

Hydrogen-Natural Gas Living Lab

Description: A project to test in live conditions the impacts of higher concentrations of blended H₂ on gas piping materials and a wide range of gas engineering aspects and operations

Status: Design specifications, constructions requirements, permits and other contractual documents are being put into place by SoCal Gas, the Living Lab host and project lead. NYSEARCH funders are providing input and materials that influence design selection, test plans and samples for use.

BENEFITS

By displacing natural gas with blended hydrogen, there is a potential for significant reduction in Greenhouse Gas Emissions (GHGs). Blending as a hydrogen delivery method, can defray the cost of building dedicated hydrogen pipelines or other costly delivery infrastructure especially during early market development. Blended hydrogen has the potential to enhance energy efficiency and resiliency in delivering renewable and non-renewable fuels.

This project explores and validates feasibility studies that have already been performed by collecting data in live conditions for a range of issues and systems that the blended hydrogen (at higher volume percentage concentrations: 25 vol% - 35 vol %) could face. The 'Living Laboratory' concept is designed to take lab scale concepts to validation without the need for full pilot test structures and by taking advantage of existing test expertise, facilities and scaleup opportunities.

BACKGROUND

Hydrogen blending has the potential to be disruptive in the energy space and utilities need to identify and overcome technical challenges to ensure people's safety as well as provide a cleaner and greener fuel. Transformational research is needed to educate gas companies on how to maintain security of the gas supply to our homes and businesses, as the country moves away from natural gas that has been the bedrock of the US energy system for almost a century.

Blending hydrogen into natural gas pipeline networks has also been proposed as a means of delivering pure hydrogen to markets, using separation and purification technologies downstream to extract hydrogen from the natural gas blend close to the point of end use. SoCalGas has experience with small scale testing of hydrogen blends at <20 vol% and with participation in a range of low carbon fuels projects. In this NYSEARCH consortium, materials and test specifications can be shared by other members and then used in the SoCalGas test program.

TECHNICAL APPROACH

The objective is to demonstrate, collect and analyze data, and report on the impacts of hydrogen blending at higher percentages and in medium and high-pressure systems by monitoring and evaluating conditions that affect safety, maintenance, and emergency response related to the gas distribution infrastructure.



Figure 1: Rough layout of Living Lab being constructed at SoCalGas' Pico Rivera facility

A partial list of project activities include: testing the performance of the hydrogen blending skid, assessing emissions impacts when using hydrogen blends, impact on pipeline materials and components, leak detection equipment applicability and performance, metering and regulation and safety/response procedures.

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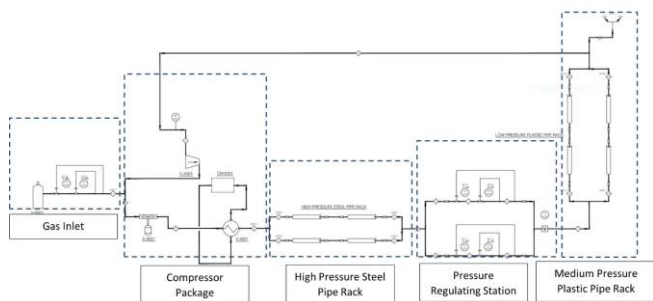


Figure 2: Conceptual Process Flow Diagram

PROGRAM STATUS

SoCalGas is leading the engineering design, construction, and testing data collection throughout the two-year demonstration. The SoCalGas team and the NYSEARCH Project Manager have been working collectively with other NYSEARCH funders on the specifications for the test site. A test plan for materials testing and leak detector evaluation is also being circulated for input by the funding members. Also, other NYSEARCH members are providing samples for pipe material and component testing.

SoCalGas is working with third parties on engineering design and compressor assembly and installation. They are also working on the necessary permitting with the city. Thus, the site will likely be in construction and not live for testing until mid-2023. At that time or sooner, commissioning will commence the test phase.

Highlights

- Living lab approach builds on previous feasibility studies and laboratory analyses by moving to near full-scale deployment
- SoCalGas serves as the industry leader in this project and host using their facilities, in-house expertise, third party contractors and regulatory drivers
- NYSEARCH’s role in the Living Lab is to provide funding and input through its diverse membership to broaden the visibility and lessons learned from the project
- NYSEARCH members provide input and gain valuable lessons learned through a large investment of SoCalGas