

Negative Emissions Technology for Pale Blue Hydrogen Production

Hydrogen Innovation Fund Project Details

Proponent: Western University

Partner: Cipher Neutron

Project Type: Research study

Project Total Cost: \$996,000

Year Contracted: 2023

Location: London, Ontario

Status: Open

Project Objectives

The objective of the study is to demonstrate how Green and Blue Hydrogen can be combined to produce "Pale Blue" Hydrogen and reduce emissions. The Green Hydrogen will be produced by a 5 kW solar powered anion exchange membrane (AEM) electrolyzer using wastewater recycled in a microalgae photo-bioreactor. The Blue Hydrogen will be produced by a solar powered plasma reactor fed with methane extracted from biogas using a graphene membrane. The resulting low-carbon Pale Blue hydrogen will be compressed and stored for fuel cell electricity generation.

The purpose of combining Green and Blue Hydrogen to form the Pale Blue Hydrogen is to lower both the water footprint and the carbon footprint associated with hydrogen electrolysis. The study also aims to investigate the economics of several hydrogen types (e.g. green, blue and pale blue) and to study the potential for the different technologies to participate in the IESO Administered Markets to provide grid services such as operating reserves without contributing to grid emissions.

Outcomes

If successful, this study will demonstrate positive economic and environmental benefits of Pale Blue Hydrogen (Green + Blue) for Ontario and potential for new jobs and industries. Expected outcomes include:

- Hydrogen demonstration site at Western University's Institute for Chemicals and Fuels from Alternative Resources (ICFAR) campus.
- Comparison of Blue Hydrogen and Green Hydrogen pathways and potential integration approaches with the electricity system (costs, likelihood, emissions, imports vs domestic production, infrastructure requirements).
- A rationale for clean electrolytic hydrogen production technologies such as AEM electrolyzers
- Estimated reduction in water usage (footprint) and carbon footprints of blue, green, and pale blue hydrogen production processes.