GTI ENERGY

RAISE

Summary: Minnesota Workshop on Decarbonization Pathways of Natural Gas Systems

On November 6th, 2025, GTI Energy held its Reliable Affordable Infrastructure for Secure Energy (RAISE) Workshop on Decarbonization Pathways of Natural Gas Systems for non-utility stakeholders at the Minnesota Public Utilities Commission (PUC) headquarters in St Paul, Minnesota. This was the third workshop of 2025. Previous workshops were held with the commission staff of Illinois and Washington state. The GTI Energy RAISE team presenting to the commission was Jarrod Bullen, Dylan Chandler, Marina Slijepcevic, and Yan Zhao. This memo summarizes the workshop and key discussion points.

Stakeholders

The workshop was attended by Commissioners Audrey Partridge and John Tuma, and approximately 20 PUC staff from various policy and regulatory teams. The session had high levels of engagement between the stakeholders and the presenting team, with a focus on pipeline leak management and pipeline material research programs, and hydrogen integration considerations.

Key Topics of Engagement

- U.S. Gas Infrastructure Systems and Monitoring/Modernization Efforts
    - The workshop held a lengthy discussion on the potential reasons for the under-/over-estimation of leaks and leak rates from gas infrastructure systems across the natural gas supply chain. The team detailed the methodology and assumptions behind the emission factor (bottom-up) and measurement (top-down) approaches to estimating leaks and emission inventories. Presenters stressed the need to match any approach and monitoring technology to the specific use case as determined by research and implementation.
    - Attendees asked about the main factors for the uneven distribution of underground gas storage across the country. Presenters noted the geological factors required for storage. Underground storage sites are predominantly of three types: depleted oil or gas fields (~78%), aquifers (~15%), and salt caverns (7%)[1]. Storage underground requires dry caverns with low permeability to prevent gas loss. Because of this, depleted fields are a preferred choice, meaning locations of underground storage are near production sites. Aquifers and salt caverns also present more ideal permeable and non-reactive conditions for storage. The uniqueness of these sites means that they will not be found consistently across the U.S. –

[1] https://www.phmsa.dot.gov/technical-resources/pipeline/underground-natural-gas-storage/fact-sheet-underground-natural-gas

around 69% of suitable storage sites can be found in central states, from the northern to southern border[2].

- Stakeholders asked whether there was a preferred pipeline material for preventing fugitive leaks. The team detailed the many factors to consider when designing a suitable pipeline safety and environmental management program. This includes the size of the service area, pipeline operating pressure, maneuverability, and environmental conditions, such as moisture-rich soil and potential earth movement. Research efforts have focused on developing modern pipeline materials that are less susceptible to corrosion, which have now become the industry standard. Attendees expressed interest in this research effort, the current state of pipeline material development and the potential technologies for improving modern materials.
- A comment was noted on the liquid hydrocarbon content observed in some MN natural gas pipelines, and whether this is related to the observations of pipe damage seen in specific pipe cross-sections. This question led to a discussion on hydrocarbon permeation and the potential effect if hydrogen is added to the pipeline, and the pipeline material considerations that may be specifically important to Minnesota.
- The team responded to a question on the definition of certified natural gas versus differentiated gas, detailing the scope of gas certification programs that seek to certify the production, transportation, and distribution of gas with minimal gas loss. The team linked this discussion back to the previous discussion on the use of modern pipeline materials, and additional measurement technologies to best mitigate leaks.

- Alternative Fuels and Lifecycle and Techno-Economic Analysis (LCA/TEA)
  - The team discussed the definition of an LCA and its use in various applications. Stakeholders were specifically interested in its role as a tool for assessing the environmental impacts of power plants.
  - Stakeholders asked how methane emissions are quantified in greenhouse gas reports and considered in carbon intensities. There was general interest in understanding the relevance and accuracy of equivalency calculations. Presenters noted that carbon dioxide emissions are the largest and most well-known of greenhouse gases. As such, reporting practices equate the effects of other greenhouse gas emissions in relation to carbon, hence the conversion of methane emissions to a CO2-equivalent metric.
  - Stakeholders were also curious about the status of the 45 V tax credit. The credit is still active, though projects must be in the execution stage by 2027, to receive credit in 2028. At this time, the credit has not been extended beyond its original timeline.

[2] https://ingaa.org/wp-content/uploads/2016/08/30077.pdf

- Alternative Fuel Integration
    - Stakeholders and presenters discussed the testing scope during hydrogen blended testing on end-use equipment (i.e., gas stoves, heaters, etc.). The team shared details on GTI Energy's ongoing research efforts focused on evaluating the combustion of hydrogen and natural gas blends, including flame characteristics, carbon monoxide and nitrous oxide emissions, and burner efficiency.
    - Stakeholders asked whether equipment modifications were necessary for this testing program and if any significant impacts were observed in initial testing results. The team confirmed that no modifications were made in the equipment testing program noting that the gas pressure is kept constant (7-10 inches water column), which is standard practice. No significant impacts have been observed to date, although testing has shown a trend of decreasing nitrous oxide emissions.
    - Stakeholders were also interested in the potential impacts of hydrogen on pipeline materials and the status of research findings done to evaluate the effects. The team provided a high-level overview of accelerated pipeline testing programs being conducted in GTI Energy labs focused on steel pipeline materials under low-pressure hydrogen conditions for the distribution segment. Testing results are still pending but academic literature suggests that hydrogen could have a higher impact on materials at higher concentrations (>30% blends).
    - Hawaii's use of 15% hydrogen in their natural gas pipelines was discussed as an applicable case study with stakeholders noting the hesitancy to introduce hydrogen into the gas system observed in continental U.S. states versus the advanced deployment seen in Hawaii. The team explained that Hawaii has limited natural gas access and a well-established industry for producing synthetic natural gas and hydrogen on the islands. As a result, the islands upgraded pipeline distribution materials to a safe threshold for transporting the blended gas. Conversely, pipeline materials in the continental United States can still vary within service areas, making the overall system susceptible to issues from smaller segments of the pipeline. Public adoption can also be a concern when introducing newer fuels into the pipeline market.
    - The topic of CCUS was de-prioritized during the workshop based on feedback from the attendees due to the lack of storage options in Minnesota. However, the team noted that a current CO2 pipeline project has been approved to move captured CO2 from ethanol plants in Minnesota to storage fields in North Dakota.