

Evaluation of Sustainable, Green and Rapid-Response Metal-Supported Solid Oxide Cell Technology Integrated with Smart Hydrogen Hub

Hydrogen Innovation Fund Project Details

Proponent: Volta Energy Inc.

Partner: Fuel Cell Manufacturing (University of Toronto)

Project Type: Feasibility study

Project Total Cost: \$1,114,554

Year Contracted: 2023

Location: Toronto

Status: Open

Project Objectives

The objective of this study is to assess the feasibility of an integrated Smart Hydrogen Hub and reversible Solid Oxide Cell (SOC) technology to provide a pathway for hydrogen integration into the electricity grid, including providing intermittent generation smoothing, and short/long term hydrogen storage. The study will also investigate reversible SOC technology market-entry barriers, including durability, rapid response capability, and cost. SOCs are inherently reversible between electricity production and gas (hydrogen) production, namely, between fuel cell mode (SOFC) and electrolysis mode (SOEC) and have the potential to produce hydrogen at double the efficiency of Proton Exchange Membrane (PEM)-based electrolyzers.

Outcomes

If successful, the study will provide insights to the feasibility of integrating a Smart Hydrogen Hub (SH2) and high-efficiency Solid Oxide Cell (SOC) into the electricity system to provide grid services.

Expected learnings include:

- Decarbonization potential study that will quantify, through process modelling and life cycle assessment, the technological pathway of the reversible solid oxide hydrogen fuel cells.
- Performance capabilities assessment of the reversible solid oxide hydrogen fuel cell technology and the potential for this technology to provide grid services such as supporting intermittent generation and load following in response to grid signals.
- Analysis of cost, barriers, and opportunities associated with scaling up and implementing reversible solid oxide hydrogen fuel cells, including the sensitivity to policy/regulatory regimes.
- Roadmap of what is required to further pilot/demonstrate the technology at scale.
- Economics of integrating the technology into the electricity system to accelerate a Net Zero grid.