Pipeline Safety TRUST

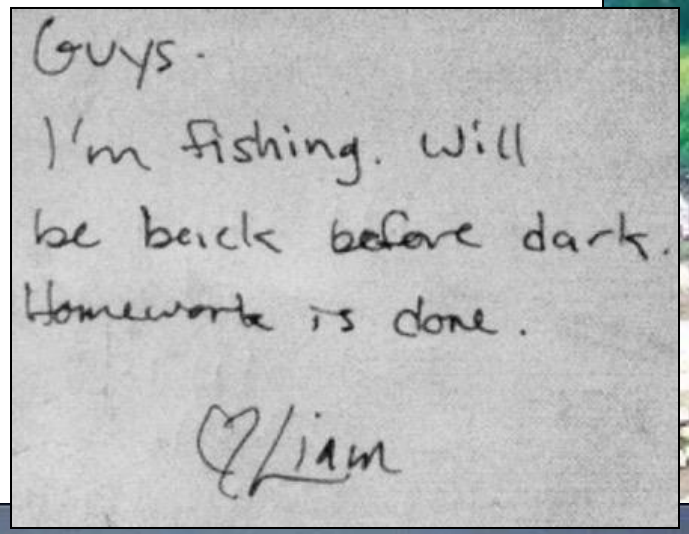
Credible.
Independent.
In the public interest.

Hydrogen Informational Summit

October 12, 2024

Bill Caram – Executive Director

Pipeline Safety Trust History



Pipeline Safety TRUST

Pipeline Safety Trust History

"… there's going to be a Trust that's going to be funded as part of today's sentencing. With $4,000,000 … they've nowhere near the lobbying potential of the oil industry. It's not even David and Goliath. It's more like Bambi and Godzilla. No industry polices itself very well… you need outside people, and these are going to be the people so pay attention to them."

The Honorable Barbara Rothstein
United States District Judge
at Olympic Pipe Line Co Sentencing

Pipeline Safety TRUST

Introduction to Pipelines

Hazardous Liquid
(including CO_2)

Natural Gas
(Including hydrogen)

Pipeline Safety TRUST

Introduction to Pipelines

About **230,000 miles**
of onshore and offshore
Hazardous Liquid pipelines

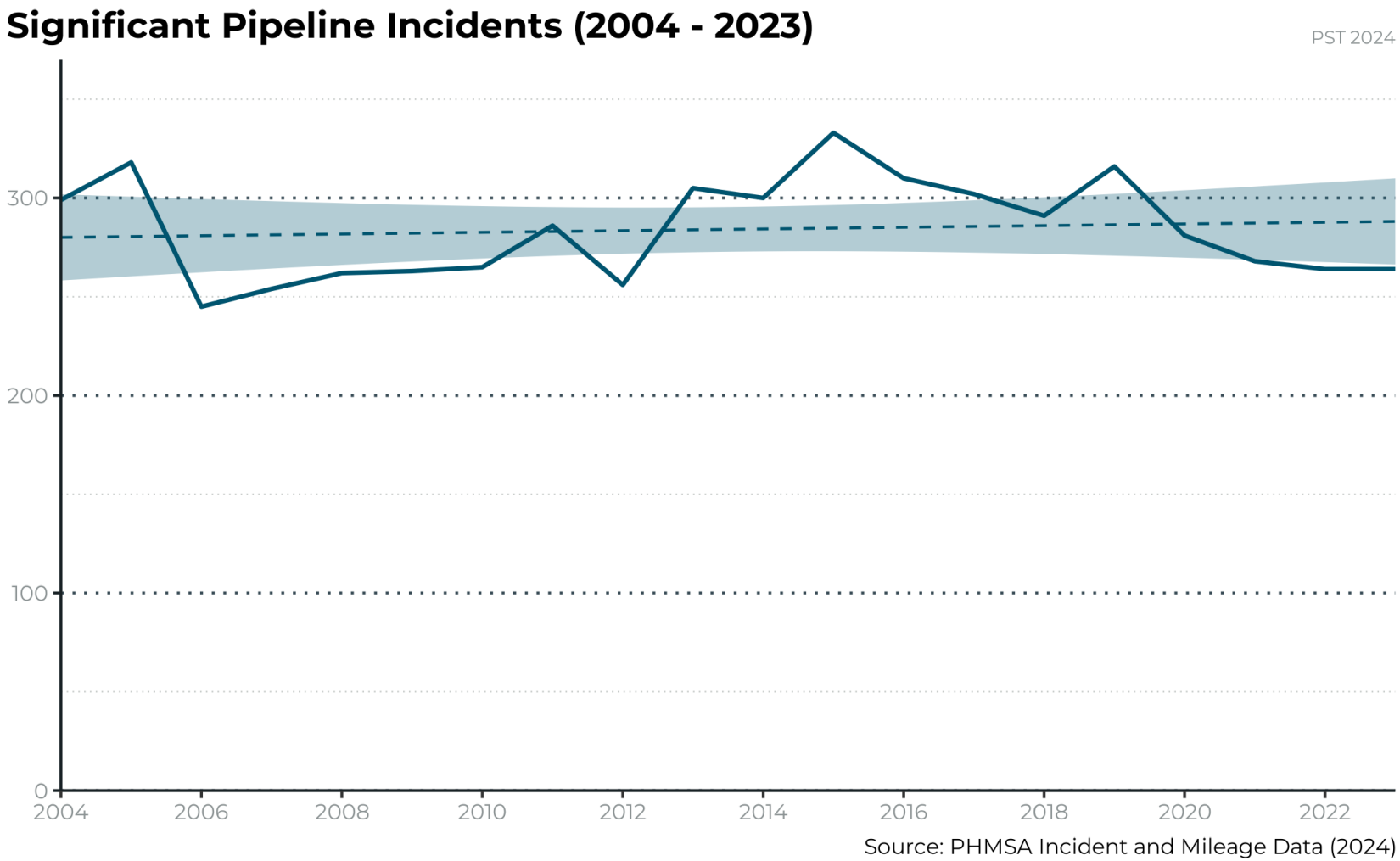
About **400,000 miles**
of Gas Gathering pipelines

About **319,000 miles**
of onshore and offshore
Gas Transmission pipelines

About **2,300,000 miles**
of Natural Gas Distribution
mains and service pipelines

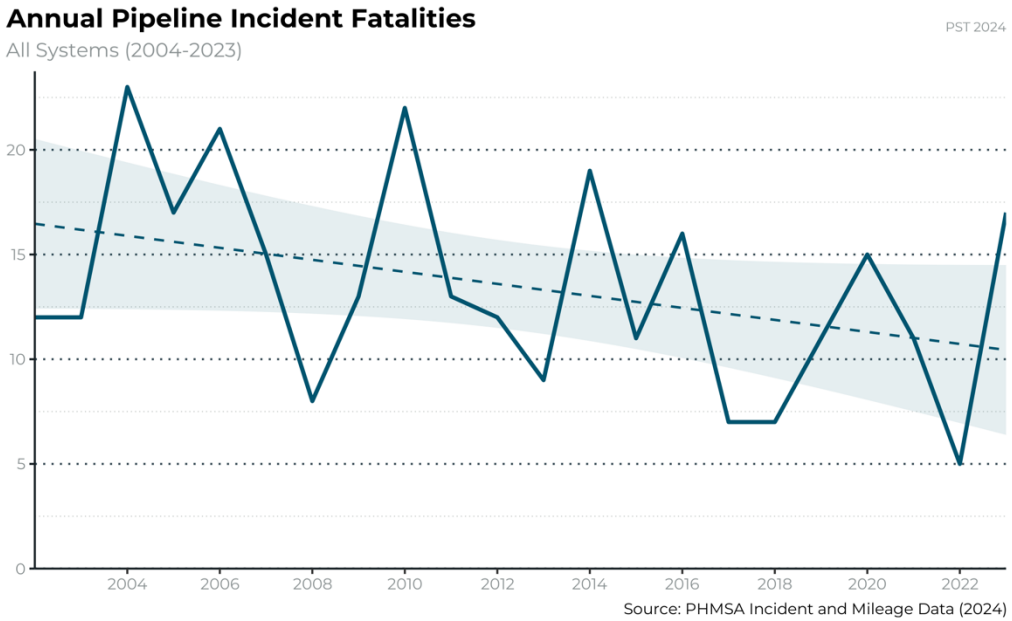
Pipeline Safety TRUST

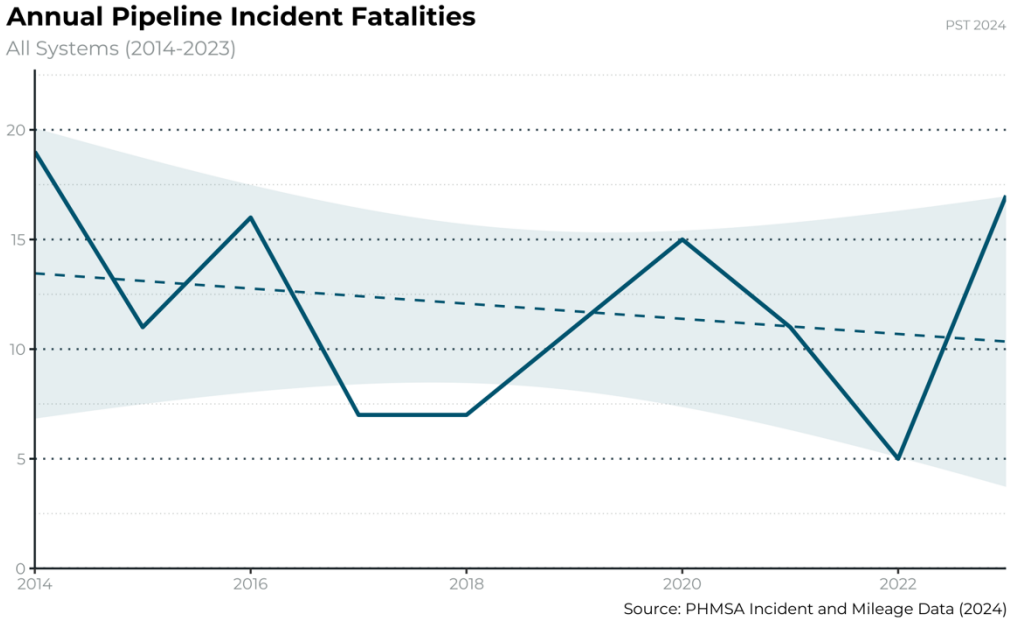
Introduction to Pipelines



Pipeline Safety TRUST

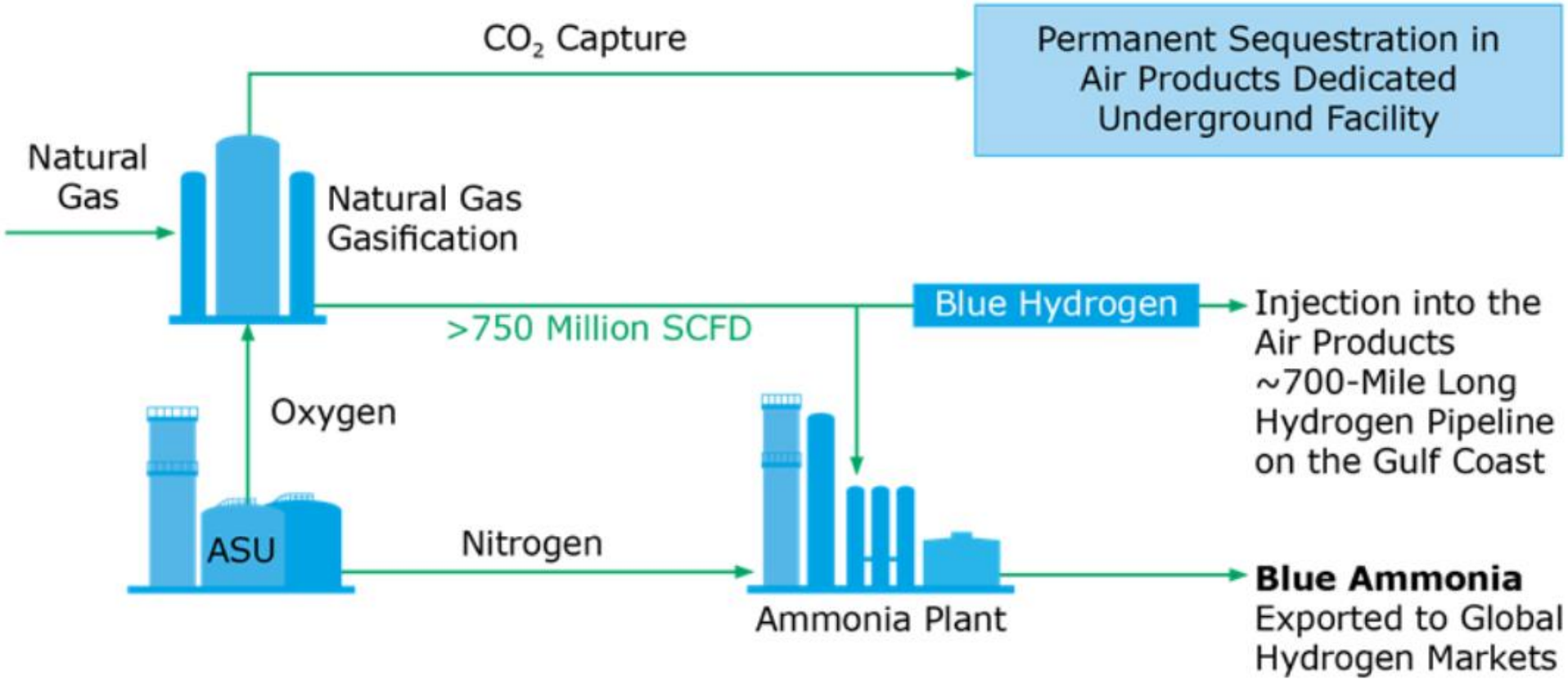
Introduction to Pipelines





Pipeline Safety TRUST

Blue Hydrogen



Pipeline Safety TRUST

Blue Hydrogen

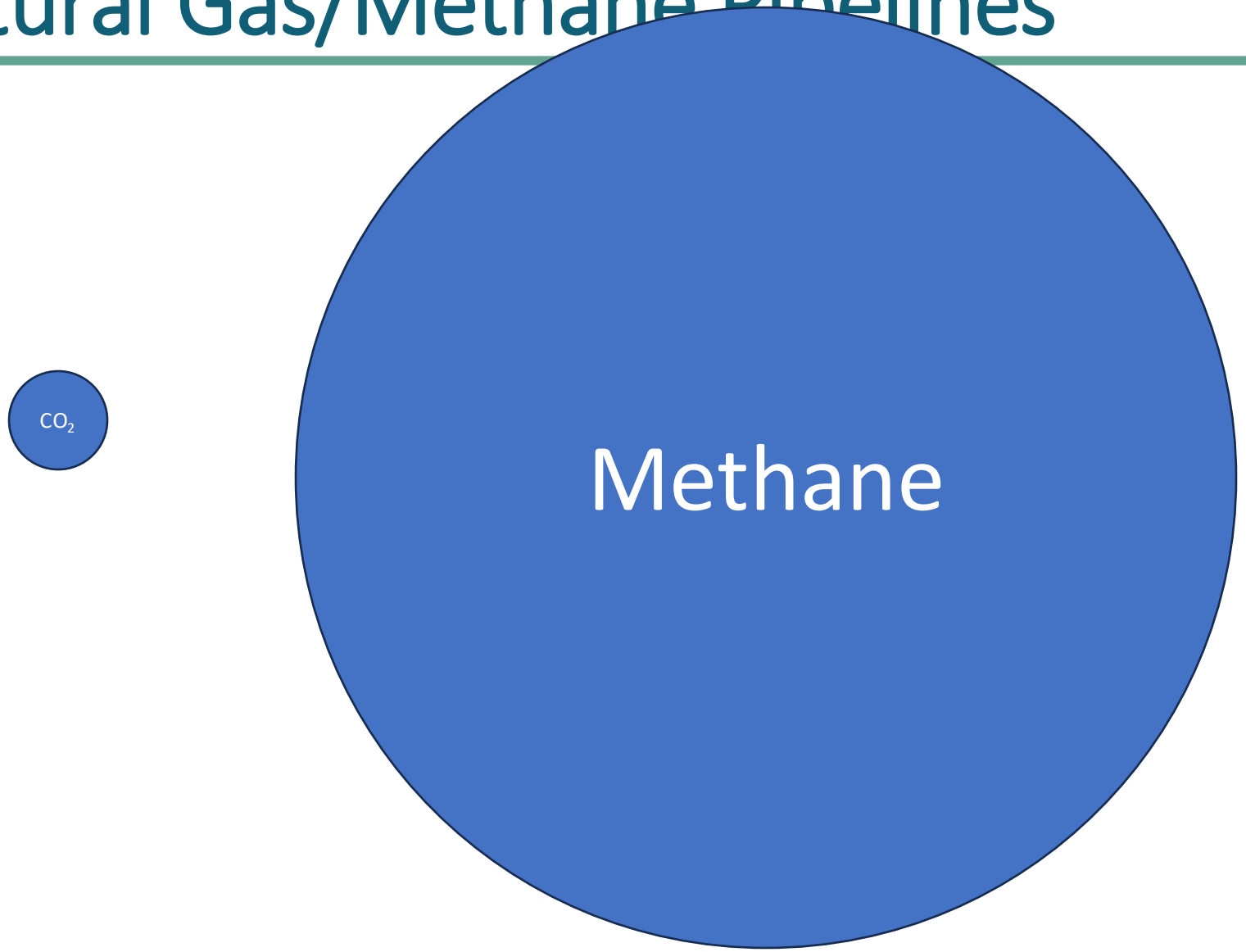
- Natural Gas/Methane Pipelines
- Carbon Dioxide Pipelines
- Hydrogen Pipelines

Pipeline Safety TRUST

Natural Gas/Methane Pipelines

Pipeline Safety TRUST

Natural Gas/Methane Pipelines



Pipeline Safety TRUST

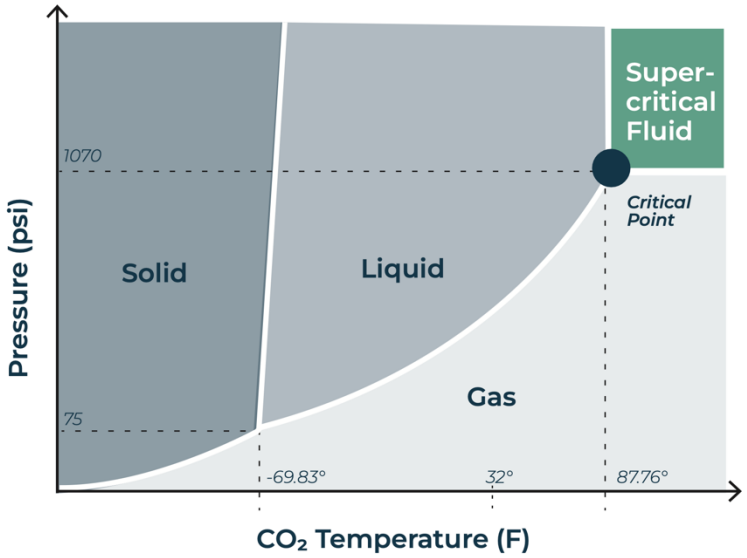
CO_2 Pipelines - History

- 1986 – Lake Nyos, Cameroon tragedy
- 1988 – PHMSA final rule
- 2020 – Satartia, MS disaster
- 2021 – 45Q Tax credit expansion
- 2022 – Inflation Reduction Act
- 2023 – PHMSA Public Meeting
- 2024 – PHMSA NOPR *expected*

Operators and regulators have little experience with CO_2 pipelines compared to hazardous liquid

Pipeline Safety TRUST

CO_2 Pipelines Report – Major findings



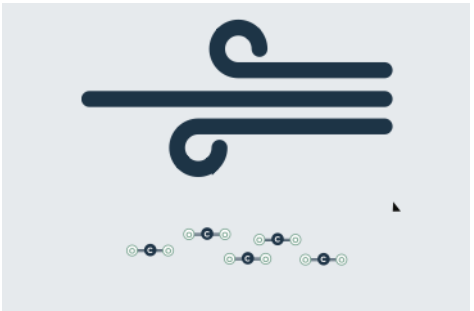
WATER IN CO_2 PIPELINES: POTENTIAL FOR CORROSION

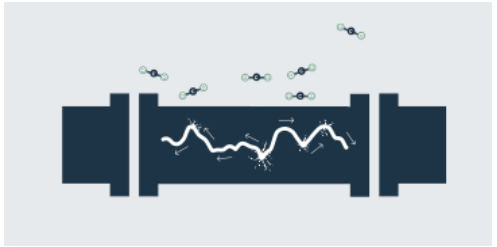
No Corrosion

Corrosion

Severe Corosion

Historically, CO_2 pipelines have transported relatively dry and pure CO_2. However, the expansion in different sources of CO_2 has the potential to lead to higher water content and more impurities introduced into pipelines. In addition, carbon dioxide mixed with water can form carbonic acid which is extremely corrosive to the internal surface of the pipe.





Pipeline Safety TRUST

Ongoing concerns

- Lack of any regulation in some cases
- Danger to communities
- No odorant requirement
- Contaminants
- Emergency response education and resources
- Community engagement

Pipeline Safety TRUST

Carbon Dioxide: Key takeaways

- Decisionmakers must ensure:
  - any new pipelines will be a sufficient distance from people and communities, which may mean multiple miles
  - the contents of the pipeline will be continually monitored for the presence of contaminants, including water
  - the project will indeed reduce greenhouse gas emissions
  - transparency and accountability for the public, including adequate reporting and leak detection technologies
  - preparation of emergency response in case of pipeline failures

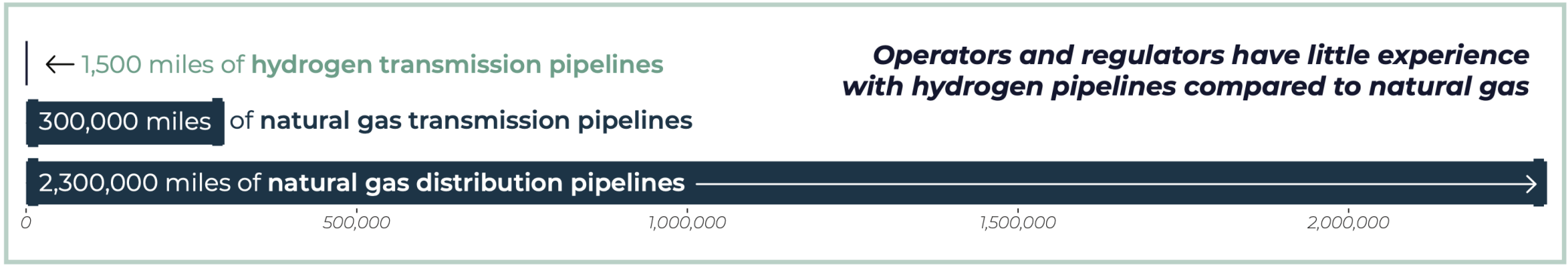
Pipeline Safety TRUST

Hydrogen pipeline safety

- Strong incentives in 2021 Infrastructure Bill (Hydrogen Hubs) and 2022 Inflation Reduction Act

Pipeline Safety TRUST

Hydrogen: Current infrastructure



- 1,500 miles of hydrogen pipelines
- 85% of mileage with three operators
- Relatively rural and small diameter

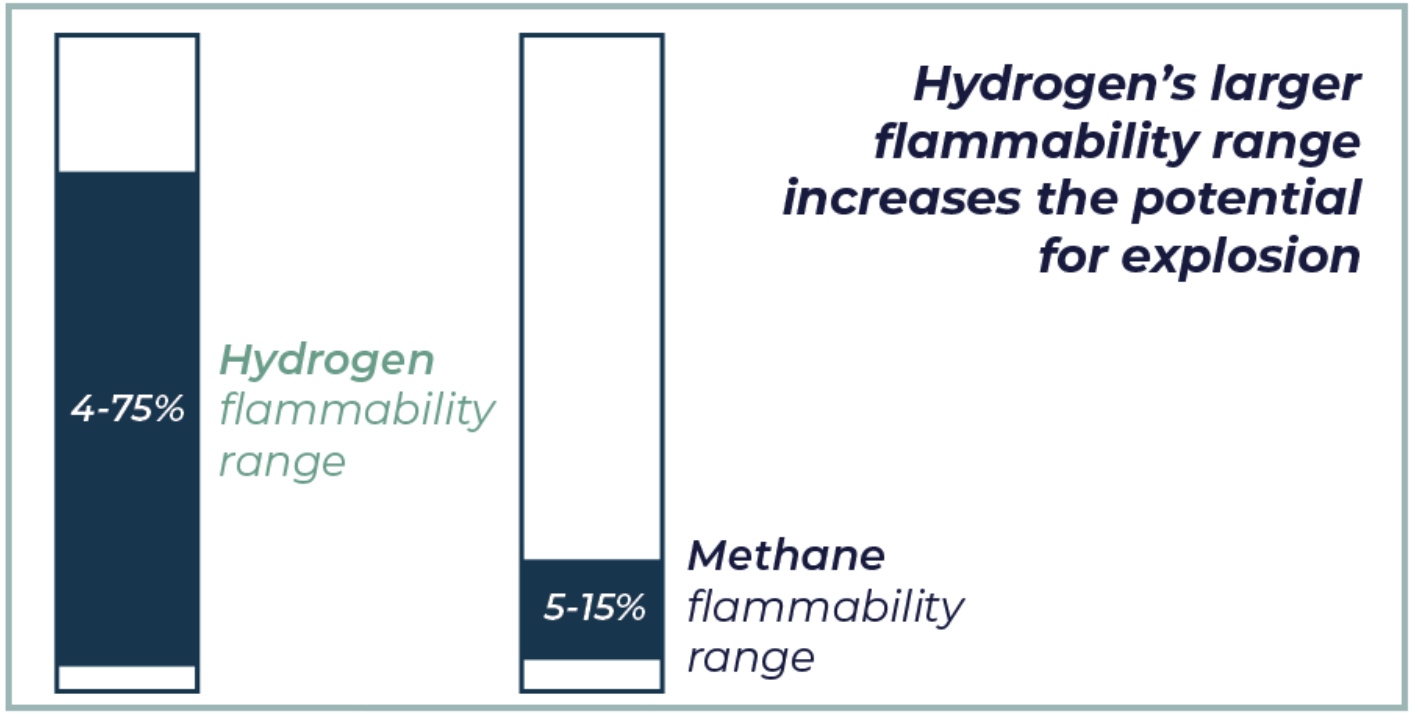
Pipeline Safety TRUST

Hydrogen: Jurisdiction

- Falls under PHMSA natural gas safety regulations
- PHMSA reporting requirements only require operator to report the predominant product in the pipeline
- No hydrogen-specific safety regulations

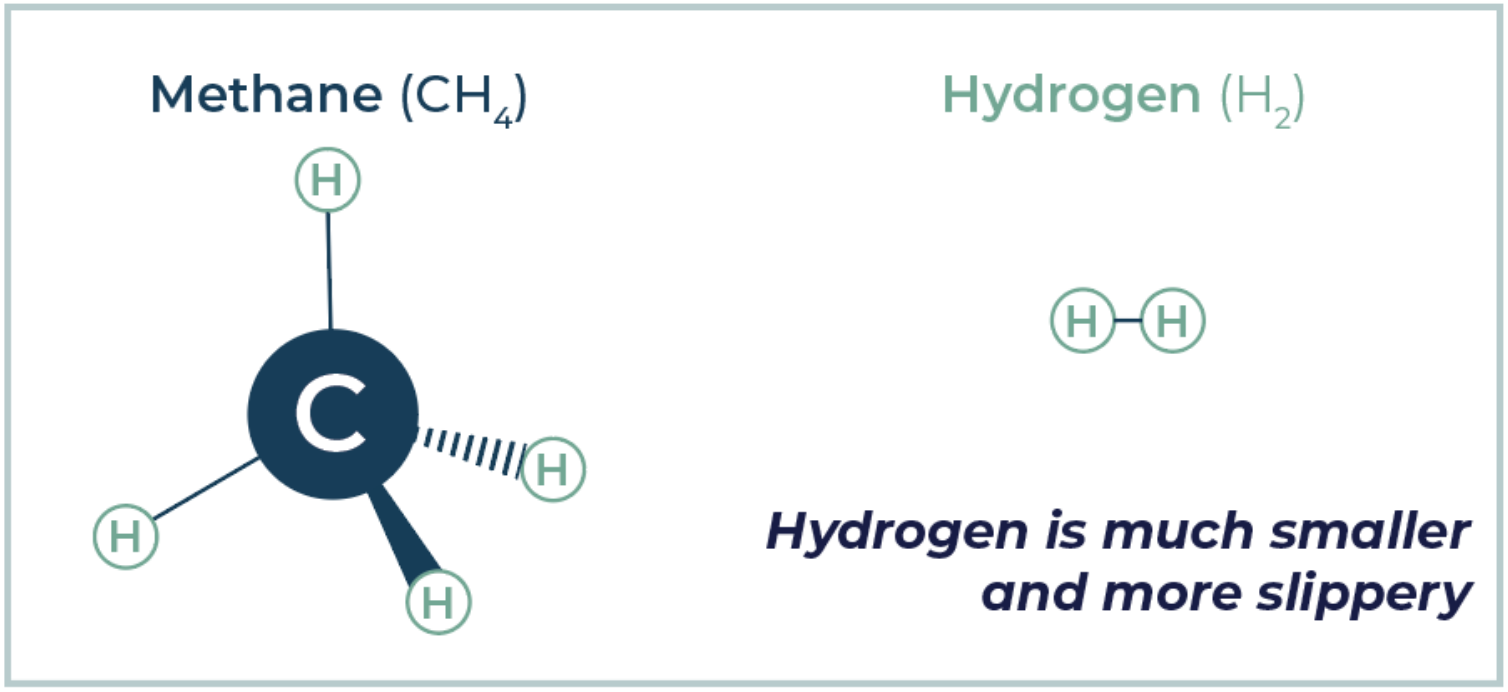
Pipeline Safety TRUST

Hydrogen: Riskier than methane



Pipeline Safety TRUST

Hydrogen: Riskier than methane



Pipeline Safety TRUST

Hydrogen: Riskier than methane

- H_2 can leak at higher rates than methane, given its small size and viscosity
- It can migrate underground and accumulate in basements or other confined spaces

Pipeline Safety TRUST

Hydrogen: Riskier than methane

- H_2 causes integrity issues in both steel and certain polyethylene leading to embrittlement and cracking
- We expect systems with hydrogen to fail at higher rates without further R&D to close knowledge gaps and extensive infrastructure overhauls

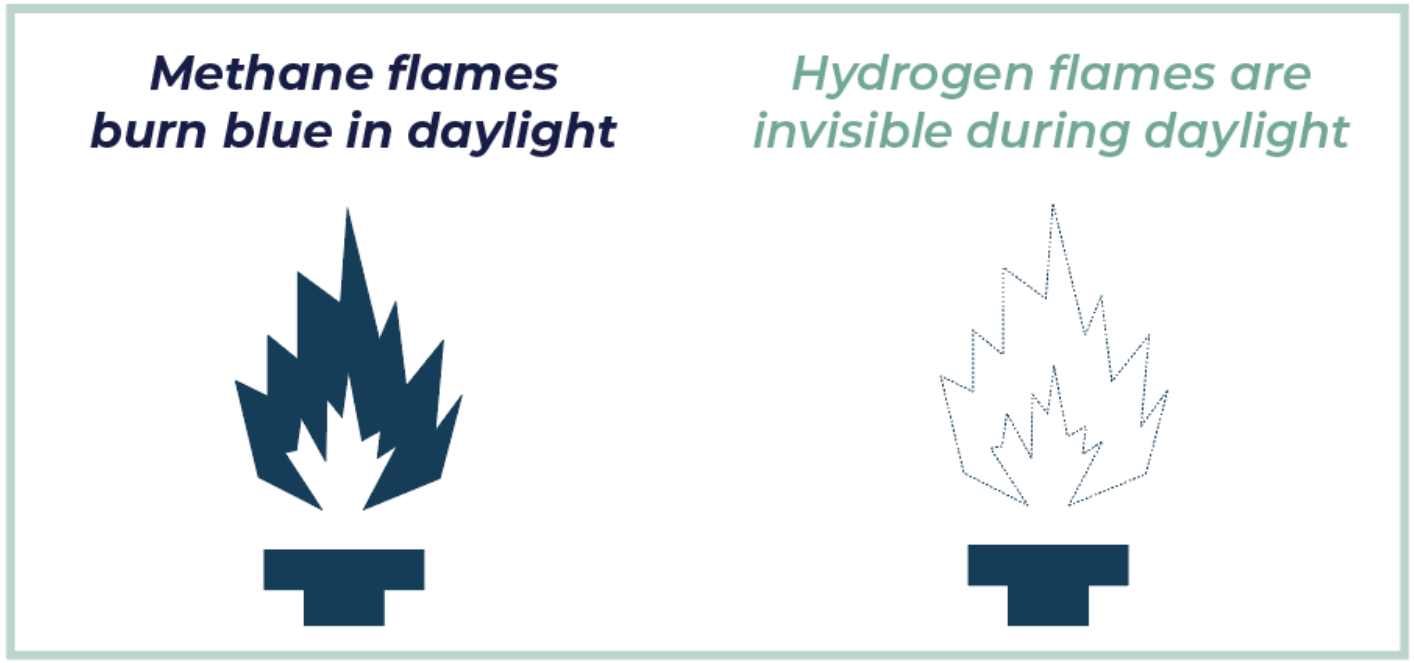
Pipeline Safety TRUST

Hydrogen: Riskier than methane

- All these factors lead to the fact that hydrogen is much more likely to explode than methane

Pipeline Safety TRUST

Hydrogen: Riskier than methane



Pipeline Safety TRUST

Hydrogen: Climate issues

- H_2 is an indirect greenhouse gas with over 30 times the warming power of CO_2 in its first 20 years
- Leakage will erode climate benefits or could even worsen warming
  - Can leak at higher rates than methane
  - Leak detection technology is limited

Pipeline Safety TRUST

Blue Hydrogen: Climate issues

- H_2 climate issues
- Methane leakage from natural gas pipelines
- Questionable efficacy of capturing and sequestering carbon

Pipeline Safety TRUST

Key question

Why are we asking our communities to accept more risk from pipelines for questionable climate benefits?

Pipeline Safety TRUST

Hydrogen: Key takeaways

- Decisionmakers must ensure:
  - any new pipelines will be a sufficient distance from people and communities
  - the integrity of the pipelines will not be compromised by the presence of hydrogen
  - the project will indeed reduce greenhouse gas emissions taking into account leakage, the hydrogen's source, and lower energy density
  - transparency and accountability for the public, including adequate reporting and leak detection technologies
  - preparation of emergency response in case of pipeline failures

Pipeline Safety TRUST

Thank you!

Bill Caram
Executive Director
Pipeline Safety Trust

bill@pstrust.org
360-543-5686 Ext. 103
www.pstrust.org

Pipeline Safety TRUST