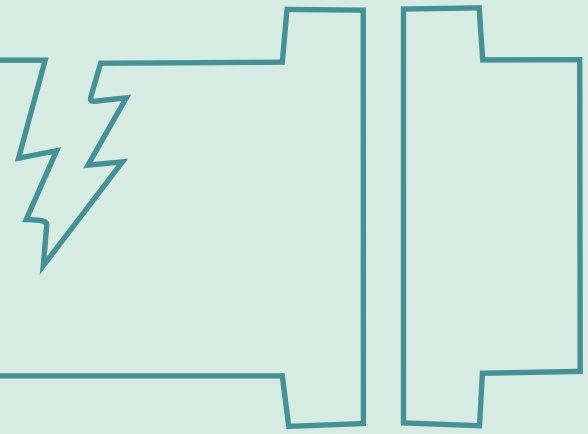
STATES' GUIDE TO

Methane Pipeline Leak Detection and Repair



INTRODUCTION

This guide—intended for legislators, regulators, academics, non-governmental organizations, and community groups—highlights the importance of modernizing methane (the primary component in natural gas) pipeline leak detection and repair regulations to protect communities and the environment from the safety risks posed by leaking gas pipelines.

Current minimum federal regulations set no standards on the sensitivity, reliability, or accuracy of leak detection equipment for gas pipelines.[1] In fact, in some cases, leak detection equipment is not even required to be used for leak detection. Since the minimum federal safety standards were developed, leak detection technology has advanced considerably. Current standards require discovered leaks deemed "hazardous" to be repaired promptly, but set no repair standards or timelines on other leaks. Some states set standards that go beyond the minimum federal regulations; however, home explosions continue to occur as a result of pipeline leaks that operators knew about but did not repair.

Unfortunately, there is little financial incentive for pipeline operators to proactively locate and repair leaking infrastructure. Utilities typically recover lost and unaccounted for (LAUF) gas, natural gas that leaks, is vented, or otherwise goes unmeasured between the point of purchase and point of sale, through rate cases, shifting the cost onto ratepayers rather than absorbing it as an operational expense.[2]

Pipeline Safety Trust (PST) recommends that states modernize gas pipeline leak detection and repair standards. Doing so would drastically improve public safety by helping to prevent home explosions and other incidents, and mitigate methane's potent greenhouse gas effects.

SUMMARY OF **RECOMMENDATIONS FOR STATES**

1. Increase gas pipeline leak detection survey and patrol frequencies
2. Update gas pipeline leak detection technology standards
3. Implement gas pipeline leak grading standards and accelerate repair timelines
4. Mandate the mitigation of intentional emissions

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2018 Home Explosion, Dallas, TX. Source: NTSB.

BACKGROUND

In 2020, Congress passed the Protecting our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act, which mandated, for the first time, that PHMSA create rules to modernize its leak detection and repair standards for gas pipelines as well as required operators to mitigate intentional emission events.[3] PHMSA submitted its final rule, Pipeline Safety: Gas Pipeline Leak Detection and Repair (Advanced Leak Detection rule or ALD rule)[4] to the Federal Register in the final weeks of the Biden Administration but it has not been published.

The PHMSA ALD rule was the result of a multi-year, multi-stakeholder effort, which included public meetings, several public comment periods, and formal recommendations of the Gas Pipeline Advisory Committee (GPAC).[5] In the unpublished final rule, PHMSA incorporated many of the recommendations made by GPAC, which is composed of pipeline industry representatives, members of the public, and government representatives, threading the needle between disparate priorities and meeting its own statutory cost-benefit requirement.[6]

As of 2026, it is unclear if or when PHMSA will pick up this rulemaking process to meet its statutory obligations under the PIPES Act of 2020. It is also unclear how protective any new rulemaking will be to ensure public safety and environmental protection. Although the status of this federal rulemaking is currently unknown, Pipeline Safety Trust recommends that state policymakers use state authority to implement more stringent leak detection and repair standards than those in place at the federal level. State policymakers have and can continue to use PHMSA's ALD rule as a framework for these efforts.

WHY **PIPELINE LEAK DETECTION AND REPAIR** MATTERS

Communities are impacted every year by preventable pipeline incidents. From 2010 to 2026, 199 people have lost their lives to pipeline failures.[7] Public safety means keeping the product in the pipeline. Monitoring and repairing pipeline leaks and mitigating intentional methane emissions convey substantial health, safety, and environmental benefits. For too long, leaks and venting were considered operationally normal for gas pipelines, but we know more now about the serious health, safety, and environmental impacts of methane emissions.

The National Transportation Safety Board (NTSB) has investigated multiple home explosions caused by leaking natural gas pipelines.

Pipeline Safety Trust recommends that state policymakers use state authority to implement more stringent leak detection and repair standards than those in place at the federal level.

In Dallas, TX, in 2018, a series of known, yet unfixed, pipeline leaks led to multiple home explosions, injuring six people and killing one.[8] Then in Jackson, MS in 2024, two home explosions occurred just three days apart, resulting in three homes destroyed, one injury, and one fatality.[9] Unrepaired leaks previously known to the operator were the cause.

Beyond explosions and fires, which have killed or injured hundreds of people, emissions have been extremely detrimental to public health and the environment. Methane is a potent greenhouse gas with 80 times the global warming power of carbon dioxide in its first 20 years.[10] Natural gas now contributes more to U.S. climate pollution than coal.[11] Pipeline operators are currently allowed to leak and vent natural gas into the atmosphere as a regular course of business, so long as there is no risk of explosion. The pipeline segments of the natural gas supply chain (gathering, transmission and storage, and local distribution) are estimated[12] to emit nearly 5 million tons of methane each year (which is about 160 million tons of carbon dioxide). Critical infrastructure such as highways, bridges, and pipelines are impacted on an almost daily basis from climate-related natural disasters. States should be expediting policies that mitigate further GHG emissions and protect our infrastructure, natural resources, and public health.

Unrepaired leaks **previously known to the operator** were the cause.

STATES' PIPELINE **SAFETY AUTHORITY**

Generally, interstate pipelines that cross state lines are regulated by PHMSA, and intrastate pipelines (within one state) are regulated by the state agency delegated authority over pipeline safety.[13] As of 2024, state regulators were responsible for the safety oversight of 89% of all onshore and offshore pipelines in the United States; 35% of gas transmission and gathering pipelines, and 100% of gas distribution pipelines.[14] Nearly all states have submitted certifications to PHMSA to regulate intrastate natural gas lines. Under the terms of the federal pipeline statutes, that means states may inspect these pipelines and enforce regulations against them. States may also adopt and enforce regulations that are more stringent than the federal minimum standards.[15]

There are already a few states, such as Colorado and New York, that have more stringent requirements for gas pipeline leak detection and repair.[16] However, no states have regulations as comprehensive as the withdrawn PHMSA ALD rule. While future federal action on this issue remains unclear, states can act now to protect their citizens from the dangers posed by unidentified and unremedied gas pipeline leaks and intentional emissions.

5 MILLION TONS OF METHANE are emitted each year through pipeline segments of the natural gas supply chain

≈160 MILLION TONS of carbon dioxide

METHANE has **80x** the global warming power of CARBON DIOXIDE

No states have regulations as comprehensive as the withdrawn PHMSA ALD rule.

FEDERAL LANDSCAPE

Federal regulations governing gas pipeline leak surveys and patrol are found in 49 C.F.R. pt 192, subpt. M. The regulations set minimal survey frequency requirements and no standards for categorizing or prioritizing leaks for repair, leak detection equipment performance, or the accuracy, sensitivity, or reliability of that equipment.[17]

Current **leak survey and patrol frequency** requirements are not stringent enough to ensure public safety and environmental protections. Gas pipeline leak surveys specifically target the detection and measurement of escaping gas, whereas pipeline patrols are broader visual and physical inspections of the surface conditions on and adjacent to a pipeline's right-of-way aimed at identifying indications of leaks, construction activity, and other factors affecting safety and operation. These surveys and patrols are one of the most effective ways pipeline operators can identify issues. One example of concern: leak surveys on distribution pipelines are tied to whether a pipeline is in a "business district", a term which is not defined in federal regulations and only interpreted as "where business is conducted." If the pipeline is outside of this undefined area, the operator must only perform a leak survey once every five years.

When conducting leak surveys, operators are expected to use **leak detection technology**. Current regulations only specify that "leak detector equipment" is required,[18] but this term is undefined and there is no performance standard for said equipment. Equipment used to detect methane leaks from pipelines has advanced considerably since the current federal regulations were written. Setting a performance threshold on this equipment is reasonable and feasible.

Another significant gap in the current federal regulations is a lack of specificity for **leak grading and repair**. Leak grading is a way for operators to classify the severity of a leak and helps determine how quickly a repair must be completed. Current federal standards require only that "Hazardous leaks must be repaired promptly," with no definition of "hazardous" or "promptly."[19] From PST's perspective, every leak should be considered hazardous, regardless of size. While "small" or seemingly "non-hazardous" leaks have been discounted for decades, we now know that cumulatively, these leaks add up. Over time, the effects of those small leaks are large and impactful to both humans and the environment. The withdrawn PHMSA ALD rule attempted to provide meaning and definition to those concepts.

From 2010-2026,

199 PEOPLE **have lost their lives** TO PIPELINE FAILURES

Advanced Mobile Leak Detection Technology. Source: Heath Consultants, Inc.

Equipment used to detect methane leaks from pipelines **has advanced considerably since the current federal regulations were written.**

Lastly, a huge contributor to pipeline operators' overall environmental impact is the intentional release of massive amounts of natural gas into the atmosphere during scheduled maintenance. Often called **intentional emissions**, this is where operators are "venting" or "blowing down" a segment of pipeline before maintenance. Not only do intentional emissions have a negative environmental impact, but there is also economic waste associated with large operational gas releases. Practices and technologies aimed at mitigating emissions and reducing waste product from pipeline maintenance activities are available and already used by many operators,[20] yet these practices are not required in the federal regulations.[21]

STATE POLICY **RECOMMENDATIONS**

There are four main components of improving pipeline leak detection and repair: 1) leak survey and patrol frequencies, 2) leak detection technology performance standards, 3) leak grading and repair timelines, and 4) mitigation of intentional emissions. Each component is critical to finding more leaks and fixing them faster, and each state has the authority to take action to improve pipeline safety in these areas.
PST recommends the following improvements to state requirements for pipeline leak detection and repair:

1 Leak survey and pipeline patrol frequencies

More frequent pipeline patrols and leak surveys can help operators find and fix leaks faster, resulting in safer communities and healthier environments. PST recommends annual leak surveys for all distribution pipelines, regardless of whether they are within a "business district," and leak surveys should be required within 72 hours of extreme weather events. Transmission and gathering lines should be leak surveyed four times per year in Class 4 areas, and twice per year in all other areas.

PST also recommends patrols on transmission and gathering at least six times per year in Class 3 and 4 areas and four times per year in Class 1 and 2 areas.

2 Leak detection technology standards

Leak detection technology is constantly improving, allowing operators to find smaller leaks farther away from the pipeline. Current federal regulations merely require operators to use "leak detector equipment" with no clear standards on how sensitive, accurate, or reliable that equipment must be.

PST recommends that states establish performance-based standards requiring equipment to meet minimum sensitivity and detectability thresholds. Rather than prescribing specific technologies that risk becoming outdated, standards should define what technology must be capable of detecting, such as a minimum leak rate detectable at a defined distance from the pipeline. Performance standards for methane detection technologies should be differentiated between pipeline types, recognizing that appropriate standards may differ for high-pressure transmission lines in rural areas and distribution mains in dense urban areas.

3 Leak grading and repair timelines

Leaks can be categorized or "graded" into grade 1, grade 2, and grade 3 leaks, with grade 1 being the most hazardous and grade 3 being the least. There are a few states that already require operators to grade leaks, and many use the Gas Piping Technology Committee (GPTC) guide for how to grade leaks.[22] PST recommends all states adopt leak grading requirements that are, at a minimum, as protective as the GPTC guidelines and that consider environmental protection.

For repairs, it is not enough to say "hazardous leaks must be repaired promptly" without any definition of "hazardous" or "promptly." In addition to adopting leak grading requirements, which would help identify which leaks pose the highest risk to people and the environment, PST recommends that states also implement strict repair criteria and timelines for pipeline leaks that are, at a minimum, as protective as the withdrawn PHMSA ALD rule.

4 Intentional emissions

Intentional release of methane should not be accepted as a standard part of pipeline operating procedures. PST recommends that states require operators to prevent or minimize the release of gas into the atmosphere by, for example, isolating the smallest section of pipe, lowering operating pressure, or rerouting gas to a different segment of pipeline before commencing maintenance activities.

Each component is critical to finding more leaks and fixing them faster, and **each state has the authority to take action to improve pipeline safety** in these areas.

CONCLUSION

Communities should not have to live in fear or bear the burden of leaking pipelines. The harms posed by methane leaks, including injury and deaths from home explosions, decreased air quality, and increased environmental pollution, are too great to not act. Current federal regulations are not enough to protect people and the environment from these harms. States have the authority to act, without waiting for the federal government. Through a long and detailed process, PHMSA had essentially completed its ALD rule, which can now serve as a model for states to use and even improve upon. State policymakers must be proactive on this critical safety concern and adopt the recommendations made by PST through legislation, regulation, or guidance to operators to protect communities and the environment from the immediate dangers and harmful lasting effects posed by pipeline leaks.

Current federal regulations **are not enough to protect people and the environment from these harms.** States have the authority to act, without waiting for the federal government.

END NOTES

[1] 49 C.F.R. Part 192 Subpart M.

[2] National Regulatory Research Institute, Lost and Unaccounted-for Gas: Practices of State Utility Commissions Report No. 13-06 (June 2013) https://pubs.naruc.org/pub/FA86BB52-AE3F-D8AC-B295-801BD6DC6435

[3] Protecting Our Infrastructure of Pipelines and Enhancing Safety Act of 2020, S. 2299, 116th Cong. § 113 - 114 (2020).

[4] Pipeline Safety: Gas Pipeline Leak Detection and Repair, 90 Fed. Reg. ___ (proposed final rule Jan. 17, 2025) (Docket No. PHMSA-2021-0039, RIN 2137-AF51) (unpublished) https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2025-01/PHMSA%20Final%20Rule%20-%20Gas%20Pipeli....

[5] 88 Fed. Reg. 64518. (2023 GPAC meeting notice).

[6] 49 U.S.C. § 60115.

[7] PHMSA Incident and Accident Data and PHMSA Annual Report Data (2026).

[8] Nat'l Transp. Safety Bd., NTSB/PAR-21/01, Atmos Energy Corporation Natural Gas-Fueled Explosion, Dallas, Texas, February 23, 2018 (2021).

[9] Nat'l Transp. Safety Bd., PIR-26/01, Atmos Energy Corporation Natural Gas-Fueled Home Explosions and Fires, Jackson, Mississippi, January 24, 2024, and January 27, 2024 (2026).

[10] Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 731 (2013) https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf (a report of the Intergovernmental Panel on Climate Change).

[11] Friedlingstein, P. et al., Global Carbon Budget 2022, Earth Syst. Sci Data, Volume 14, Issue 11(Nov. 11, 2022) https://doi.org/10.5194/essd-14-4811-2022, visualized by https://robbieandrew.github.io/GCB2021/PNG/s29_2021_Category_USA.png.

[12] Ramón A. Alvarez et al., Assessment of methane emissions from the U.S. oil and gas supply chain, Science, Volume 361, Issue 6398, 186-188 (2018) https://www.science.org/doi/10.1126/science.aar7204.

[13] PHMSA, State Programs Overview (Aug. 11, 2026) https://www.phmsa.dot.gov/working-phmsa/state-programs/state-programs-overview.

[14] PHMSA, *Supra* note 9.

[15] 49 U.S.C. §§ 60105- 60106.

[16] 4 Colorado Code of Regulations 723-11 §§ 11209-11210; N.Y. Comp. Codes R. & Regs. Tit. 16 §§ 255.805-821.

[17] Pipeline Safety Trust, Table of Current Federal Regulations Related to Gas Pipeline Leak Detection and Repair (Aug. 24, 2026) https://pstrust.org/wp-content/uploads/2026/09/Table-of-Current-Federal-Regulations-Related-to-Gas-Pipeline-Leak-Detection-and-Repair.pdf

[18] 49 C.F.R. §§ 192.706, 192.723(b).

[19] 49 C.F.R. § 192.703(c).

[20] 88 Fed. Reg. at 31,948; Dana Lowell et al., Analysis of Pipeline and Hazardous Materials Safety Administration Proposed New Safety Rules: Pipeline Blowdown Emissions and Mitigation Options (June 2016) https://pstrust.org/wp-content/uploads/2015/10/PHMSA-Blowdown-Analysis-DRAFT-FINAL-30jun16.pdf.

[21] PHMSA previously issued an Advisory Bulletin (ADB) that directed operators to update their Operations and Maintenance Plans to minimize gas releases. This ADB has since been rescinded. PHMSA, USDOT Rescinds Biden Era Guidance (Spt. 11, 2026) https://www.phmsa.dot.gov/news/usdot-rescinds-biden-era-guidance.

[22] Gas Piping Technology Committee, The Guide for Gas Transmission, Distribution, and Gathering Piping Systems Z380.1-2022, Including Addenda 1 and 2 (2022).

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Pipeline Safety Trust (PST) is a nonprofit watchdog organization dedicated to pipeline safety. Pipeline Safety Trust promotes pipeline safety through education and advocacy, increased access to information, and partnerships with residents, safety advocates, government, and industry, resulting in safer communities and a healthier environment.