator (RETCO) Program…. Each RETCO

[48] DHS and DOT, "Memorandum of Understanding Between the Department of Homeland Security and the Department of Transportation on Roles and Responsibilities," September 28, 2004, p. 4.

[49] TSA and PHMSA, "Transportation Security Administration and Pipelines and Hazardous Materials Safety Administration Cooperation on Pipelines and Hazardous Materials Transportation Security," August 9, 2006.

[50] T. J. Barrett, Administrator, PHMSA, testimony before the Senate Committee on Commerce, Science, and Transportation hearing on *Federal Efforts for Rail and Surface Transportation Security*, January 18, 2007.

[51] Jack Fox, TSA, Pipeline Security Division, personal communication, July 6, 2007.

[52] DOT, Office of Inspector General, *Actions Needed to Enhance Pipeline Security, Pipeline and Hazardous Materials Safety Administration*, Report No. AV-2008-053, May 21, 2008, p. 3.

[53] Ibid., pp. 5-6.

[54] Jack Fox, TSA, personal communication, February 2, 2010.

> manages regional DOT emergency preparedness and response activities in the assigned region on behalf of the Secretary of Transportation.[55]

The plan also refers to the establishment of an Interagency Threat Coordination Committee established by TSA and PHMSA to organize and communicate developing threat information among federal agencies that may have responsibility for pipeline incident response.[56]

DOT has continued to cooperate with TSA on pipeline security over the last decade. For example, TSA coordinated with DOT and other agencies to address ongoing vandalism and sabotage against critical pipelines by environmental activists in 2016.[57] In April 2016, the director of TSA's Surface Division testified about her agency's relationship with DOT:

> TSA and DOT co-chair the Pipeline Government Coordinating Council to facilitate information sharing and coordinate on activities including security assessments, training, and exercises. TSA and DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) work together to integrate pipeline safety and security priorities, as measures installed by pipeline owners and operators often benefit both safety and security.[58]

In December 2016, PHMSA issued an Advisory Bulletin "in coordination with" TSA regarding cybersecurity threats to pipeline Supervisory Control and Data Acquisition systems.[59] In July 2017, the two agencies collaborated on a web-based portal to facilitate sharing sensitive but unclassified incident information among federal agencies with pipeline responsibilities.[60] In February 2018, the director of TSA's Surface Division again testified about cooperation with PHMSA, stating, "TSA works closely with [PHMSA] for incident response and monitoring of pipeline systems," although she did not provide specific examples.[61]

In June 2019, the Government Accountability Office (GAO) published a report examining the relative roles and responsibilities of DOT and DHS in pipeline security.[62] GAO concluded that, while the 2006 TSA-PHMSA MOU Annex delineated the agencies' mutually agreed-upon roles and responsibilities, it had not been reviewed to consider pipeline security developments since its inception. TSA's *Pipeline Security and Incident Recovery Protocol Plan* likewise had not been updated since it was issued in 2010 "to reflect changes in pipeline security threats, technology, federal law and policy, and any other factors."[63] Among other things, GAO recommended that TSA and PHMSA update these documents and put in place formal processes to periodically update them in the future. In response to this recommendation, TSA and PHMSA signed an

[55] TSA, *Pipeline Security and Incident Recovery Protocol Plan*, March 2010, p. 7.

[56] TSA, March 2010, p. 20.

[57] GAO, *Critical Infrastructure Protection: Actions Needed to Address Significant Weaknesses in TSA's Pipeline Security Program Management*, GAO-19-48, December 2018, p. 23.

[58] Sonya Proctor, Surface Division Director, TSA, testimony before the House Committee on Homeland Security, Subcommittee on Transportation Security hearing on *Pipelines: Securing the Veins of the American Economy*, April 19, 2016.

[59] PHMSA, "Pipeline Safety: Safeguarding and Securing Pipelines from Unauthorized Access," 81 *Federal Register* 89183, December 9, 2016.

[60] GAO, *Critical Infrastructure Protection: Actions Needed to Address Significant Weaknesses in TSA's Pipeline Security Program Management*, p. 23.

[61] Sonya Proctor, Surface Division Director, TSA, testimony before the House Committee on Homeland Security Subcommittee on Transportation and Maritime Security and Subcommittee on Cybersecurity, Infrastructure Protection, and Innovation joint hearing on *Securing U.S. Surface Transportation from Cyber Attacks*, February 26, 2019.

[62] GAO, *Critical Infrastructure Protection: Key Pipeline Security Documents Need to Reflect Current Operating Environment*, GAO-19-426, June 2019.

[63] GAO, *Critical Infrastructure Protection: Key Pipeline Security Documents Need to Reflect Current Operating Environment*, pp. 29-30.

update to the MOU Annex in February 2020.[64] In its November 2024 proposed rule to regulate pipeline (and rail) cybersecurity, TSA states that it "will coordinate activities under this part with ... PHMSA of the DOT with respect to regulation of pipeline systems ... to avoid conflicting requirements and minimize redundancy of compliance activities."[65]

Colonial Pipeline Incident

Following the Colonial Pipeline ransomware attack, PHMSA joined TSA and the Cybersecurity and Infrastructure Security Agency (CISA) on a teleconference call with pipeline operators to provide updates on the incident, answer questions, and provide resources to support cybersecurity mitigation efforts.[66] The Deputy Secretary of Transportation subsequently testified that PHMSA intended to "leverage its authorities to inspect and enforce three critical components of pipeline operations" related to cybersecurity: system control room regulations, integrity management plan requirements,[67] and emergency response plan regulations.[68] The Deputy Secretary also stated that DOT's Office of Intelligence, Security, and Emergency Response was collaborating with the National Security Council and interagency partners on a natural gas pipelines Industrial Control Systems Cybersecurity Initiative and that "DOT continues work with [its] sister agencies, especially TSA and CISA, to invest in world class research and pursue initiatives to address cybersecurity threats."[69]

Policy Issues for Congress

PHMSA's pipeline safety authorization expired at the end of FY2023, although the agency has continued to receive funding under subsequent appropriations. In considering future reauthorization, Congress may focus on oversight of the agency's ongoing regulatory activities and implementation of its most recent legislative priorities. Among these issues, the following may be of particular interest, in no particular order: staffing resources; pipeline modernization; new regulation of gas gathering lines; regulation of methane leaks; PHMSA's role in pipeline security; updates to regulation of LNG, carbon dioxide, and hydrogen infrastructure; special permits; class location; pipeline safety R&D; and repair criteria. These issues are discussed in the following sections.

[64] PHMSA and TSA, "Annex to the Memorandum of Understanding Between the Department of Homeland Security and the Department of Transportation Concerning Transportation Security Administration and Pipeline and Hazardous Materials Safety Administration Cooperation on Pipeline Transportation Security and Safety," February 26, 2020, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/regulatory-compliance/phmsa-guidance/73466/phmsa-tsa-mou-annexexecuted.pdf.

[65] TSA, "Enhancing Surface Cyber Risk Management," 89 *Federal Register* 88488, November 7, 2024, p. 88546.

[66] TSA, "TSA Response to Congressional Research Service Inquiry on Colonial Pipeline Incident," memorandum, June 29, 2021. Congress created CISA in the Cybersecurity and Infrastructure Security Agency Act of 2018 (P.L. 115-278). However, predecessor organizations executed similar authorities and capabilities.

[67] "An integrity management program is a set of safety management, operations, maintenance, evaluation, and assessment processes that are implemented in an integrated and rigorous manner to ensure operators provide enhanced protection" for high consequence areas. See PHMSA, "Overview: Integrity Management," https://primis.phmsa.dot.gov/comm/Im.htm.

[68] Polly Trottenberg, Deputy Secretary of Transportation, written testimony submitted for the Senate Committee on Commerce, Science, and Transportation hearing on *Pipeline Cybersecurity: Protecting Critical Infrastructure*, July 27, 2021, p. 3.

[69] Ibid., pp. 4-5.

Staffing Resources for Pipeline Safety

The U.S. pipeline safety program employs a combination of federal and state staff to implement and enforce federal pipeline safety regulations. To date, PHMSA has relied heavily on state agencies for pipeline inspections, with over three-quarters of inspectors being state employees. As the PHMSA administrator remarked in 2018,

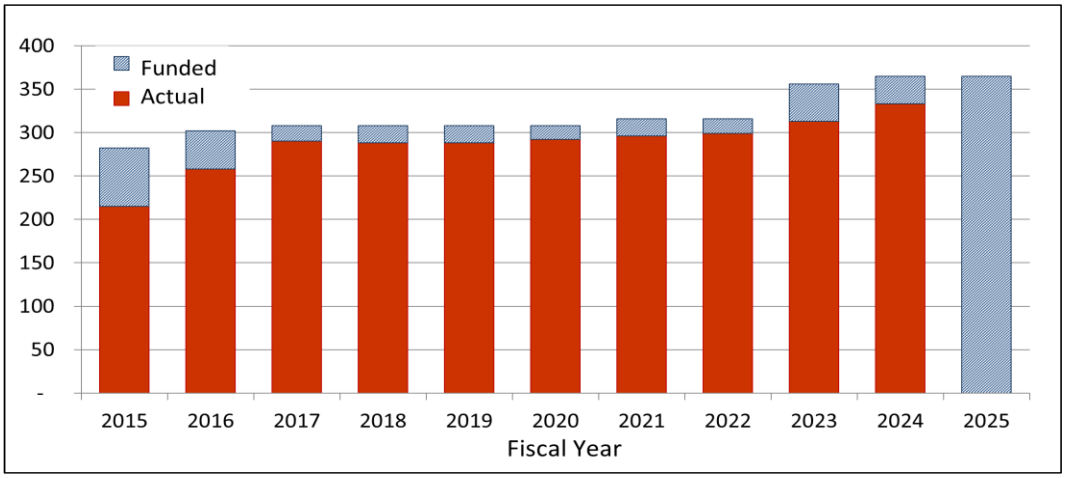
> PHMSA faces a manpower issue. It is obvious that [PHMSA] … cannot oversee 2.7 million miles of pipeline all by itself. In fact, PHMSA makes no attempt to do so. Most actual safety inspections are performed by our state partners.[70]

Nonetheless, some in Congress have criticized staffing at PHMSA for being insufficient to inspect pipelines under the agency's jurisdiction and to revise its regulations in line with legislative mandates and deadlines. In considering PHMSA staffing levels, issues of particular interest have been the number of federal inspectors and the agency's historical use of staff funding.

In FY2023, PHMSA was funded for 356 full-time equivalent (FTE) employees in pipeline safety. This total included eight new FTE positions required by the PIPES Act of 2020 (§102) "to finalize outstanding rulemakings and fulfill congressional mandates." PHMSA's enacted budget authority for FY2024 and FY2025 included funding for 365 FTE employees in both years.[71]

Figure 5. PHMSA Pipeline Safety Staffing, Historical and Enacted, 2015-2025

(Full-Time Equivalent Staff)



Sources: U.S. Office of Management and Budget, *Budget of the United States Government: Appendix*, Fiscal Years 2016-2025, "Pipeline Safety," line 1001, "Direct civilian full-time equivalent employment"; Linda Daugherty, PHMSA, email communication, April 16, 2025.

Notes: These figures assume all staff are full-time equivalent employees (FTEs). Funded staff are "estimated staff" anticipated by the agency as reported in annual budget requests. They differ from actual staff employed (for the same fiscal year) as reported in subsequent budget requests. Pipeline safety FTEs in the figure include pipeline safety positions reporting directly through the Office of Pipeline Safety and through other program offices.

As **Figure 5** shows, PHMSA has faced a persistent staffing shortfall, which has generally been due to a shortage of inspectors. Agency officials have offered a number of reasons for the

[70] Howard "Skip" Elliott, PHMSA Administrator, remarks to the Fall Pipeline Leadership Meeting of the Association of Oil Pipe Lines and the American Petroleum Institute, October 25, 2018, p. 3, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/news/69671/aopl-api-speech.pdf.

[71] Linda Daugherty, PHMSA, email communication, April 16, 2025.

shortfall, including a scarcity of qualified inspector job applicants, delays in the federal hiring process (during which applicants accept other job offers), and PHMSA inspector turnover—especially due to retirements and departures to pipeline companies. Because PHMSA pipeline inspectors are extensively trained by the agency—typically for two years before being allowed to operate independently—they are highly valued by pipeline operators seeking to comply with federal safety regulations.

A 2017 DOT IG report supported PHMSA's assertions about industry-specific hiring challenges and confirmed "a significant gap between private industry and Federal salaries for the types of engineers PHMSA hires."[72] PHMSA has continued to experience staff losses due to an aging workforce and continued difficulty hiring and retaining engineers and technical staff because of competition from the oil and natural gas industry as well as lingering workforce challenges related to the COVID-19 pandemic.[73]

Although PHMSA has acted in recent years to shore up its workforce, there have been recommendations for improvement. A 2018 GAO study stated that PHMSA had not "planned for future workforce needs for interstate pipeline inspections" and, in particular, had not assessed the resources and benefits available from its state partners.[74] GAO concluded that without this type of forward-looking analysis, PHMSA could not "proactively plan for future inspection needs to ensure that federal and state resources are in place to provide effective oversight of interstate pipelines."[75] According to GAO, PHMSA concurred with its recommendation to develop a workforce plan for interstate pipeline inspections.

The PIPES Act of 2020 (§102(b)) established a yearly minimum number of FTEs for pipeline safety inspection and enforcement for FY2021-FY2023. The act also required PHMSA to "use incentives, as necessary, to recruit and retain a qualified workforce" as permitted under Title 5 of the *U.S. Code*, including special pay rates, student loan repayment, tuition assistance, and retention incentives. The agency has long been taking measures to address its staffing challenges, such as using Direct Hiring Authority for applicable positions; investing in education programs promoting pipeline safety engineering; developing targeted recruitment and hiring strategies for key positions; extending outreach among universities and professional associations; and participating in special hiring events, among other activities.[76] PHMSA has also received approval for a special pay rate table from the Office of Personnel Management for a 35% premium for engineer inspectors in its five regional offices, and PHMSA continues to implement other financial incentives, including recruitment and retention bonuses, tuition assistance, and student loan repayment.[77]

The second Trump Administration has stated plans to downsize the federal workforce, which it has indicated may involve actions in which individuals' employment with federal agencies is

[72] DOT, Office of Inspector General, "PHMSA Has Improved Its Workforce Management but Planning, Hiring, and Retention Challenges Remain," Report No. ST2018010, November 21, 2017, p. 12. Congress mandated the IG study in P.L. 114-183 (§9(a)).

[73] Tristan Brown, PHMSA Acting Administrator, Keynote address at the Pipeline Safety Trust annual conference, *The Future of Pipeline Safety*, New Orleans, LA, December 2, 2022, https://youtu.be/7lo1Nu6rGe4.

[74] GAO, *Interstate Pipeline Inspections: Additional Planning Could Help DOT Determine Appropriate Level of State Participation*, GAO-18-461, May 2018, p. 16. Congress mandated the IG study in P.L. 114-183 (§24).

[75] GAO, *Interstate Pipeline Inspections*, p. 16.

[76] DOT, *Budget Estimates Fiscal Year 2024, Pipeline and Hazardous Materials Safety Administration*, 2023, p. 35.

[77] U.S. Office of Personnel Management (OPM), Special Rate Table Number 0803, https://www.opm.gov/special-rates/2025/Table080301012025.aspx; Damon Hill, PHMSA, personal communication, March 24, 2023.

ended either voluntarily or involuntarily.[78] There are several preexisting voluntary and involuntary mechanisms the executive branch may use to downsize its workforce. In January, the Trump Administration announced a voluntary deferred resignation program.[79] According to press reports, some senior PHMSA staff have accepted the Administration's retirement offers, and other staff may be subject to involuntary separation, although the agency has made no public statements about staff departures.[80] What impact the Trump Administration's government downsizing efforts may have on PHMSA's future staffing levels—and how they may affect the agency's ability to effectively carry out its mission—may be of interest to Congress.

Aging Pipeline Modernization

The NTSB listed the safe shipment of hazardous materials by pipeline among its *2019-2020 Most Wanted List of Transportation Safety Improvements*, stating "as infrastructure ages, the risk to the public from pipeline ruptures also grows."[81] Likewise, Congress has been concerned about the safety of older transmission pipelines—a key factor in the San Bruno, CA, accident—and in leaky and deteriorating cast iron pipe in natural gas distribution systems—at issue in Merrimack Valley.[82] Construction work in Merrimack Valley, which led to the release of natural gas, was part of a cast iron pipe replacement project. According to the American Gas Association and other stakeholders, antiquated cast iron pipes in natural gas distribution systems, many over 50 years old, "have long been recognized as warranting attention in terms of management, replacement and/or reconditioning."[83] Old distribution pipes have also been identified as a significant source of methane leakage, which poses safety risks and contributes to U.S. GHG emissions.[84]

Natural gas distribution system operators with antiquated pipes in their systems all have programs for their replacement, although some are constrained by costs and rate regulation. Upgrading or replacing natural gas distribution infrastructure involves substantial capital investment. According to a 2015 Department of Energy analysis, the total cost of replacing all cast iron and bare steel distribution pipes in the United States at that time would have been approximately $270 billion (2015 dollars).[85] These costs, in turn, could be passed on to consumers through increased natural gas rates. The costs could pose particular challenges for publicly owned (e.g., municipal) gas utilities with constrained budgets and limited access to capital. Practical barriers, such as urban excavation and disruption of gas supplies, also constrain annual pipe replacement. Nonetheless, as the Department of Energy stated in a 2017 report, "many policymakers and the utilities responsible for delivering natural gas to customers broadly recognize the need to accelerate

[78] OPM, "Deferred Resignation Email to Federal Employees," January 28, 2025, https://www.opm.gov/fork/original-email-to-employees/.

[79] For further discussion, see CRS Insight IN12505, *Federal Workforce Downsizing: Voluntary and Involuntary Mechanisms*, by Taylor N. Riccard.

[80] Jacob Wendler, "Top Leaders Flee Pipeline Safety Agency as Trump Pushes to Build," *Bloomberg*, March 19, 2025.

[81] NTSB, "Ensure the Safe Shipment of Hazardous Materials," March 28, 2019.

[82] See, for example, U.S. Congress, House Committee on Energy and Commerce, Subcommittee on Energy, *Legislative Solutions to Make Our Nation's Pipelines Safer*, committee print, 116th Cong., 1st sess., June 19, 2019; and Office of Senator Edward Markey, "Markey Report: Leaky Natural Gas Pipelines Costing Consumers Billions," press release, Thursday, August 1, 2013.

[83] American Gas Association, "Managing the Reduction of the Nation's Cast Iron Inventory," 2013, summary.

[84] Kathryn McKain et al., "Methane Emissions from Natural Gas Infrastructure and Use in the Urban Region of Boston, Massachusetts," *Proceedings of the National Academy of Sciences*, vol. 112, no. 7 (February 27, 2015), pp. 1941-1946.

[85] Department of Energy, *Quadrennial Energy Review*, April 2015, pp. 1-4.

ongoing efforts to replace aging infrastructure while embracing new approaches to operations and maintenance."[86]

Although the federal role in natural gas distribution systems is limited because they are under state jurisdiction, there have been past legislative proposals in Congress to provide federal support for the replacement of old cast iron pipe.[87] Likewise the House Select Committee on the Climate Crisis majority staff report, released in June 2020, concluded that Congress should "provide financial support for cities and states to eliminate methane leaks from natural gas distribution lines within 10 years."[88] Consistent with these efforts, IIJA authorized a Natural Gas Distribution Infrastructure Safety and Modernization Grant Program (NGDISM), administered by PHMSA. The program was designed to provide grants to municipal or community-owned natural gas distribution utilities (excluding for-profit utilities) for the repair, rehabilitation, or replacement of some or all of their pipeline systems in order to reduce safety incidents and "avoid economic losses." IIJA appropriated a total of $1.0 billion for the program in $200 million increments annually from FY2022 to FY2026 to remain available until expended.

PHMSA announced it had begun accepting applications for the grants in May 2022.[89] According to the DOT FY2024 budget request, the agency awarded no grants in FY2022 but expected to award $392 million in grants through the end of FY2023.[90] In May 2024 testimony, PHMSA's deputy administrator stated,

> We have been delighted to see the interest and excitement from grant applicants and recipients and are happy to say that the NGDISM program is working. During our first year of project solicitations, the program attracted nearly $1.8 billion worth of applications for $200 million in funding. We had similar interest when we announced the FY23 and FY24 round of funding.... And this week, we are issuing another Notice of Funding Opportunity for the FY25 round of funding, which I know applicants are eager to apply for... Although the program is funded through 2026, PHMSA anticipates the work in carrying out and overseeing the infrastructure projects from the NGDISM program won't be completed until 2033.[91]

On January 20, 2025, President Trump issued Executive Order 14154, "Unleashing American Energy," which, among other provisions, directs agencies to pause disbursement of funds appropriated in the IIJA and to "review their processes, policies, and programs for issuing grants."[92] As of the date of this report, an FY2025 funding opportunity does not appear on

[86] Department of Energy (DOE), *Natural Gas Infrastructure Modernization Programs at Local Distribution Companies: Key Issues and Considerations*, January 2017, p. 5.

[87] For example, see the Pipeline Revolving Fund and Job Creation Act (S. 1209, 114th Congress) introduced by Sen. Markey and two cosponsors on May 6, 2015.

[88] House Select Committee on the Climate Crisis, *Solving the Climate Crisis*, majority staff report, June 2020, p. 7.

[89] PHMSA, "USDOT Begins Accepting Applications for President Biden's Bipartisan Infrastructure Law Program Designed to Improve Pipeline Safety, Reduce Gas Distribution Leaks in Communities Across the Country," press release, PHMSA 04-22, May 24, 2022.

[90] U.S. Office of Management and Budget, *Budget of the United States Government, Appendix*, Fiscal Year 2024, "Natural Gas Distribution Infrastructure Safety and Modernization Grant Program," Line 0002, "Grants," p. 941.

[91] Tristan Brown, Deputy Administrator, PHMSA, written testimony submitted for the House Committee on Transportation and Infrastructure, Subcommittee on Railroads, Pipelines, and Hazardous Materials hearing on *Ensuring Safety and Reliability: Examining the Reauthorization Needs of the Pipeline and Hazardous Materials Safety Administration*, May 7, 2024, p. 3, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2024-05/Written%20Testimony%20for%20Tristan%20Brown%20House%20TI%20PS%20Hearing%20-%20May%207%202024.pdf (hereinafter Tristan Brown, "Ensuring Safety and Reliability").

[92] Executive Order 14154, "Unleashing American Energy," 90 *Federal Register* 8353, January 20, 2025, Section 7, p. 8357.

PHMSA's website for the NGDISM grant program, nor is there an NGDISM grant opportunity listed in Grants.gov.

As PHMSA's implementation of the NGDISM program continues, Congress may examine its structure and effectiveness along with the industry's overall progress in addressing the safety of antiquated distribution lines.

Gathering Line Regulation

Natural gas gathering lines are pipelines that collect produced gas from wellheads and transport it to centralized collection points. The latter are usually gas processing facilities where impurities are removed and gas constituents (e.g., methane, propane) are separated into distinct products for further shipment to market. Natural gas gathering lines have historically operated in mostly rural areas at lower pressure than transmission lines and with smaller diameters—typically 20 inches or less. However, due to differences in extraction techniques, especially in shale gas production with hydraulic fracturing, newer gathering lines have been constructed up to 36 inches in diameter and operated at pressures similar to those in transmission lines.[93] Shale gas production has also been occurring in relatively more populated areas, notably the Marcellus basin in Ohio, Pennsylvania, and West Virginia. The construction of larger gathering lines in more populous regions, together with recent gathering pipeline accidents, has raised concerns about safety risks in nearby communities.

The Pipeline Safety Act of 1992 (P.L. 102-508, §109) authorized PHMSA to regulate the safety of gas gathering lines that "warrant regulation," taking account of "such factors as location, length of line from the well site, operating pressure, throughput, and the composition of the transported gas." Under these provisions, PHMSA issued a 2006 final rule defining *regulated gathering line* that covered less than 10% of U.S. natural gas gathering line mileage at the time.[94] The remaining gathering lines were judged to pose little risk to the public due to their physical characteristics and more remote locations.

In 2011, PHMSA published an Advance Notice of Proposed Rulemaking to begin examining, among other things, whether new regulations were needed to govern the safety of natural gas gathering lines—with specific reference to shale gas lines.[95] Continuing this rulemaking process, in 2016, PHMSA published a Notice of Proposed Rulemaking (NPRM) to modify the regulation of onshore gas gathering lines—repealing an exemption for operator reporting and extending specific regulatory requirements to certain gas gathering lines with large diameters and high operating pressures in certain locations.[96]

The PIPES Act of 2020 (§112(a)) required PHMSA to finalize its rule for onshore gas gathering lines by March 27, 2021. PHMSA published its final rule in the *Federal Register* on November 15, 2021.[97] Among its key provisions, the rule requires operators to report incidents and file annual reports for *all* natural gas gathering lines to "help determine the need for future regulatory

[93] PHMSA, "Pipeline Safety: Safety of Gas Transmission and Gathering Pipelines," 81 *Federal Register* 20721, April 8, 2016, p. 20728.

[94] PHMSA, "Gas Gathering Line Definition; Alternative Definition for Onshore Lines and New Safety Standards," 71 *Federal Register* 13289, March 15, 2006.

[95] PHMSA, "Pipeline Safety: Safety of Gas Transmission Pipelines," 76 *Federal Register* 5308, August 25, 2011, pp. 3086-53102.

[96] PHMSA, "Pipeline Safety: Safety of Gas Transmission and Gathering Pipelines," pp. 20722-20856.

[97] PHMSA, "Pipeline Safety: Safety of Gas Gathering Pipelines: Extension of Reporting Requirements, Regulation of Large, High-Pressure Lines, and Other Related Amendments," 86 *Federal Register* 63266, November 15, 2021, pp. 63266-63299.

changes to address the risks to the public, property and the environment."[98] According to PHMSA's announcement, under this requirement, "there are at least 425,000 miles of onshore gas gathering lines that have not been subject to PHMSA oversight but will be after this rule takes effect."[99]

The final rule also imposes new safety requirements (e.g., for damage prevention, construction, and operation) on gathering lines that have outer diameters of 8.625 inches or greater and operate at higher stress levels or pressures, with greater requirements for lines larger than 16 inches and certain gathering lines that could directly affect homes and other structures.[100] PHMSA estimated at the time of the rule that approximately 91,000 miles of gathering lines fell into this category.[101] Operators were required to comply with safety requirements for the larger gathering lines as of May 16, 2022, with initial annual reports due by May 15, 2023.

Pipeline stakeholder representatives participated in PHMSA's gathering line rulemaking process both as members of technical panels and as commenters on the proposed rule. While stakeholders reached a consensus on many provisions in PHMSA's final rule, some remained the subject of disagreement. In December 2021, two pipeline trade associations filed a petition with PHMSA to stay enforcement and reconsider a number of specific requirements due to disagreement with the agency's risk assessment and cost-benefit determination, arguing that PHMSA was imposing excessive and unnecessary burdens on operators.[102] Conversely, pipeline safety advocates supported implementing the agency's final rule "unhindered," citing the perceived "progress" in gathering line safety and concerns about industry's potentially negative influence on PHMSA's safety regulation.[103] In April 2022, PHMSA denied the petition for reconsideration of the final rule.[104] As PHMSA's final gathering line rule continues to be implemented, compliance among operators and the effects of the final rule on overall safety in the pipeline sector may be oversight issues for Congress.

PHMSA Regulation of Methane Leaks and Emissions

The Environmental Protection Agency's Greenhouse Gas Inventory lists "natural gas systems" as among the highest U.S. emissions sources of atmospheric methane, a potent GHG.[105] Within this category, studies have identified pipeline emissions—arising from leaks, planned maintenance releases, accidents, and other releases—as a major source of fugitive methane.[106] Given national goals to reduce GHG emissions in an effort to limit climate change, some in Congress have called

[98] 86 *Federal Register* 63266, p. 63268.

[99] PHMSA, "New Federal Regulations Add More Than 400,000 Miles of 'Gas Gathering' Pipelines Under Federal Oversight," press release, November 15, 2021.

[100] 86 *Federal Register* 63266, p. 63268.

[101] 86 *Federal Register* 63266, p. 63292.

[102] GPA Midstream Association and American Petroleum Institute, Petition for Reconsideration of Final Rule, "Safety of Gas Gathering Pipelines: Extension of Reporting Requirements, Regulation of Large, High-Pressure Lines, and Other Related Amendments," Docket No. PHMSA-2011-0023, December 20, 2021.

[103] Pipeline Safety Trust, "Pipeline Safety Trust Denounces Petition from API and GPA Midstream to Remove Important Safety Measures," press release, December 15, 2021.

[104] 87 *Federal Register* 26296, May 4, 2022.

[105] Environmental Protection Agency, "Data Highlights, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2019," 430-F-21-010, p. 2.

[106] See, for example, Zachary D. Weller et al., "A National Estimate of Methane Leakage from Pipeline Mains in Natural Gas Local Distribution Systems," *Environmental Science and Technology,* vol. 54, no. 14 (2020), pp. 8958-8967.

for tighter regulation of pipeline methane releases to reduce the sector's GHG contribution.[107] Reflecting these views, the PIPES Act (§113) mandates that PHMSA promulgate regulations requiring natural gas pipeline operators "to conduct leak detection and repair programs … to meet the need for gas pipeline safety, as determined by the Secretary; and … *to protect the environment*" (emphasis added). The act similarly requires PHMSA to evaluate "protection of the environment" as a factor in its review of pipeline operators' inspection and maintenance plans (§114).

The inclusion by Congress of explicit language in the PIPES Act about protecting "the environment" has been widely viewed as expanding PHMSA's traditional safety mission to include climate considerations. As PHMSA's former acting administrator stated in 2021, "we need to do all we can to prevent climate change[,] and reducing leaks which contribute to methane emission is a critical part of that."[108] The Biden Administration likewise cited the PIPES Act provisions as elements of a national strategy to "to tackle super-polluting methane emissions—a major contributor to climate change."[109]

The inspection and maintenance plan provisions in the PIPES Act (§114) are self-executing, applying directly to pipeline operators. PHMSA published an advisory bulletin in the *Federal Register* in June 2021 reminding pipeline operators to update their plans by the statutory deadline of December 27, 2021.[110]

In compliance with Section 113 of the PIPES Act, on January 17, 2025, PHMSA posted a final rule for "Gas Pipeline Leak Detection and Repair" (LDAR) on its website.[111] The rule would "require pipeline operators to establish advanced leak detection programs aimed at detecting and repairing *all* gas leaks" (emphasis added) through a set of new or expanded requirements:

- Increasing leak survey frequency and requiring the use of advanced leak detection technology.
- Reducing unintentional gas emissions (e.g., from leaks and equipment failures) and lowering the minimum volume threshold for reporting leaks.
- Minimizing intentional gas releases from planned pipeline maintenance, repair, and construction activities, and encouraging the use of methane capture equipment.

[107] See for, example, House Select Committee on the Climate Crisis, June 2020, pp. 200-201; Office of Sen. Edward Markey, "Markey: When We Fix Leaky Natural Gas Pipelines, We Can Save Lives and Money, Create Jobs," press release, May 6, 2015.

[108] Tristan Brown, PHMSA Acting Administrator, "Remarks of PHMSA Acting Administrator Tristan Brown Before the AOPL-API Fall Meeting," October 14, 2021, https://www.phmsa.dot.gov/news/remarks-phmsa-acting-administrator-tristan-brown-aopl-api-fall-meeting (hereinafter Tristan Brown, "Remarks Before the AOPL-API Fall Meeting").

[109] White House, "Biden Administration Tackles Super-Polluting Methane Emissions," January 31, 2022.

[110] PHMSA, "Pipeline Safety: Statutory Mandate to Update Inspection and Maintenance Plans to Address Eliminating Hazardous Leaks and Minimizing Releases of Natural Gas from Pipeline Facilities," 86 *Federal Register* 31002, June 10, 2021, pp. 31002-31003.

[111] PHMSA, "Pipeline Safety: Gas Pipeline Leak Detection and Repair," final rule (unofficial), Docket No. PHMSA-2021-0039, January 17, 2025, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2025-01/PHMSA%20Final%20Rule%20-%20Gas%20Pipeline%20Leak%20Detection%20and%20Repair%20-%20As%20submitted.pdf.

- Setting clear criteria and time frames for repairing all leaks that pose a safety or environmental risk.[112]

On January 17, 2025, PHMSA also submitted the LDAR final rule to the Office of the Federal Register (OFR) for publication in the *Federal Register*, the final statutory requirement for the rule to take effect. However, on January 20, 2025, President Trump issued a memorandum, "Regulatory Freeze Pending Review," ordering "all executive departments and agencies" to "immediately withdraw any rules that have been sent to the OFR but not published in the *Federal Register*, so that they can be reviewed and approved."[113] In compliance with the memorandum, PHMSA withdrew the LDAR final rule from *Federal Register* publication, so the rule is not in effect and operators are not required to comply with it. The future status of the rule under the Trump Administration remains to be seen.

Given the PIPES Act's mandate that PHMSA incorporate new environmental considerations in its pipeline safety standards, its Section 114 enforcement and Section 113 rulemaking continue to be of great interest among industry and environmental stakeholders as well as in Congress. As PHMSA implements the environmental protection and leak-related provisions in the PIPES Act, Congress may examine how the agency quantifies the costs and benefits of climate-related regulatory requirements, potential impacts to pipeline operations, how new information on methane leaks can inform future regulation, and how new technologies could improve leak identification and mitigation.

PHMSA and Pipeline Security

Ongoing physical and cyber threats against the nation's pipelines have heightened concerns about pipeline security risks. In a December 2018 study, GAO stated that, since the terrorist attacks of September 11, 2001, "new threats to the nation's pipeline systems have evolved to include sabotage by environmental activists and cyber attack or intrusion by nations."[114] The 2021 ransomware attack on the Colonial Pipeline Company brought pipeline security to the fore. Recent oversight of federal pipeline safety and security activities has included discussion of PHMSA's role in pipeline security.

In October 2021, PHMSA's acting administrator stated that the agency's security role "includes coordination efforts with [TSA] and other federal agencies to ensure there is a collaborative and efficient approach to monitoring, inspecting, and promulgating regulations related to cybersecurity in the pipeline industry."[115] While PHMSA has reported past cooperation with TSA in pipeline security under the terms of the pipeline security annex and subsequent collaboration, questions may remain regarding the ongoing roles of the two agencies. Some in Congress have been interested in PHMSA's role in the overall federal regulatory structure overseeing pipeline security, particularly cybersecurity, and incident response.[116] In March 2023 testimony before Congress, the PHMSA Deputy Administrator stated,

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[112] PHMSA, "USDOT Advances Rule to Modernize Gas Pipeline Methane Emissions Detection Requirements," press release, PHMSA 02-25, January 17, 2025, https://www.phmsa.dot.gov/news/usdot-advances-rule-modernize-gas-pipeline-methane-emissions-detection-requirements-0.

[113] 90 *Federal Register* 8249.

[114] GAO, *Critical Infrastructure Protection: Actions Needed to Address Significant Weaknesses in TSA's Pipeline Security Program Management*, p. 1.

[115] Tristan Brown, "Remarks Before the AOPL-API Fall Meeting."

[116] See, for example, Rep. Robert Menendez, remarks before the House Transportation and Infrastructure Committee, Subcommittee on Railroads, Pipelines, and Hazardous Materials hearing on *Pipeline Safety: Reviewing Implementation of the PIPES Act of 2020 and Examining Future Safety Needs*, March 8, 2023.

> We work very closely with [TSA].... There are operational impacts, potentially, when you have a cyberattack, and we're responsible for [overseeing] safe operations.... We've provided our input to the Transportation Security Administration on their proposed security directives on cybersecurity and we've engaged with leadership of pipeline companies ... to make sure we're all on the same page.[117]

In past Congresses, some legislative proposals would have promoted greater coordination among federal agencies and state government agencies and the energy sector in pipeline security.[118] What role PHMSA might play in any future pipeline security initiatives, and what resources it might require to perform that role, may be a consideration for Congress.

Carbon Dioxide Pipeline Rulemaking

Carbon dioxide (CO_2) pipelines are essential components of carbon capture and storage (CCS) systems, which are proposed to reduce atmospheric emissions of anthropogenic CO_2, a greenhouse gas.[119] Pipelines are needed to transport the CO_2 from where it is captured (e.g., power plants) to the underground geologic formations where it can be stored. Approximately 5,300 miles of pipeline already carry CO_2 in the United States (**Table 1**), primarily linking natural CO_2 sources to aging oil fields where the CO_2 is used for enhanced oil recovery. However, a larger CO_2 pipeline network could be needed for CCS to significantly reduce U.S. greenhouse gas emissions. A 2021 study suggested that such a network could total some 66,000 miles of pipeline by 2050, requiring some $170 billion in new capital investment.[120] Because CO_2 in high concentrations can be hazardous to human health, building out a national CO_2 pipeline network raises safety issues that may affect communities near such a network and may hinder CCS deployment because of public concerns about safety.

CO_2 occurs naturally in the atmosphere and is produced by the human body, so it is often perceived to be relatively harmless. However, as concentrations increase, CO_2 displaces oxygen—which may cause a range of negative health impacts, including suffocation.[121] Pipeline CO_2 also may contain potentially hazardous contaminants, such as hydrogen sulfide. Because CO_2 is colorless, odorless, and heavier than air, an uncontrolled release may spread undetected near the ground or in confined spaces. Therefore, CO_2 pipelines pose a public safety risk, as demonstrated by the 2020 CO_2 pipeline rupture in Satartia, MS, which led to a local evacuation and caused 45 people to be hospitalized.[122]

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[117] Tristan Brown, Deputy Administrator, PHMSA, testimony before the House Transportation and Infrastructure Committee, Subcommittee on Railroads, Pipelines, and Hazardous Materials hearing on *Pipeline Safety: Reviewing Implementation of the PIPES Act of 2020 and Examining Future Safety Needs*, March 8, 2023 (hereinafter Tristan Brown, *Reviewing Implementation of the PIPES Act of 2020*).

[118] See, for example, the Pipeline and LNG Facility Cybersecurity Preparedness Act (H.R. 3078) in the 117th Congress.

[119] For more information on CCS, see CRS Report R44902, *Carbon Capture and Sequestration (CCS) in the United States*, by Angela C. Jones and Ashley J. Lawson.

[120] Princeton University and High Meadows Environmental Institute, *Net-Zero America*, final report summary, October 29, 2021, https://netzeroamerica.princeton.edu/img/Princeton%20NZA%20FINAL%20REPORT%20SUMMARY%20(29Oct2021).pdf.

[121] U.S. Department of Agriculture, Food Safety and Inspection Service, "Carbon Dioxide Health Hazard Information Sheet," ESHG-Health-02.00, February 7, 2018, https://www.fsis.usda.gov/sites/default/files/media_file/2020-08/Carbon-Dioxide.pdf.

[122] PHMSA, "Failure Investigation Report—Denbury Gulf Coast Pipelines, LLC—Pipeline Rupture/Natural Force Damage," May 26, 2022, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2022-05/Failure%20Investigation%20Report%20-%20Denbury%20Gulf%20Coast%20Pipeline.pdf.

PHMSA has promulgated and enforces regulations for construction, operation and maintenance, and emergency response planning for CO_2 pipelines.[123] Although CO_2 is listed as a Class 2.2 (nonflammable gas) hazardous material under DOT regulations, PHMSA currently applies safety requirements to CO_2 pipelines similar to those for pipelines carrying hazardous liquids such as crude oil and anhydrous ammonia.[124] Prior to the Satartia accident, according to PHMSA statistics, CO_2 pipeline operators reported only one injury and no fatalities caused by regulated pipelines over the last 20 years. However, pipeline safety advocates have argued that PHMSA's regulations for CO_2 pipelines are insufficient with respect to hazard zones around CO_2 releases, potential pipeline fractures, and corrosion of CO_2 pipeline steel, among other things.[125]

Concerns about CO_2 pipeline safety have emerged as an issue for developing CCS projects, especially in the Upper Midwest, where several CO_2 pipeline projects have been proposed in recent years.[126] These pipelines have faced opposition among affected landowners and advocacy groups for reasons including risks to public safety. As a consequence, the developers have faced resistance securing voluntary agreements with landowners for pipeline rights-of-way through their properties and there have been regulatory interventions and legislative efforts to limit state eminent domain authority for such projects.[127]

The Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 (P.L. 112-90, §15) directed PHMSA to "prescribe minimum safety standards for the transportation of carbon dioxide by pipeline in a gaseous state" and to "consider" whether applying the safety standards in effect at that time for transporting liquid carbon dioxide or gaseous carbon dioxide "would ensure safety." In response to this previously unfulfilled mandate, and findings from its own Satartia accident investigation, PHMSA announced a rulemaking on May 26, 2022, to update its CO_2 pipeline safety standards and a research solicitation to study the impact of CO_2 pipeline releases.[128]

On January 15, 2025, PHMSA announced an NPRM to "strengthen existing standards for hazardous liquid and CO_2 pipelines (including CO_2 that is transported in a supercritical fluid state), and for the first-time, establish new standards for transporting carbon dioxide in a gaseous state via pipeline."[129] If adopted, the rule would establish new safety requirements for CO_2 pipelines, including

[123] 49 C.F.R. §§190, 195-199.

[124] 49 C.F.R. §172.101.

[125] Richard B. Kuprewicz, President, Accufacts Inc., *Accufacts' Perspectives on the State of Federal Carbon Dioxide Transmission Pipeline Safety Regulations as It Relates to Carbon Capture, Utilization, and Sequestration Within the U.S.*, prepared for the Pipeline Safety Trust, March 23, 2022, pp. 12-13.

[126] Summit Carbon Solutions, "Project Footprint," web page, March 16, 2023, https://summitcarbonsolutions.com/project-footprint/; Navigator CO_2 Ventures, "Navigator CO_2," fact sheet, August 15, 2022, https://d3o151.p3cdn1.secureserver.net/wp-content/uploads/2022/08/HG-Fact-Sheet-vFINAL.pdf; Wolf Carbon Solutions, "Wolf Carbon Solutions Files Mt. Simon Hub Permit Application in Iowa," press release, February 23, 2023, https://wolfcarbonsolutions.com/wp-content/uploads/2023/02/Iowa-Permit-Release-02232023.pdf.

[127] Noel Copeland, "Summit Carbon Solutions Faces Another Setback," RBN Energy, April 24, 2025, https://rbnenergy.com/analyst-insights/summit-carbon-solutions-faces-another-setback; Donnelle Eller, "Iowa Poll: Strong Majority Opposes Using Eminent Domain for Carbon-Capture Pipelines," *Des Moines Register*, March 14, 2023.

[128] PHMSA, "PHMSA Announces New Safety Measures to Protect Americans from Carbon Dioxide Pipeline Failures After Satartia, MS Leak," press release, PHMSA 05-22, May 26, 2022.

[129] PHMSA, "USDOT Proposes New Rule to Strengthen Safety Requirements for Carbon Dioxide Pipelines," press release, January 15, 2025, https://www.transportation.gov/briefing-room/usdot-proposes-new-rule-strengthen-safety-requirements-carbon-dioxide-pipelines.

- establishing design, installation, operation, maintenance, and reporting requirements for CO_2 gas pipelines;
- establishing new requirements for converting existing pipelines to transport CO_2 in different phases;
- requiring CO_2 pipeline operators to provide training to emergency responders and ensure the availability of CO_2 detection and other equipment for emergency response;
- implementing more robust requirements for public communication during an emergency; and
- requiring more detailed CO_2 vapor dispersion analyses to better protect the public and the environment in a pipeline failure.[130]

According to PHMSA, the agency submitted the NPRM for publication in the *Federal Register* concurrently with its posting on its website.[131] However, as in the case of the LDAR final rule, in accordance with President Trump's memorandum, "Regulatory Freeze Pending Review," PHMSA subsequently withdrew the CO_2 pipeline NPRM from *Federal Register* publication. Consequently, the proposed rule is not "official" and is not open for public comment.

Given the fundamental need for pipelines in CCS systems, actual or perceived safety risks associated with CO_2 pipelines may limit the potential of CCS as a greenhouse gas mitigation option. Opposition to siting of pipelines due to safety concerns may prevent CO_2 pipeline development in certain localities and increase development time and costs in others. How PHMSA will proceed with its CO_2 pipeline NPRM under the Trump Administration is uncertain, but CO_2 pipeline safety, and its implications for CCS deployment, may be an oversight issue for Congress.

Hydrogen Pipeline Safety

Some in Congress have proposed hydrogen as an environmentally friendlier alternative to conventional fossil fuels for vehicles, vessels, and electric power generation. IIJA authorized an $8 billion program of Regional Clean Hydrogen Hubs, which would be centers of activity involving hydrogen production, delivery, and end use.[132] Supplying hydrogen from sources like regional hubs to power plants, industrial facilities, and vehicular fuel distribution centers could require the development of an expansive hydrogen pipeline network.

Shipping hydrogen by pipeline in the United States is not new, but the existing pipeline network is relatively small and located almost entirely along the Gulf Coast. There are approximately 1,600 miles of active hydrogen pipeline in the United States (**Table 1**), with over 90% located in Texas, Louisiana, and Alabama, primarily serving refineries and ammonia plants.[133] The pipeline

[130] Ibid.

[131] PHMSA, "Pipeline Safety: Safety of Carbon Dioxide and Hazardous Liquid Pipelines," notice of proposed rulemaking (unofficial), Docket No. PHMSA-2022-0125, January 12, 2025, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2025-01/PHMSA%20Notice%20of%20Proposed%20Rulemaking%20for%20CO2%20Pipelines%20-%202137-AF60.pdf.

[132] For more information, see CRS Report R47487, *The Hydrogen Economy: Putting the Pieces Together*, by Martin C. Offutt.

[133] PHMSA, "Gas Distribution, Gas Gathering, Gas Transmission, Hazardous Liquids, Liquefied Natural Gas (LNG), and Underground Natural Gas Storage (UNGS) Annual Report Data," Form 7100.2-1 operator filings database, Gas Transmission & Gathering Annual Data—2023, available at https://www.phmsa.dot.gov/data-and-statistics/pipeline/gas-distribution-gas-gathering-gas-transmission-hazardous-liquids. The other states with hydrogen pipelines are Kansas, Michigan, New York, Ohio, Oklahoma, Utah, and Washington.

network required to support a hydrogen-based U.S. energy strategy would need to be much larger. To facilitate the pipeline transportation of hydrogen, some in Congress, in the pipeline industry, and in the executive branch have proposed blending significant hydrogen volumes with methane in existing natural gas pipelines.[134]

Transporting hydrogen by pipeline, especially in existing natural gas pipelines, poses safety challenges due to hydrogen's chemical characteristics. Hydrogen molecules are the smallest of all molecules, and therefore are more prone than methane (the principal component of natural gas) to leak through joints, microscopic cracks, and seals in pipelines and associated infrastructure.[135] Hydrogen can also permeate directly through polymer (plastic) materials, such as those typically used to make natural gas distribution pipes. The presence of hydrogen can deteriorate steel pipe, pipe welds, valves, and fittings through a variety of mechanisms, particularly embrittlement.[136] In 2022, a safety advocacy group published a report on hydrogen blending that "identifies serious concerns about the pursuit of hydrogen blending options for existing gas transmission or gas distribution pipelines" due to the potential for pipeline leaks and failures and the greater flammability of hydrogen compared to methane.[137] However, a pipeline industry trade group disagreed with these findings, pointing to operator experience safely transporting hydrogen blends.[138]

PHMSA's pipeline safety authority extends to hydrogen pipelines, which the agency has regulated since 1970 as a "flammable gas."[139] PHMSA does not currently prohibit natural gas pipeline operators from introducing hydrogen into their systems. However, some stakeholders have questioned whether PHMSA's existing regulations are appropriate and sufficient to ensure the safety of an expanding hydrogen pipeline network, especially if it includes existing natural gas pipelines carrying hydrogen blends.[140] For example, the agency does not currently require operators to report information about hydrogen blends in their pipeline systems if natural gas is the dominant commodity. A 2021 Sandia National Laboratories report reviewing pipeline industry standards concluded,

> There are many safety codes and standards that are relevant to hydrogen blending in the natural gas infrastructure. Relevant codes include those that address natural gas and hydrogen specifically, as well as those that address blended gasses. However, there are

[134] See, for example, DOE, "August H2IQ Hour: Regulation and Permitting of Hydrogen and Natural Gas Pipelines: Text Version," webinar transcript, August 29, 2024, https://www.energy.gov/eere/fuelcells/august-h2iq-hour-regulation-and-permitting-hydrogen-and-natural-gas-pipelines-text; Sen. Joe Manchin, opening remarks before the U.S. Senate Committee on Energy and Natural Resources hearing on *Opportunities and Challenges in Using Clean Hydrogen in the Transportation, Utility, Industrial, Commercial, and Residential Sectors*, February 10, 2022; Kavya Balaraman, "SoCalGas, SDG&E Outline Plan for Hydrogen Blending Demonstration Projects in California," *Utility Dive*, September 20, 2022, https://www.utilitydive.com/news/socalgas-sdge-hydrogen-blending-cpuc/632201/.

[135] The kinetic diameters of molecular hydrogen and methane, respectively, are 289 and 380 picometers.

[136] Peter Adam et al., "Hydrogen Infrastructure—The Pillar of Energy Transition," white paper, Siemens Energy, September 15, 2020, pp. 14-15, https://assets.siemens-energy.com/siemens/assets/api/uuid:3d4339dc-434e-4692-81a0-a55adbcaa92e/200915-whitepaper-h2-infrastructure-en.pdf.

[137] Richard B. Kuprewicz, President, Accufacts Inc., *Safety of Hydrogen Transportation by Gas Pipelines*, prepared for the Pipeline Safety Trust, November 28, 2022, p. 1, https://pstrust.org/wp-content/uploads/2022/11/11-28-22-Final-Accufacts-Hydrogen-Pipeline-Report.pdf.

[138] American Gas Association and American Public Gas Association, joint letter to Bill Caram, Executive Director, Pipeline Safety Trust, and Richard Kuprewicz, President, Accufacts Inc., December 15, 2022, https://pstrust.org/wp-content/uploads/2023/01/AGA-letter-to-PST-on-H-Report.pdf.

[139] PHMSA regulates hydrogen pipeline safety under its safety requirements at 49 C.F.R. Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards."

[140] Mike Soraghan, "Biden Energy Agenda Exposes Regulatory Gap," *E&E News*, February 26, 2023.

> gaps that will need to be addressed when considering introducing hydrogen/natural gas blends into the current infrastructure.[141]

PHMSA's research and development program database currently lists 13 active projects related to hydrogen infrastructure safety funded under its existing research grant program.[142] Congress has promoted additional federal initiatives around hydrogen pipeline safety-related research and development. The IIJA directs the Secretary of Energy to advance the safe and efficient delivery of hydrogen or hydrogen-carrier fuels in pipelines, including by retrofitting existing natural gas pipelines (§40313). In the 118th Congress, the Hydrogen Infrastructure Finance and Innovation Act (S. 649; H.R. 7200) would have established a DOE hydrogen infrastructure finance and innovation pilot program. The act also would have required federal agencies, including PHMSA, to cooperatively study outstanding questions regarding research, development, and demonstration of hydrogen pipeline infrastructure and to separately study "jurisdiction over the siting, construction, safety, and regulation of hydrogen transportation infrastructure, including, at a minimum, the blending of hydrogen in natural gas pipelines." The bill also would have imposed hydrogen leakage, monitoring, reporting, verification, detection, and repair requirements on pipelines receiving federal financial support under the bill.

PHMSA officials stated in 2022 that the agency was "taking a look at" revising its regulations for hydrogen pipelines but that "research ... needs to be done, we need to know more" to ensure that any potential future changes to its regulations appropriately address risks to hydrogen pipeline safety.[143] In 2024, PHMSA's acting administrator testified that research on hydrogen pipeline transportation was "necessary and timely as we look towards ... varying hydrogen blending of natural gas pipelines ... which may involve additional rulemaking efforts at PHMSA."[144] Some stakeholders have questioned whether new hydrogen pipeline projects, especially blending projects, should be permitted while PHMSA's existing regulations are being reexamined. As hydrogen infrastructure research, development, and deployment continues, the adequacy of PHMSA's hydrogen pipeline safety regulation may be an issue for Congress.

Special Permits

If a pipeline operator believes unique circumstances would make it impracticable or inappropriate to comply with PHMSA's pipeline safety regulations, the operator may apply to the agency for a special permit to waive or modify compliance. By statute, PHMSA is authorized to "waive compliance with any part of an applicable standard ... with respect to such facility on terms the Secretary [of Transportation] considers appropriate if the Secretary determines that the waiver is not inconsistent with pipeline safety."[145] PHMSA's website lists 135 special permits (formerly called waivers) for pipelines dating back to 1976.[146] PHMSA issued 18 such permits in 2023, all

[141] Sandia National Laboratories, *Codes and Standards Assessment for Hydrogen Blends into the Natural Gas Infrastructure*, SAND2021-12478, October 2021, p. 31.

[142] PHMSA, "Research and Development Program Awards," web database, accessed April 28, 2025, https://primis.phmsa.dot.gov/matrix/prjquery.rdm.

[143] Alan Mayberry, PHMSA Associate Administrator, remarks at the *Future of Pipeline Safety—Technology, Tools, and Transition* conference, "Hydrogen Pipeline Safety" session, sponsored by the Pipeline Safety Trust, New Orleans, LA, December 2, 2022, https://www.youtube.com/watch?v=5uECL9-Gc9M.

[144] Tristan Brown, "Ensuring Safety and Reliability."

[145] 49 U.S.C. §60118(c).

[146] PHMSA, "Special Permits Issued," web table, April 4, 2025, https://www.phmsa.dot.gov/pipeline/special-permits-state-waivers/special-permits-issued.

for natural gas transmission pipelines. The agency did not issue any special permits in 2024 or in the first quarter of 2025. PHMSA has not denied a pipeline special permit since 2019.[147]

In 2021, GAO published a report reviewing PHMSA's oversight of the Keystone Pipeline, which had experienced several spills while operating under a special permit.[148] The pipeline's special permit, issued in 2007, allowed it to operate at a pressure level of 80% of its specified minimum yield strength (SMYS) rather than the standard limit of 72% of SMYS.[149] The GAO report identified shortcomings in PHMSA's administration of special permits and stated that PHMSA was "establishing a process to more formally document and track the safety and compliance of all special permits."[150] However, PHMSA's special permits continued to be an issue of concern after the December 2022 oil spill near Washington, KS, again from the Keystone Pipeline, which released an estimated 14,000 barrels of crude oil and impacted Mill Creek.[151] Some in Congress and other stakeholders questioned PHMSA's issuance and enforcement of the Keystone Pipeline special permit, and the agency's use of such permits in general.[152]

Following the GAO report, PHMSA commissioned Oak Ridge National Laboratory "to assess the overall effectiveness of its pipeline special permit program."[153] The Oak Ridge report, issued in 2023, concluded that "the enforcement history for special permit pipeline segments is generally positive," and that "based on OPS accident records, the special permit process has not resulted in a reduction in safety of special permit segments."[154] However, the report recommended several changes to improve PHMSA's administration of pipeline special permits, such as establishing an approved standard operating procedure for the special permit process, consistent procedures for special permit compliance oversight, and sunset provisions for special permits.[155] Congress may examine PHMSA's implementation of these recommendations and its oversight and enforcement of existing special permits.

Outdated LNG Safety Standards

The adequacy of PHMSA's minimum safety standards for LNG facilities (49 C.F.R. §193) has become a concern in Congress due to growth in U.S. LNG infrastructure and recent safety incidents.[156] Although PHMSA has no siting authority, FERC requires compliance with PHMSA's

[147] PHMSA, "Special Permits Denied," web table, April 24, 2025, https://www.phmsa.dot.gov/pipeline/special-permits-state-waivers/special-permits-denied.

[148] GAO, "Pipeline Safety: Information on Keystone Accidents and DOT Oversight," GAO-21-588, July 2021, https://www.gao.gov/assets/gao-21-588.pdf.

[149] PHMSA, Special Permit PHMSA-2006-26617, April 30, 2007, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/TC_Keystone_2007-04-30_508compliant.pdf.

[150] GAO, July 2021, p. 29.

[151] PHMSA, "In the Matter of TC Oil Pipeline Operations, Inc.," Corrective Action Order, CPF No. 3-2022-074-CAO, December 8, 2022, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2022-12/TC%20Oil%20CAO.3-2022-074.pdf.

[152] See, for example, Senate Committee on Commerce, Science, and Transportation, "Cantwell Calls for Increased Oversight After Keystone Pipeline Spills Nearly 600,000 Gallons of Tar Sands, Largest Onshore Spill in Nearly a Decade," press release, January 9, 2023.

[153] PHMSA, report cover letter, October 27, 2023, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2023-10/ORNL%20PHMSA%20Special%20Permits%20Review%202023.pdf.

[154] Oak Ridge National Laboratory, *PHMSA Special Permit Process Review*, ORNL/SPR-2022/2682, August 2023, Executive Summary, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2023-10/ORNL%20PHMSA%20Special%20Permits%20Review%202023.pdf.

[155] Ibid.

[156] PHMSA's statutory authority for LNG is codified at 49 U.S.C. §60103.

regulations for the siting and operation of LNG marine terminals for import or export.[157] In August 2020, GAO published a study of U.S. LNG exports that examined PHMSA's regulation of LNG terminal safety, among other topics. The study reported,

> PHMSA's Part 193 regulations for permitting LNG export facilities, last revised in 2015, incorporate nine technical standards that, according to a PHMSA document, are the basis for FERC's safety review of LNG export facilities. Eight of the nine incorporated standards are outdated.[158]

The PIPES Act of 2020 subsequently required PHMSA to review its minimum LNG operating and maintenance standards and, based on its review, to update its standards for "large-scale liquefied natural gas facilities (other than peak shaving facilities) to provide for a risk-based regulatory approach for such facilities" (Section 110a).[159] PHMSA was given a three-year deadline from enactment to complete these tasks.

The issue of outdated LNG facility standards initially drew scrutiny after the 2018 partial shutdown of the Sabine Pass LNG terminal in Cameron Parish, TX, due to cracks found in LNG storage tanks that resulted in leaking LNG.[160] This incident was followed by the June 8, 2022, accident at the Freeport LNG export terminal. In the latter incident, a piping failure caused a rapid release of methane, forming a flammable vapor cloud that subsequently exploded as a massive fireball.[161] Although no injuries were reported, the incident caused significant damage to adjacent piping, electrical systems, and other facility infrastructure. The LNG terminal was forced to shut down to make repairs and conduct safety recommissioning, temporarily halting approximately 20% of U.S. LNG exports. Freeport LNG was able to resume full operation in March 2023, approximately eight months after the accident.[162] In the wake of the Freeport accident, pipeline safety advocates and community stakeholders called for greater urgency in updating PHMSA's LNG safety requirements.[163]

The PHMSA Deputy Administrator testified in March 2023 that the agency's updated LNG rule was a "priority" and that he "hoped to get a proposal this year."[164] According to PHMSA's public tracker for PIPES Act rulemakings, as of January 2025, the agency expected to publish a revised

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[157] The siting provisions in 49 C.F.R. §193 incorporate by reference Standard 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, from the National Fire Protection Association (NFPA). NFPA 59A requires thermal exclusion zones and flammable vapor-gas dispersion zones around LNG terminals (§§193.2057, 193.2059). PHMSA regulations also adopt many of NFPA's design and construction guidelines, including requirements for LNG facilities to withstand fire, wind, hydraulic forces, and erosion from LNG spills (§§193.2067, 193.2155, 193.2301).

[158] GAO, *Natural Gas Exports: Updated Guidance and Regulations Could Improve Facility Permitting Processes*, GAO-20-619, August 2020, p. 29.

[159] Peak shaving facilities draw natural gas from the pipeline system during periods of low demand and liquefy it into LNG for long-term storage. The LNG can then be regasified and reinjected into the pipeline system at a later time to supplement pipeline gas supplies during times of peak demand.

[160] PHMSA, "Notice of Probable Violation and Proposed Civil Penalty," CPF 4-2021-002-NOPV, Cheniere Energy, Inc., July 1, 2021.

[161] IFO Group, *Freeport LNG Quintana Island, Texas: June 8, 2022—Loss of Primary Containment Incident Investigation Report*, October 30, 2022, pp. 49-50, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2022-11/IFO-Group-RCFA-Report-final-redacted.pdf.

[162] Freeport LNG, "Freeport LNG Receives Regulatory Approval for Restart of Final Liquefaction Train," press release, March 8, 2023, http://freeportlng.newsrouter.com/news_release.asp?intRelease_ID=9760&intAcc_ID=77.

[163] Mike Soraghan and Mike Lee, "LNG Explosion Shines Light on 42-Year-Old Gas Rules," *E&E News*, June 28, 2022.

[164] Tristan Brown, *Reviewing Implementation of the PIPES Act of 2020*.

LNG safety standard in the *Federal Register* in February 2026.[165] However, on April 29, 2025, the Secretary of Transportation announced that PHMSA was publishing a new Advance Notice of Proposed Rulemaking (ANPRM) to revisit its LNG safety standards, effectively starting the rulemaking process from the beginning.[166] When PHMSA promulgates its new regulations, and whether the revisions to its regulations appropriately incorporate the newest industry standards to reduce LNG safety risks, may be oversight issues for Congress.

Class Location Requirements

PHMSA's safety regulations for natural gas pipelines use "class location" as a method to differentiate risk to the public based on the population density adjacent to a pipeline.[167]

> Locations along gas pipelines are divided into classes from 1 (rural) to 4 (densely populated) and are based upon the number of buildings or dwellings for human occupancy. Allowable pipe stresses ... decrease as class location increases from Class 1 to Class 4 locations.[168]

In October 2020, PHMSA published an NPRM to amend its safety regulations for natural gas transmission pipelines that experience a change in class location due to changes in population density.

> Under the existing regulations, pipeline segments located in areas where the population density has significantly increased must perform one of the following actions: Reduce the pressure of the pipeline segment, pressure test the pipeline segment to higher standards, or replace the pipeline segment. This proposed rule would add an alternative set of requirements operators could use, based on implementing integrity management principles and pipe eligibility criteria, to manage certain pipeline segments where the class location has changed.[169]

In March 2024, PHMSA convened its Gas Pipeline Advisory Committee to discuss its class location NPRM and recommend approval or modifications to technical aspects of the rule.[170]

According to PHMSA, pipeline operators assert "that performing integrity management measures on pipelines where class locations have changed due to population increases would be an equally safe but less costly alternative to the current requirements."[171] Pipeline safety advocates have also stated their support for PHMSA to "finalize the rule without major departures from its original intent."[172] However, as of April 2025, PHMSA had not published a final rule. On April 29, 2025, the Secretary of Transportation announced that finalizing PHMSA's pipeline class location

[165] PHMSA, "PIPES Act 2020 Web Chart," January 17, 2025.

[166] DOT, "Trump's Transportation Secretary Sean P. Duffy Announces Effort to Update Outdated Liquefied Natural Gas Regulations Tuesday," press release, April 29, 2025, https://www.transportation.gov/briefing-room/trumps-transportation-secretary-sean-p-duffy-announces-effort-update-outdated (hereinafter DOT, "Effort to Update Outdated LNG Regulations"); Mike Soraghan and Carlos Anchondo, "Trump Administration Kicks Off Rewrite of LNG Safety Rules," *EnergyWire*, April 30, 2025.

[167] 49 C.F.R. §192.5.

[168] 78 *Federal Register* 46560, August 1, 2013, p. 46561.

[169] 85 *Federal Register* 65142, October 14, 2020.

[170] 89 *Federal Register* 12798, February 20, 2024, pp. 12798-12800.

[171] See PHMSA summary at Reginfo.gov, RIN: 2137-AF29, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202404&RIN=2137-AF29.

[172] Pipeline Safety Trust, letter to Alan K. Mayberry, PHMSA Associate Administrator, August 27, 2024, p. 4, https://pstrust.org/wp-content/uploads/2024/08/PST-Comment-re-GPAC-Meeting-Class-Location-PHMSA-2024-0005.pdf.

change requirements would be a top priority for the agency.[173] The timing and nature of PHMSA's updated class location regulations, and whether they strike a proper balance between operator efficiency and public safety, may be oversight issues for Congress.

Pipeline Safety Research, Development, and Demonstration

Congress provides PHMSA with funding for pipeline safety-related research and development. According to PHMSA, the agency "conducts and supports research to support regulatory and enforcement activities and to provide the technical and analytical foundation necessary for planning, evaluating, and implementing the pipeline safety program."[174] As of April 30, 2025, PHSMA's database listed 61 active projects supported by approximately $42.4 million in agency funding.[175]

In addition to R&D activities funded by PHMSA, the PIPES Act of 2020 included provisions allowing PHMSA to "establish and carry out limited safety-enhancing testing programs to evaluate innovative technologies and operational practices" for natural gas and hazardous liquid pipeline facilities implemented by pipeline operators (§104). In February 2002, PHMSA published in the *Federal Register* a notice outlining how the agency would review and process Pipeline Safety Enhancement Program (PSEP) applications by pipeline owners and operators, establishing a three-year time limit for the duration of a PSEP pilot project, and setting an application deadline of December 21, 2023.[176] However, according to March 2023 hearing testimony from pipeline industry representatives, no operator had participated in the PSEP technology pilot program because, in their view, PHMSA did not allow sufficient time for the program to operate and imposed excessive administrative and review requirements on the PSEP applications.[177] At the same hearing, the PHMSA Acting Administrator testified that a high standard of safety review is necessary because PSEP projects have safety implications for the public.[178] He also testified that environmental review is mandated under the National Environmental Policy Act (NEPA) but that it is a "common goal" to make the program more efficient.[179]

Apart from PHMSA's R&D activities, Congress has funded pipeline safety-related research through DOE. For example, DOE's Hydrogen Program funded a study from 2020 to 2022 by Sandia National Laboratories on hydrogen blending in natural gas pipelines; the study examined, among other things, hydrogen-induced degradation of distribution piping and gaps in related safety codes and standards.[180] In addition, DOE's Office of Fossil Energy and Carbon Management, through its Carbon Transport program and in collaboration with PHMSA and other

[173] DOT, "Effort to Update Outdated LNG Regulations."

[174] PHMSA, "PHMSA Research and Development," web page, https://www.phmsa.dot.gov/research-and-development/phmsa-research-and-development.

[175] PHMSA, "Research Project Query," web database, accessed April 30, 2025, https://primis.phmsa.dot.gov/matrix/prjQuery.rdm.

[176] 87 *Federal Register* 5939, February 2, 2022.

[177] Andrew Black, Chief Executive Officer, Liquid Energy Pipeline Association (LEPA), and Kenneth W. Grubb, Chief Operating Officer, Gas Pipelines, Kinder Morgan, Inc., testimony before the House Transportation and Infrastructure Committee, Subcommittee on Railroads, Pipelines, and Hazardous Materials hearing on *Pipeline Safety: Reviewing Implementation of the PIPES Act of 2020 and Examining Future Safety Needs*, March 8, 2023.

[178] Tristan Brown, *Reviewing Implementation of the PIPES Act of 2020*.

[179] Tristan Brown, "Remarks Before the AOPL-API Fall Meeting." NEPA is codified at 42 U.S.C. §§4321 et seq.

[180] Sandia National Laboratories, "Hydrogen Blending into Natural Gas Pipelines," Project ID: H2060, WBS 8.6.4.2, slide presentation at the DOE Hydrogen Program 2022 Annual Merit Review and Peer Evaluation Meeting, June 6, 2022.

federal agencies, works "to ensure a safe and reliable CO_2 transport network that supports the deployment of carbon capture, utilization, and storage (CCUS) and carbon dioxide removal (CDR)."[181]

The Next Generation Pipelines Research and Development Act (H.R. 2613), which was ordered to be reported on April 29, 2025, by the House Committee on Science, Space, and Technology, Subcommittee on Energy, would require the DOE, in coordination with PHMSA, to establish a new initiative to fund

> demonstration projects on low- to mid-technology readiness level subjects ... applicable to pipelines and associated infrastructure, including liquefied natural gas facilities and underground and above ground gas and liquid fuel storage facilities; and ... development of next generation pipeline systems, components, and related technologies (§4(a)).

Focus areas under the initiative would include advanced leak detection and mitigation, novel materials, technologies and methods for retrofitting existing pipelines, advanced sensors, and technologies and methods to reduce potential environmental impacts, among others. The initiative would prioritize a diverse mix of commodities, including gas and liquid hydrocarbons, carbon dioxide, hydrogen, and hydrogen blends.

As the programs above indicate, Congress has supported ongoing initiatives within PHMSA, DOE, and the pipeline industry, to develop and deploy new pipeline safety technologies and operating practices. Budgetary and legislative proposals in the 119th Congress could expand these initiatives. Ensuring that these programs are implemented and coordinated effectively among the various entities involved may require additional congressional oversight and direction.

Pipeline Repair Criteria

In 2022, PHMSA published a final rule including, among other things, updated repair criteria for gas transmission pipelines in HCAs and new repair criteria for pipelines outside HCAs.[182] The final rule updated repair criteria for HCAs to address additional types of pipeline defects, including crack anomalies, corrosion metal loss, and mechanical damage defects. PHMSA's intention was to "provide greater assurance that operators will repair injurious anomalies and defects before those defects grow to a size that causes a leak or rupture."[183] The rule also established explicit repair criteria for non-HCA pipelines, which previously were subject only to general requirements for repair. However, on August 16, 2024, in a challenge to the rule brought by the Interstate Natural Gas Association of America (INGAA), the United States Court of Appeals for the District of Columbia Circuit vacated some of the repair criteria in the final rule, as well as certain other provisions.[184]

[181] National Energy Technology Laboratory, "Carbon Transport," web page, https://netl.doe.gov/carbon-management/carbon-storage/transport.

[182] 87 *Federal Register* 52224, August 24, 2022, pp. 52224-52279.

[183] Ibid., p. 52226.

[184] INGAA v. PHMSA, 114 F.4th 744, 756 (D.C. Cir. Aug. 16, 2024).

In January 2025, PHMSA issued correcting amendments to its final rule, removing several vacated provisions while retaining the rest of the rule.[185] On April 29, 2025, the Secretary of Transportation announced that PHMSA would be issuing an ANPRM addressing both hazardous liquid and gas transmission pipeline repair criteria "to modernize pipeline repair requirements to improve safety and efficiency."[186] How PHMSA may revisit its gas transmission pipeline repair criteria, or consider new repair criteria for hazardous liquids pipelines, may be an oversight issue for Congress.

Conclusion

Government and industry have taken numerous steps to improve pipeline, natural gas storage, and LNG infrastructure safety over the past 10 years. Nonetheless, major oil and natural gas pipeline accidents and security incidents continue to occur. Congress and various stakeholders have called for additional regulatory measures to reduce the likelihood of future failures. Recent PHMSA reauthorizations have included expansive pipeline safety mandates, such as requirements for the agency to update its LNG safety standards, significantly increase inspector staffing, and account for the climate impacts of methane leaks. Congress may consider new regulatory mandates for PHMSA or may impose new requirements directly on the pipeline industry. However, significant changes to pipeline safety regulation are being implemented, and certain rulemakings remain outstanding, so their effects on pipeline safety have yet to be determined. The emergence of new safety risks from the development of carbon dioxide and hydrogen pipeline infrastructure raises additional regulatory challenges. As Congress continues its oversight of the federal pipeline safety program, an important focus may be the practical effects of the many changes being made to particular aspects of PHMSA's pipeline safety regulations.

In addition to the specific issues highlighted in this report, Congress may assess how the many elements of U.S. pipeline safety activity fit together in the nation's overall strategy to protect the public and the environment. Pipeline safety necessarily involves various groups: federal and state agencies, tribal governments, pipeline associations, large and small pipeline operators, local communities, and other interest groups. Reviewing how these groups work together to achieve common goals or resolve conflicting approaches could be an overarching concern for Congress.

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[185] 90 *Federal Register* 3713, January 15, 2025, pp. 3713-3716.

[186] DOT, "Effort to Update Outdated LNG Regulations."

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