Readout Report: Working Group 3B Leak Detection for LNG Facilities

Working Group Leaders

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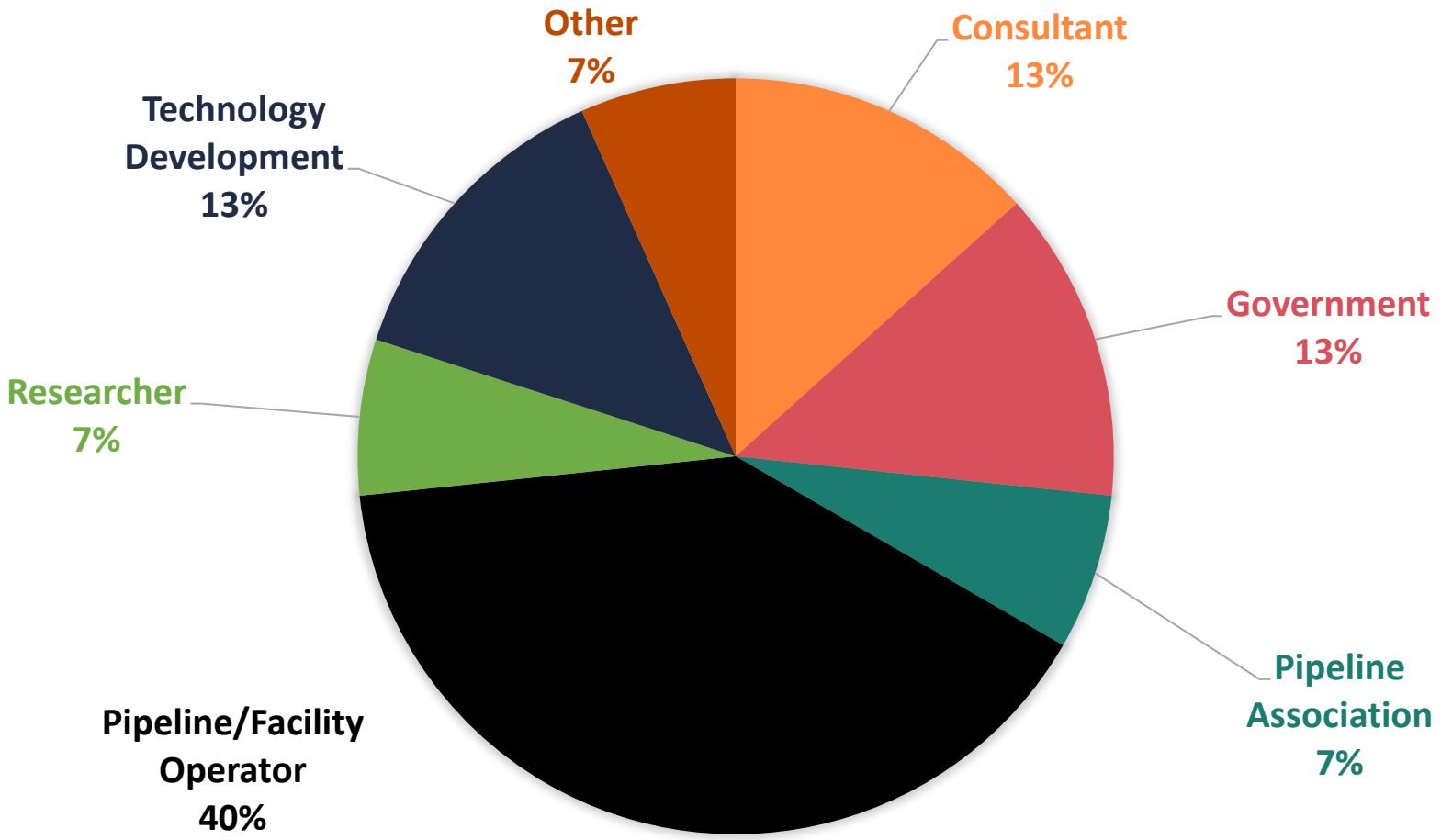
Working Group Participation by Industry



Top Identified R&D Gaps

Gap #1 – Gap analysis between existing LDAR programs, such as EPA LDAR and state administered programs, and potential DOT PHMSA LDAR program goals. Adequacy or synergy in leveraging existing programs, such as API 754 / AiChE CCPS / IOGP 654, and existing FERC reporting, EPA LDAR and state administered programs to fulfill DOT PHMSA LDAR program and reduce duplication.
Output type: General Knowledge
Infrastructure type: LNG

Gap #2 – Study how existing leak detection systems in LNG facilities might be impacted in the presence of blended products (e.g. with hydrogen).
Output type: Technology Development
Infrastructure type: LNG

Gap #3 – Feasibility of automated drone/robot LDAR surveys of facilities.
Output type: Technology Development
Infrastructure type: LNG

Gap #1 Associated Details

Title: **Gap analysis and leveraging existing programs to fulfill DOT PHMSA LDAR program.**

Main Objective: To evaluate the adequacy of existing environmental LDAR and safety leak reporting programs, such as EPA LDAR, existing FERC reporting, state administered programs and API 754 / AiChE CCPS / IOGP 654 to reduce duplication and inform potential DOT PHMSA LDAR program goals.

Creation and Dissemination of General Knowledge

a. What facility type does the technology target? **All LNG facilities.**
b. Does the gap address any regulatory, congressional, or NTSB drivers? **PIPES Act of 2020 Section 114, EPA LDAR, existing FERC reporting, and state administered programs (e.g. TCEQ 28M and 28VHP).**
c. Does the gap address related consensus standards? **API 754 / AiChE CCPS / IOGP 654**
d. What technical details or scope items are necessary and recommended? **Applicability of each program and practice for each facility type to meet existing LDAR and leak reporting requirements. Differentiate between environmental and safety requirements, including thresholds, methods, frequency, exceptions, and component definitions. Create a comparison table or similar and recommendations for environmental and/or safety requirements.**
e. What are anticipated targets or timeframes to complete this research? **12-18 months**

Gap #2 Associated Details

Title: **Impact of hydrogen blended products on existing leak detection systems in LNG facilities.**

Main Objective: Study how existing leak detection systems in LNG facilities are impacted by the presence of hydrogen blended products. Evaluate the sensitivity/reliability of the leak detection systems for each component in the blended product as it passes through the LNG process.

New or Improved Technology

a. What facility type does the technology target? **All LNG facilities.**
b. What operating environment(s) must the technology operate in (inside/outside-pipe, above/under-ground, hazardous liquid or natural gas service, etc.)? **Outside-pipe, above ground, and hydrogen blended products.**
c. Are there any functionality and/or performance requirements? **Determine if the existing leak detection systems detect hydrogen blended releases. Determine at what concentration the existing leak detection systems fail to detect hydrogen blended releases.**
d. Does the gap address any regulatory, congressional, or NTSB drivers? **Bipartisan Infrastructure Law**
e. Does the gap address related consensus standards? **NFPA 59A and ISA 12.13**
f. What technical or regulatory roadblocks or barriers prevent the technology deployment? **Limitations of currently utilized technology.**
g. What are anticipated targets or timeframes to complete this research? **18-24 months**

Gap #3 Associated Details

Title: **Feasibility of automated drone/robot LDAR surveys in LNG facilities.**

Main Objective: Determine the feasibility and practicality of automated drone/robot LDAR surveys in LNG facilities, including accessibility for required component surveys and accuracy/precision of readings obscured by equipment and congestion within a facility.

New or Improved Technology

a. What facility type does the technology target? **All LNG facilities.**
b. What operating environment(s) must the technology operate in (inside/outside-pipe, above/under-ground, hazardous liquid or natural gas service, etc.)? **Outside-pipe, above ground, and hydrocarbon services.**
c. Are there any functionality and/or performance requirements? **Detection limits, range, atmospheric conditions, maneuverability, time-constraints (e.g. battery life), electrical classification (device and RF signal) requirements, and safe operating practices.**
d. Does the gap address any regulatory, congressional, or NTSB drivers? **PIPES Act of 2020 Section 114 and FAA Section 333 waiver**
e. Does the gap address related consensus standards? **ISA 12.12.03**
f. What technical or regulatory roadblocks or barriers prevent the technology deployment? **Required risk assessment for operation.**
g. What are anticipated targets or timeframes to complete this research? **24 months**

Gap #4 Associated Details

Title: **Independent validation criteria for leak quantification methods.**

Main Objective: Develop validation criteria and environmental and safety leak detection performance requirements for determining: concentration, concentration-length (e.g. LFL-m) and/or flow rates using existing technologies (e.g. OGI, Method 21).

New or Improved Technology

a. What facility type does the technology target? **All LNG facilities.**
b. What operating environment(s) must the technology operate in (inside/outside-pipe, above/under-ground, hazardous liquid or natural gas service, etc.)? **Outside-pipe, above ground, and hydrocarbon service.**
c. Are there any functionality and/or performance requirements? **Environmental and safety**
d. Does the gap address any regulatory, congressional, or NTSB drivers? **PIPES Act of 2020 Section 114**
e. Does the gap address related consensus standards? **Potential standard development (none exist currently)**
f. What technical or regulatory roadblocks or barriers prevent the technology deployment? **Vendor intellectual property and proprietary restrictions. Limitations to the measurement method.**
g. What are anticipated targets or timeframes to complete this research? **24-36 months**

Additional Identified Gaps

1. There is a significant group of LNG tanks in operation in the US (30 to 50) dating from the 60s/70s whose original design lives of 20-30 years are now well exceeded. Research work is proposed to determine if and when should they be taken out of service as a result of crack growth from fatigue stemming from flaws in welds which are bound to have occurred during construction. PHMSA has already begun studying the fatigue mechanism for 9%Ni steel plate tanks, but stainless and aluminum tanks were not studied due to lack of funding. Similarly, technologies such as membrane should be included in the study, and subject to the same level of scrutiny as steel plate tanks. This research is critical because the failure mode of an old LNG tank is break-before-lake (not leak-before-break), and therefore large cracks may occur with no warnings to older assets. Moreover, existing design standards such as API620/625 rely on “old school” techniques that fail to incorporate fracture mechanics and crack propagation. Proposed research work should take advantage of advanced tools such as FEA to look into these matters, and account for an investigative damage model due to thermal cycling that can stand peer review (models are not available today).

Thank You!/Questions?