GREEN ENERGY INSTITUTE
Lewis & Clark Law School

Hydrogen Blending: Pipeline Requirements Factsheet

Regulation of Hydrogen Transport by Pipeline:

In Oregon, regulatory oversight of fuel transportation by pipeline is a cooperative effort between a federal agency called the Pipeline & Hazardous Materials Safety Administration (PHMSA) and the Oregon Public Utility Commission (PUC). Applying the standards promulgated by the PHMSA, Oregon exercises authority over intrastate gas pipelines, but not hazardous liquid pipelines.[1] The PHMSA exercises jurisdiction, with the occasional assistance of the PUC, over the two interstate natural gas transmission pipelines that run through Oregon.[2]

- U.S.: About three million miles of natural gas pipelines exist
- Oregon: Approximately16,000 miles of distribution main lines and about 730 miles of high-pressure transmission pipeline exist
- Mostly Texas: 1,600 miles of dedicated hydrogen pipelines exist
- Oregon: Zero dedicated hydrogen pipelines exist

Renewable Hydrogen in Oregon: Opportunities and Challenges, Or. Dep't of Energy (Nov. 15, 2022), https://www.oregon.gov/energy/Data-and-Reports/Documents/2022-ODOE-Renewable-Hydrogen-Report.pdf; *Hydrogen Pipelines*, Hydrogen and Fuel Cell Technologies Office, Office of Energy Efficiency & Renewable Energy, U.S. Dept of Energy, https://www.energy.gov/eere/fuelcells/hydrogen-pipelines

The PHMSA has regulated the transportation of hydrogen fuels via pipeline since 1970 under the Minimum Federal Standards for the Transportation of Natural and Other Gas by Pipeline.[3] 49 U.S.C. § 5103(a)–(b) directs the Secretary of the Department of Transportation[4] (DOT) to designate certain materials as hazardous and prescribe regulations for their safe transportation. Under this authority, PHMSA has designated both hydrogen and methane as "hazardous materials" and issued regulations for safe transportation in pipelines.[5] **The regulations do not address any additional requirements or specific terms applicable to pipelines when hydrogen is blended into methane.**

PHMSA's regulations focus almost entirely on natural gas pipelines. These regulations set highly technical standards for pipe and component materials, design, installation, construction, inspection, testing, corrosion control, operation,

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[1] 49 U.S.C. § 60105(a); U.S. D.O.T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., App. F – State Program Certification/Agreement Status (2024), https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2024-01/2024%20Appendix%20F%20-%20State%20Program%20Certification%20Agreement%20Status.pdf; ORS 757.039; U.S. D.O.T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., Gas Transmission and Hazardous Liquid Pipeline Safety Programs, Participating States in the Federal/State Cooperative Partnership (Sept. 2024), https://www.npms.phmsa.dot.gov/Documents/CoopAgreementsMap.pdf.

[2] *Natural Gas Pipeline Safety, PUC's Responsibilities*, Or. Public Util. Comm'n, https://www.oregon.gov/puc/safety/pages/gas-pipeline-safety.aspx (last visited Oct. 2, 2024).

[3] *Hydrogen*, U.S. D.O.T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., https://primis.phmsa.dot.gov/comm/hydrogen.htm (last visited July 30, 2024); OAR 860-024-0020 (incorporating federal rules for constructing, operating, and maintaining natural gas facilities).

[4] Housed within DOT, PHMSA is tasked with implementing this statutory provision.

[5] Hazardous Materials Table, 49 CFR § 172.101; 49 CFR, part 192 (2023); 49 CFR § 192.3 ("gas means natural gas, flammable gas, or gas which is toxic or corrosive."); *see also* PHMSA Ltr. of Interp. To CO Energy & Carbon Mgmt. Comm'n (May 13, 2024), https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2024-05/Colorado-PI-24-0001-05-10-2024-Part192.12.pdf (PHMSA may regulate any mixture of "gas").

maintenance, and reporting.[6] As a result, under PHMSA's (and the PUC's) regulatory framework, the same standards apply to both methane and hydrogen with only two limited exceptions:

> (1) "When hydrogen gas is intended to be used as feedstock for a manufacturing process, it does not have the requirement to be odorized" in certain locations.[7]
> (2) "Materials for pipe and components must be chemically compatible with any gas that they transport and with any other material in the pipeline with which they are in contact."[8]

The limited waiver of odorization requirements is unlikely to be relevant to utility blending of hydrogen into natural gas for commercial and residential use. The second provision may be relevant if PHMSA concludes hydrogen blended with methane is not "chemically compatible" with distribution pipelines because of the potential for hydrogen to cause pipeline embrittlement and failure.[9]

Pipeline operators are not required to obtain a permit or approval for pipeline activity except when they seek a Special Permit to waive safety regulations because of unique circumstances.[10] Rather than requiring permits, enforcement of pipeline safety requirements is primarily carried out following inspections, which are conducted under routine schedules or as a result of public complaints, state or federal reporting, pipeline accidents, or other reasons PMHSA deems appropriate.[11]

A Regulatory Gap:

According to PHMSA, blends of hydrogen and methane are "not currently defined or captured in the data."[12] As a result, there is a regulatory gap governing the transport of hydrogen through pipelines. Places that have adopted hydrogen blending more widely and at greater percentages have taken extensive and costly safety precautions. Hawaii Gas, utilizing a 15% hydrogen-natural gas blend, has admitted that the hydrogen blended gas "puts infrastructure at risk for hydrogen embrittlement."[13] To combat embrittlement and leaks, the company is using a liner in its pipes called Oceanit's HydroPel, which costs $239,000 per mile of pipe.[14] It also operates its system at a lower pressure than is typical in the continental U.S, in order to safely transport the

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[6] *See* 49 CFR §§ 190-196.
[7] 49 CFR § 192.625(b).
[8] 49 CFR § 192.53(b).
[9] Li, et al., *A review on hazards and risks to pipeline operation under transporting hydrogen energy and hydrogen-mixed natural gas*, 79 SCIENCE & TECH. FOR ENERGY TRANSITION 9 (2024), https://www.stet-review.org/articles/stet/full_html/2024/01/stet20230217/stet20230217.html.
[10] *PHMSA Approvals and Permits*, U.S. D.O.T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., https://www.phmsa.dot.gov/approvals-and-permits (last updated Oct. 21, 2021).
[11] 49 CFR § 190.203(b)
[12] U.S. D. O. T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., HYDROGEN GAS: PIPELINE SAFETY & RESEARCH & DEV. PROGRAM (2022), www.energy.gov/sites/default/files/2022-03/Bulk%20Storage%20Workshop_Day1_12.pdf.
[13] Hawai'i Gas, *Hydrogen*, https://www.hawaiigas.com/sustainability/hydrogen [https://web.archive.org/web/20241005060557/https://www.hawaiigas.com/sustainability/hydrogen (reflecting the use of HydroPel "throughout the entire 1,100-mile network)].
[14] Hydropel, *Hydropel*, https://h2pel.com/.

hydrogen blend.[15] These costs are ultimately passed on to everyday consumers; Hawaiians experience the highest gas utility rates in the country.[16]

- Hawaii Gas uses a 15% hydrogen/natural gas blend
- "Puts infrastructure at risk for hydrogen embrittlement"
- Lines pipes with Oceanit's HydroPel, at a cost of $239,000 per mile of pipe
- Hawaii operates its system at a lower pressure than is typical
- Hawaii has the highest gas utility rates in the country

Forthcoming Federal Regulation:
PHMSA recognizes that using hydrogen will require changes to building codes, equipment and other technical standards, and new consumer products.[17] PHMSA indicated it is working with standards organizations to identify and develop new requirements, and to support research and certification investigations when necessary to develop appropriate standards.[18] In particular, PHMSA observed that the American Society of Mechanical Engineers (ASME) will be an important source of piping standards.[19] ASME published updated hydrogen pipeline standards in 2024, but these guidelines are voluntary and serve only as best practices unless incorporated into mandatory federal standards, which has not happened.[20]

Recognizing the need to further develop federal standards for safely transporting hydrogen, PHMSA identified a host of supporting activities that must take place, including investigating safety implications from materials, designs, and systems, pressure and mechanical limitations, fatigue crack growth, and the effects of hydrogen in pipelines currently transporting natural gas.[21] Additionally, PHMSA will be releasing a guidance document for engineering assessment of system integrity and performance for pure hydrogen and blending pipelines that will address the research gaps.[22] No timeline was given for when the above-listed action items would be

[15] NAT'L RENEWABLE ENERGY LAB., *Hydrogen Blending into Natural Gas Pipeline Infrastructure: Review of the State of Tech.* 37 (2022), https://www.nrel.gov/docs/fy23osti/81704.pdf.
[16] Choose Energy, *Natural Gas Rates by State*, (Jun. 6, 2024), https://www.chooseenergy.com/data-center/natural-gas-rates-by-state/.
[17] *Hydrogen*, U.S. D.O.T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., https://primis.phmsa.dot.gov/comm/hydrogen.htm (last visited July 30, 2024).
[18] *Id.*
[19] *Id.*
[20] *Hydrogen Piping and Pipelines B31.12 - 2023*, AMERICAN SOC'Y OF MECH. ENGINEERS (2024), https://www.asme.org/codes-standards/find-codes-standards/b31-12-hydrogen-piping-pipelines; *Standards & Certification FAQ*, AMERICAN SOC'Y OF MECH. ENGINEERS, https://www.asme.org/codes-standards/publications-information/faq (last visited July 30, 2024); *see* 49 C.F.R., part 192 (2023).
[21] *Hydrogen*, U.S. D.O.T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., https://primis.phmsa.dot.gov/comm/hydrogen.htm (last visited July 30, 2024)
[22] These developments include (1) Assessing and developing material test methodologies for non-metallics such as plastic pipes and elastomers for hydrogen and blending; (2) Developing technologies that would detect and/or quantify leaks on pure hydrogen pipeline; (3) Evaluating odorization of pure and blended hydrogen; (4) Conducting modeling analysis of Potential Impact Radius of hydrogen or H2 blending releases and provide full-scale field trials for hydrogen blend releases including radiant energy, over-pressure potential, and probability of ignition; (5) Testing and evaluating high-pressure and pipeline operational conditions under hydrogen gas blends. U.S. D.O.T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., HYDROGEN GAS: PIPELINE SAFETY & RESEARCH & DEV'T PROGRAM (2022), www.energy.gov/sites/default/files/2022-03/Bulk%20Storage%20Workshop_Day1_12.pdf.

completed. However, on March 25, 2024, PHMSA published a notice in the Federal Register inviting public comments regarding its intent to change certain forms to collect data and identify trends associated with blending hydrogen gas with other natural gasses in pipelines to inform future rulemakings.[23]

Relatedly, in compliance with the Infrastructure Investment and Jobs Act of 2021, the U.S. Department of Energy (DOE) developed a National Clean Hydrogen Strategy and Roadmap, which identified research areas and regulation development needs.[24] In particular, DOE recognized it is critical to determine the compatibility of hydrogen and hydrogen-blended fuels with pipeline and component materials. DOE anticipates completing this assessment, along with other action steps, by the end of 2025. **It does not plan to begin sharing safety best practices, or developing national guidance for hydrogen blending limits, until 2026 through 2029**.[25]

Oregon Opportunities to Regulate in the Absence of Federal Regulation:

As explained above, there is little regulatory oversight at the federal level governing hydrogen blending of natural gas and the regulations that do exist are largely focused on its transportation via pipeline. In fact, PMHSA and DOE are only now beginning to assess what regulatory requirements may be necessary. State legislatures and agencies, therefore, have a responsibility to address the safety and environmental concerns surrounding blending. Importantly, PMHSA explicitly permits states to "pass more stringent state regulations for pipeline and underground natural gas storage safety through their State Legislatures."[26]

Washington's legislature, for example, enacted requirements in RCW 80.28.435 requiring that any gas company seeking to replace natural gas with hydrogen must provide notice to the Commission. [27] Upon receipt of such notice the Commission shall consider the recommendations from the Department of Commerce, the information contained in the notice, and relevant data and analyses to decide whether it will approve the company's tariff. Oregon should adopt similar legislation requiring a gas utility to provide notice and seek approval from the PUC. Alternatively, the PUC could adopt such rules "for the protection of the health and safety of all employees, customers or the public."[28]

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[23] Pipeline Safety: Information Collection Activities Relating to Mitigation of Ruptures & Blending Hydrogen Within Natural Gas Pipelines, 89 Fed. Reg. 20751, 20752–53 (Notice and Request for Comments on Mar. 25, 2024), available at https://www.govinfo.gov/content/pkg/FR-2024-03-25/pdf/2024-06155.pdf.

[24] U.S. DEP'T OF ENERGY, U.S. NAT'L CLEAN HYDROGEN STRATEGY & ROADMAP 70 (2023), https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf?Status=Master.

[25] U.S. DEP'T OF ENERGY, U.S. NAT'L CLEAN HYDROGEN STRATEGY & ROADMAP 71 (2023), https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf?Status=Master.

[26] U.S. D.O.T. PIPELINE & HAZARDOUS MATERIALS SAFETY ADMIN., STATE PROGRAMS OVERVIEW, https://www.phmsa.dot.gov/working-phmsa/state-programs/state-programs-overview (last visited Oct. 7, 2024).

[27] RCW 80.28.435(1)(a)–(c).

[28] ORS 757.039(2).