Pipeline Safety Research and Development (R&D) Forum 2023 Event Public Brief

693JK321P000015

Report to:
Pipeline and Hazardous Materials Safety Administration
Office of Pipeline Safety
Engineering and Research Division (PHP-80)

Submitted by:
S&K Mission Support LLC
63066 Old Highway 93, Suite M
Saint Ignatius, MT 59865

ABSG Consulting Inc.
1525 Wilson Boulevard, Suite 625
Arlington, VA 22209

S&K MISSION SUPPORT

ABS Group

Forum Overview

The Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety (OPS) at the U.S. Department of Transportation (hereinafter referred to as PHMSA) led a public research and development (R&D) forum (Forum) on 31 October and 1 November 2023 in Arlington, Virginia. The purpose of the Forum was for the public, government, and industry stakeholders to identify technology and knowledge gaps related to various pipeline and liquefied natural gas (LNG) facility safety issues for development into research solicitation topics.

The Forum was informed by a combination of existing PHMSA priorities for ensuring pipeline and LNG facility safety, Biden Administration climate goals of reducing greenhouse gas (GHG) emissions, industry interests, and input received at a May 2023 PHMSA public meeting held in Des Moines, Iowa.

The goals of the R&D forum were to—

- Generate a national research agenda that identifies technical challenges to and solutions for improving pipeline safety and protecting the environment.
- Provide a venue for information exchange among key stakeholders, including the public, other federal agencies, state and tribal governments, industry, and international colleagues.

Day 1 comprised a variety of panel presentations from and Q&A sessions with subject matter experts (SMEs) to all attendees:

1. Carbon dioxide (CO_2) research gaps, technologies, technical challenges, and future initiatives (discussion begins at approximately 33:07).
2. Hydrogen research gaps, technologies, technical challenges, and future initiatives (discussion begins at approximately 2:19:45).
3. A panel on pipeline facilities leak detection research gaps, technologies, technical challenges, and future initiatives (discussion begins at approximately 3:36:58).
4. A panel on challenges and success stories with implementing research technologies in the field (discussion begins at approximately 0:50).

Following the panel sessions, the Forum split into breakout sessions during which each of six working groups (WGs) under five general topics brainstormed research gap ideas. SMEs provided each WG with presentations on relevant projects, technical challenges, and research gaps; all SME presentations can be found on the Forum meeting webpage.

Day 2 focused on the prioritization and roadmapping of research gaps within the following WG topics:

1. Carbon dioxide pipelines.
2. Hydrogen pipelines.

3. Leak detection.
    a. Leak detection in pipelines.
    b. Leak detection in LNG facilities.
4. Threat prevention.
5. Anomaly detection, repair, and rehabilitation.

Each WG began the research gap identification process by scanning a quick-response (QR) code and submitting ideas anonymously using Microsoft (MS) Forms; all participants also had the option to submit suggestions using a pen and paper. On Day 2, each WG prioritized the suggestions; participants in most WGs—except WGs that collectively decided to use another preferred prioritization method—scanned a QR code and voted on which suggestions to prioritize through a prepared MS Forms ballot.

Table 1 summarizes the prioritized research gaps identified by each WG; gaps in dark red text indicate those identified as being appropriate for academic research. All content and grammar in the Prioritized Research Gap column are those of the originators.

The WG breakout sessions were followed by the WG report out session and closing remarks.

Table 1. Summary of Prioritized and Roadmapped Research Gaps

WG No.	WG Topic	Prioritized Research Gap
1	CO_2 pipelines	0. CO_2 specification[1] 1. Equation of state (EOS) refinement for CO_2 pipelines 2. Refine fracture control models for CO_2 3. Validate and apply dispersion modeling for CO_2 4. Non-metallic materials compatibility for CO_2 service
2	Hydrogen pipelines	1. Coating and lines development 2. Welding standards 3. Evaluation of pipeline repair and maintenance 4. Recommended guidance for hydrogen pipelines
3a	Leak detection for pipelines	1. Lack of guidance for technology selection 2. Leak detection accuracy 3. Improved leak detection 4. Synthesize data to inform decisions

[1] WG 1 identified a "Gap 0" that takes precedence over the prioritized gaps, as CO_2 specification impacts all other areas of CO_2 pipeline R&D.

WG No.	WG Topic	Prioritized Research Gap
3b	Leak detection for LNG facilities	1. Gap analysis and leveraging existing programs to fulfill Department of Transportation PHMSA leak detection and repair (LDAR) program 2. Impact of hydrogen blended products on existing leak detection systems in LNG facilities 3. Feasibility of automated drone/robot LDAR surveys in LNG facilities 4. Independent validation criteria for leak quantification methods
4	Threat prevention	1. Improved rapid, in-field evaluation of strain demand 2. Testing, modeling, and verification of strain capacity in vintage pipelines 3. Integrated database of publicly available geohazard-related data
5	Anomaly detection, repair, and rehabilitation	1. Non-destructive means to determine pipe body and weld fracture toughness via in-line inspection (ILI) or in-ditch methods 2. Update the “History of Line Pipe Manufacturing in North America” to include more detail of mill processes, evolution of steel making, add high-strength low-alloy (HSLA) materials, fittings, history of coating types, and foreign manufacturers 3. Further development of in-line non-metallic pipe inspection technology to detect anomalies, map service tees, characterize ovality and any material degradation 4. Improved coating/liners for pipeline repair considering materials/cost/continued inspection and maintenance 5. Artificial intelligence (AI) or machine learning (ML) improvements in inspection technologies (standardization, data sharing, validation)