Fed. funding:	$2.5M
Length	36 mo.

Dual Mode Energy Conversion and Storage Flow Cell

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Test system and end goal

Project Vision

We are solving the challenge of energy storage for intermittent energy sources by leveraging highly efficient electrochemical conversions in flow cells. The team integrates innovative new chemistry with large scale product experience.

Project Impact

Low cost electrochemical energy storage with potential for flexible applications in renewable hydrogen.

General Flow Battery Concept

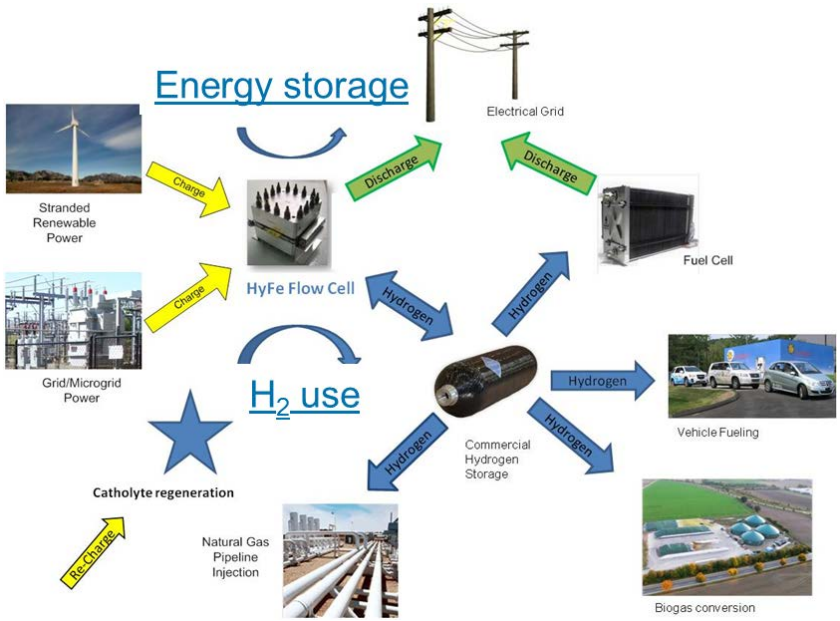
- In this case, “catholyte” is hydrogen formation from protons crossing the membrane; “anolyte” is iron electrolyte

Innovation and Objectives

Innovation

Hybrid hydrogen-iron flow battery allows application flexibility with high round trip efficiency at high current densities

Lower voltage allows carbon for both electrodes; no catalyst for iron side



Task outline, technical objectives

Electrolyte development: PNNL (M1-18)

Electrode fabrication: Proton (M6-24)

Shunt current mitigation: PNNL (M9-27)

Cell and system integration: Proton (M12-36)

Tech-to-Market strategy

- Leverage Proton/NEL sales channels and distributors in utilities and fueling to bring to market
- Leverage Proton supply chain and manufacturing capabilities for stack and system fabrication

Innovation and Objectives

Project history

Proton has a long history in commercial electrolysis systems while PNNL has strong expertise in flow batteries, which share similar characteristics. This project combines the strength of both teams in the hybrid device.

Proposed targets

Metric	State of the Art	Proposed
Noble metal loading	*3 mg/cm^2 (electrolysis)*	*0.075 mg/cm^2*
Round trip efficiency	*~80% (varies with current density)*	*80%*
Current density	*250-300 mA/cm^2*	*750 mA/cm^2*

Anticipated challenges

Managing iron crossover: leveraging new membranes and pressurized H_2 to minimize

Shunt current issues in translation from electrolyzer to flow battery: using PNNL experience in flow field designs

Desirable partnerships

Supply chain for stack components

Renewable energy providers