Novel Regenerative Fuel Cells based on Anion Exchange Membranes for Affordable Renewable Energy Storage

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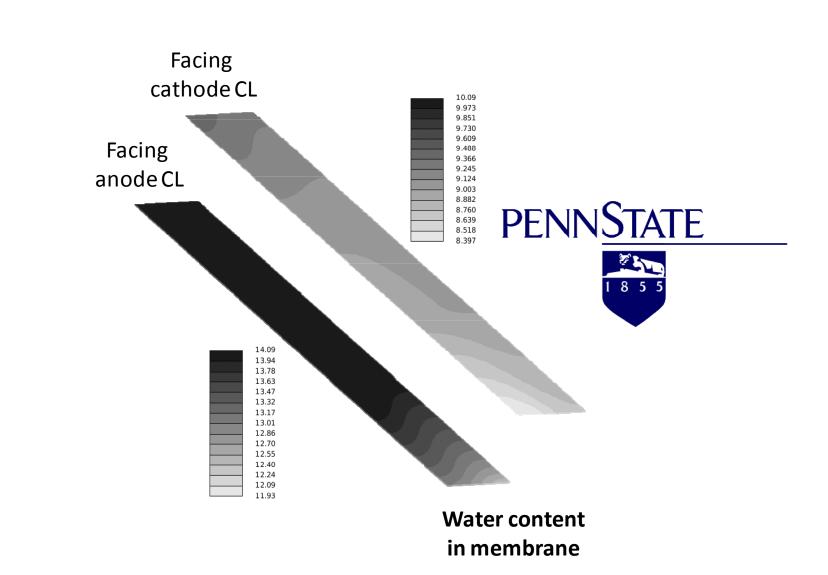
Approach

Electrolyzer Leverage Proton experience in large scale electrolysis and regenerative fuel cells for microgrid energy storage New membrane chemistry to eliminate PGM and semi-precious metals Hydrogen storage Lower current density for improved efficiency Oxygen storage Fuel cell Strategy **Technology Stage** DC power to microgrid Commercially Increased **Ultra-low** Efficiency for Mature loading **Higher Current** High Stability/ structures Reliability Density Membrane-Based Alkaline **Lower Current** Electrolysis Early Stage Non-noble Density for Materials metals for **Improved** Development reduced cost Efficiency

Key Challenges and Progress

Fuel Cell Durability:

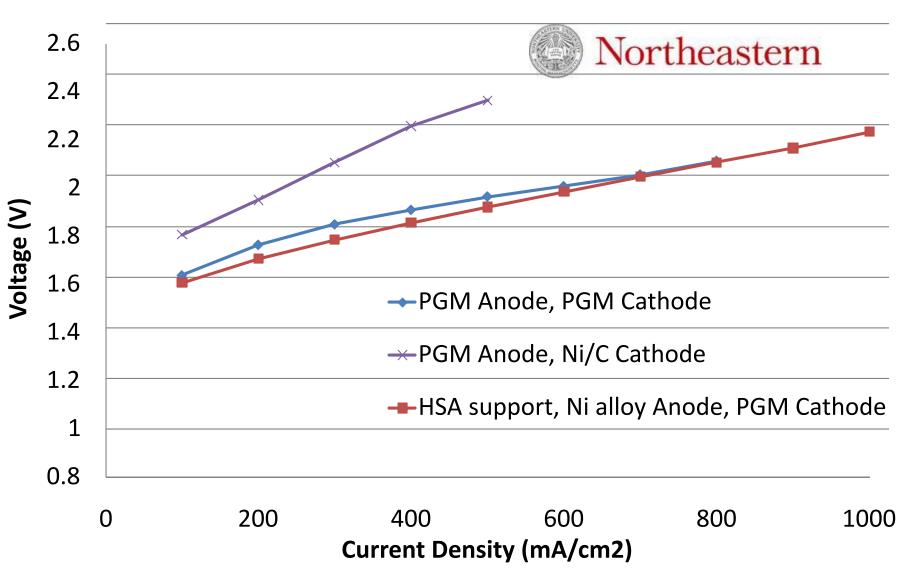
- Anode flooding and cathode dehydration due to reactions and slow membrane water transport
- Examining GDL parameters, ionomer chemistry, and flow rates



Modeling providing important insights in water transport

Non-PGM catalysts (electrolyzer)

- Translation from RDE to cell results requires MEA process understanding
- Challenge in synthesis of non-carbon supports with desired particle size range



Non-PGM catalysts approaching performance target on anode, still working on cathode

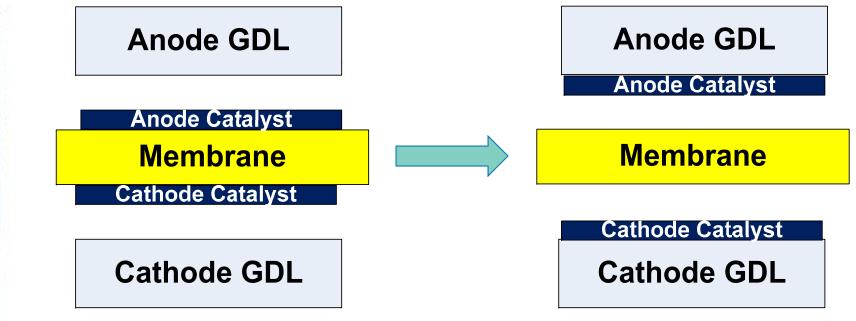
Key Supporting Advances, 2012



5000 psi Operational Prototype



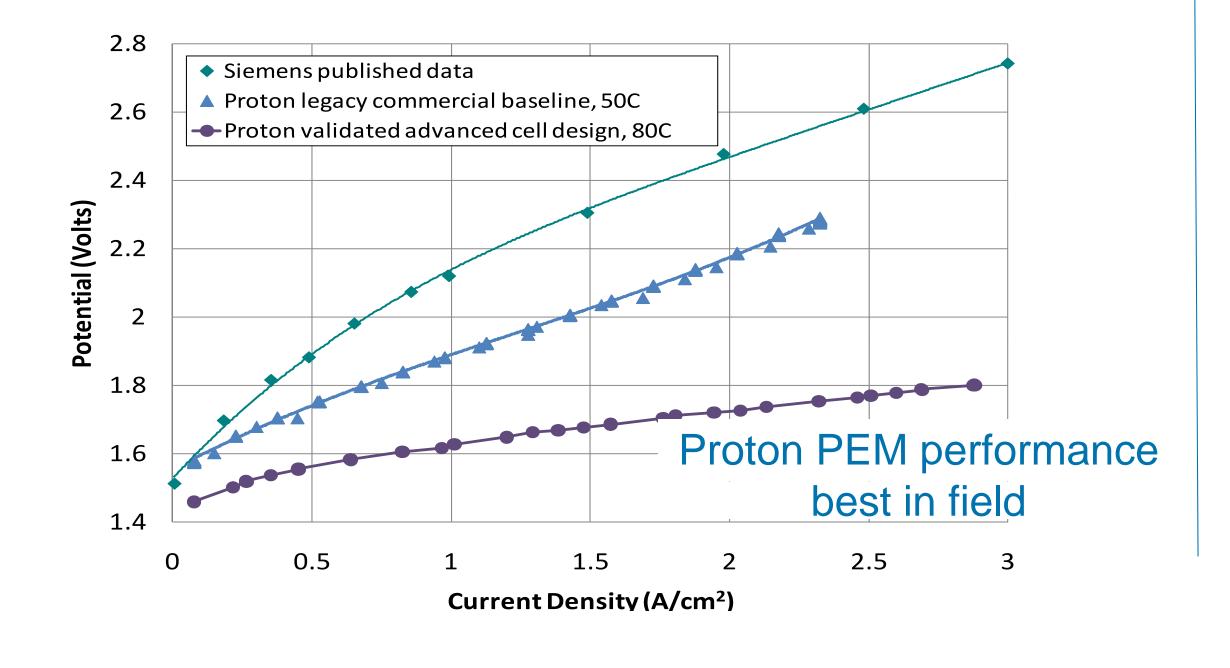
40% Cost Reduced Stack Platform



GDE Approach for Milder Membrane Processing



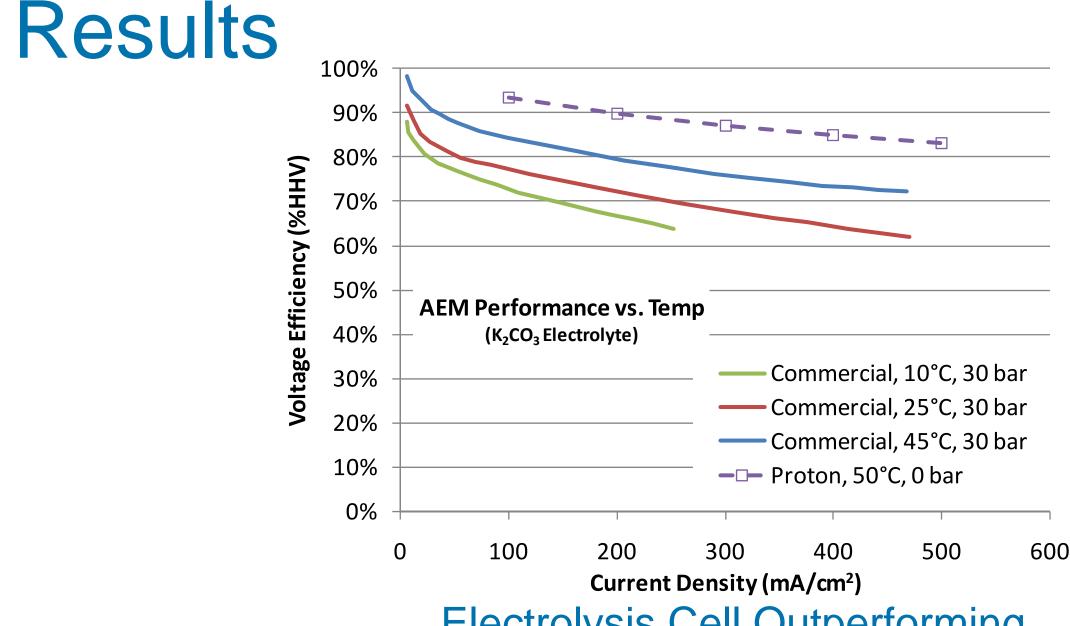
Stack Development for MW Electrolyzer



Fuel Cell Approaching Targets



Components arriving
for system build
(Previously demonstrated RFC
system of similar size shown)



Electrolysis Cell Outperforming
Commercial AEM



