# Hydrogen-Enriched Natural Gas (HENG) to Reduce Greenhouse Gas Emissions from Natural Gas

Dr. Hoorfar, Director and Professor at UBC School of Engineering, is leading a 2-year experimental study on the performance and feasibility of hydrogen-enriched natural gas (HENG) as a strategy to reduce greenhouse gas (GHG) emissions from natural gas. The research is a partnership between UBC School of Engineering (SOE), FortisBC Energy Inc. (FEI) and Hetek Solutions Inc. (Hetek), with funding support from NSERC Alliance, with the goal to develop a novel, scalable and automated HENG laboratory testbed (the H2LAB). Blending hydrogen gas ($H_2$) into the existing natural gas pipeline network has been proposed as a strategy to reduce greenhouse gas emissions and one of the most significant opportunities to introduce and boost uptake of $H_2$ as a clean fuel is represented by the existing natural gas infrastructure, such as British Columbia (BC) 50,000 kilometres of pipelines, where $H_2$ can be blended into the natural gas supply; however, there is no determined % $H_2$ by volume blend approved by industry, regulators and policymakers. The project will focus on the full life cycle of natural gas for residential and commercial uses, from injection design for the blending of $H_2$ (5 – 20% volume (v/v)) into the natural gas grid, mixing quality assessment, material exposure analysis, to separation and combustion, with the goal to determine the concentration of $H_2$ that can be safely implemented and utilized within current pipeline infrastructure and end-use devices.

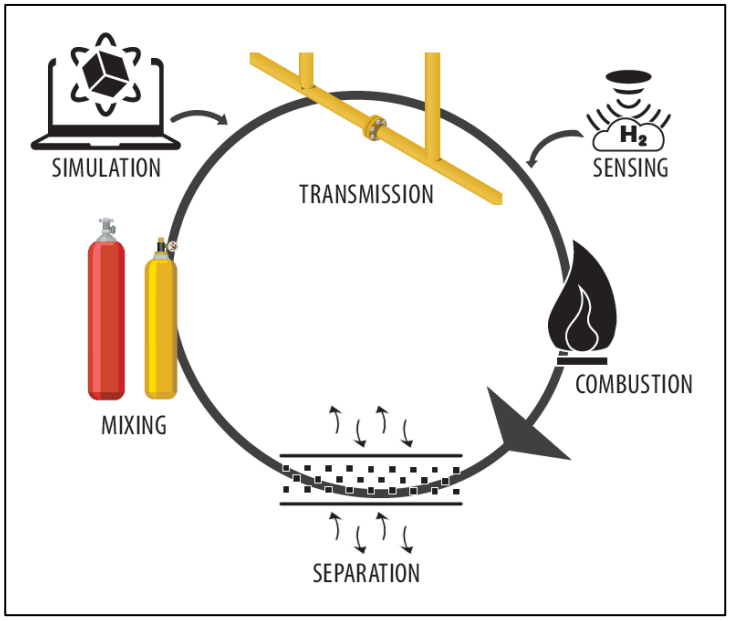


*Fig. The proposed H2LAB will integrate multiple key research subprojects starting from mixing to combustion and separation. Subprojects 1 and 2 will focus on the analytical modeling of mixing and transmission. Subproject 3 will focus on pipeline material testing. Subproject 4 will be focused on $H_2$ sensing. Subproject 5 will draw from subprojects 1, 2, and 4, and integrate them using machine-learning modeling. Subproject 6 will focus on combustion. Subproject 7 will focus on $H_2$ separation.*

## Challenges and Opportunities

The technical uncertainties of introducing $H_2$ into the existing gas network, the potential impacts on end-users, and the lack of applicable codes, standards, and regulations are crucial impediments to $H_2$ deployment that need to be addressed. Although 5-20% (v/v) $H_2$ blends are considered viable, what $H_2$ concentration range can be successfully blended in BC's pipeline network without substantial modifications to the natural gas infrastructure and compliance codes is the key research question addressed by the proposed H2LAB study. The proposed study aims to integrate an automated laboratory testbed to experimentally investigate upstream $H_2$ injection, mixing, and transmission, and downstream combustion and separation. The study will also lead to the development of tools, methods and technologies for monitoring $H_2$ content in order to determine the blending efficiency and detect accidental release during injection and transmission, with the goal of providing a safe and efficient % $H_2$ blend range. The research is aligned with UBC's Climate Action Plan, aiming to bring campus GHG emissions to zero by 2050, and FEI's 30BY30 initiative to reduce customer GHG emissions by 30% by the year 2030. More broadly, the project aligns with FEI's Clean Growth Pathway to 2050 mission to help move BC towards a low-carbon, renewable energy future.