Dual Mode Energy Conversion and Storage Flow Cell
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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
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

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<thead>
<tr>
<th>Metric</th>
<th>State of the Art</th>
<th>Proposed</th>
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<tbody>
<tr>
<td>Noble metal loading (electrolysis)</td>
<td>3 mg/cm²</td>
<td>0.075 mg/cm²</td>
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<tr>
<td>Round trip efficiency</td>
<td>~80% (varies with current density)</td>
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<td>Current density</td>
<td>250-300 mA/cm²</td>
<td>750 mA/cm²</td>
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Anticipated challenges
Managing iron crossover: leveraging new membranes and pressurized H₂ 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