Redox Flow Cells

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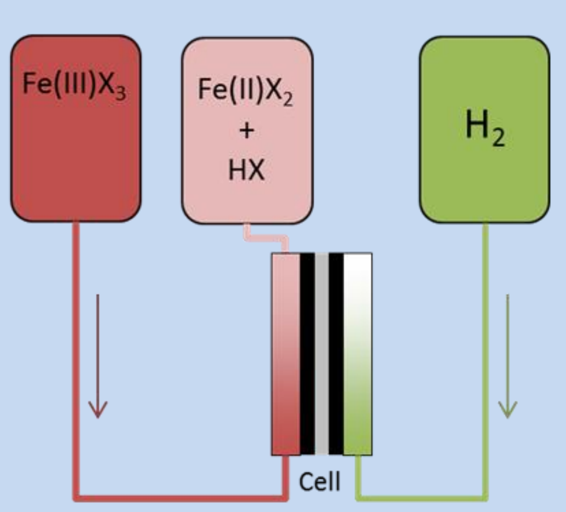
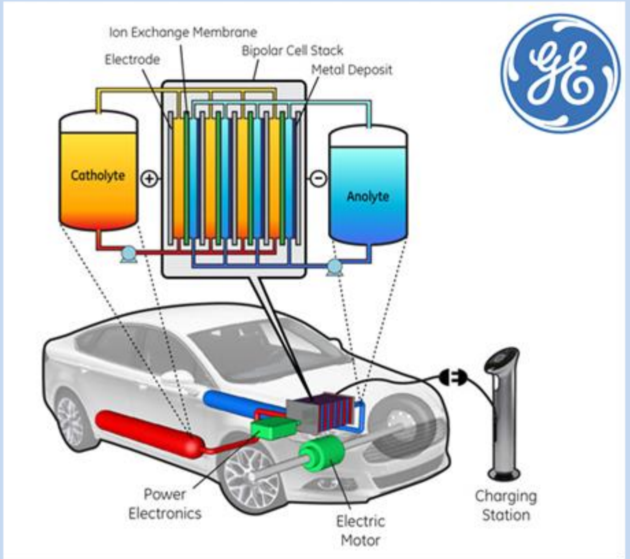
Overview of Flow Cell Projects

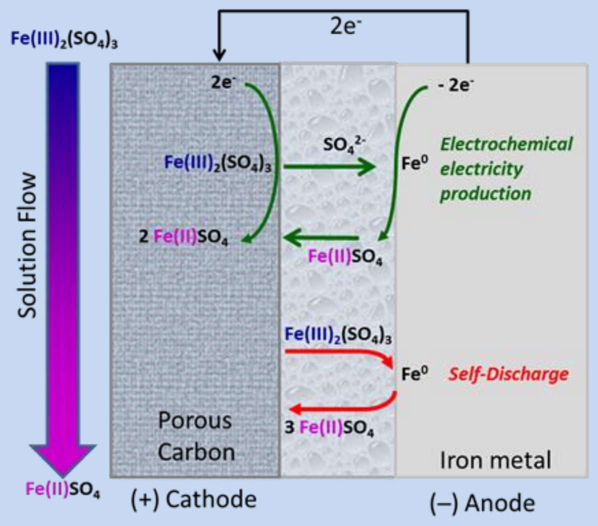
Inexpensive Fe-H_2



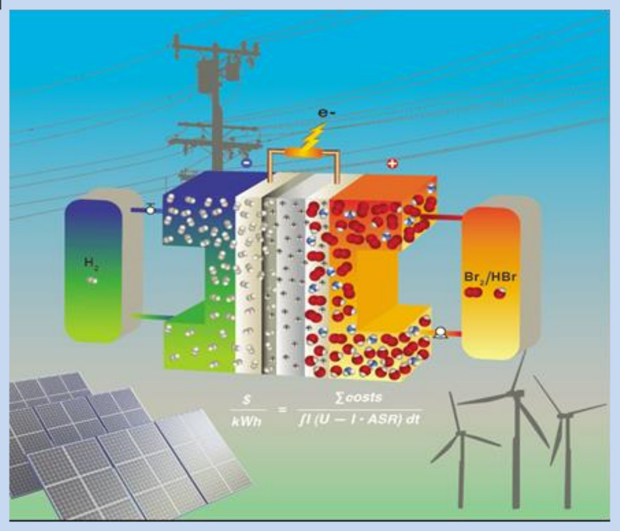
High Capacity Aqueous Chemistry



Non-hazardous Fe-Fe

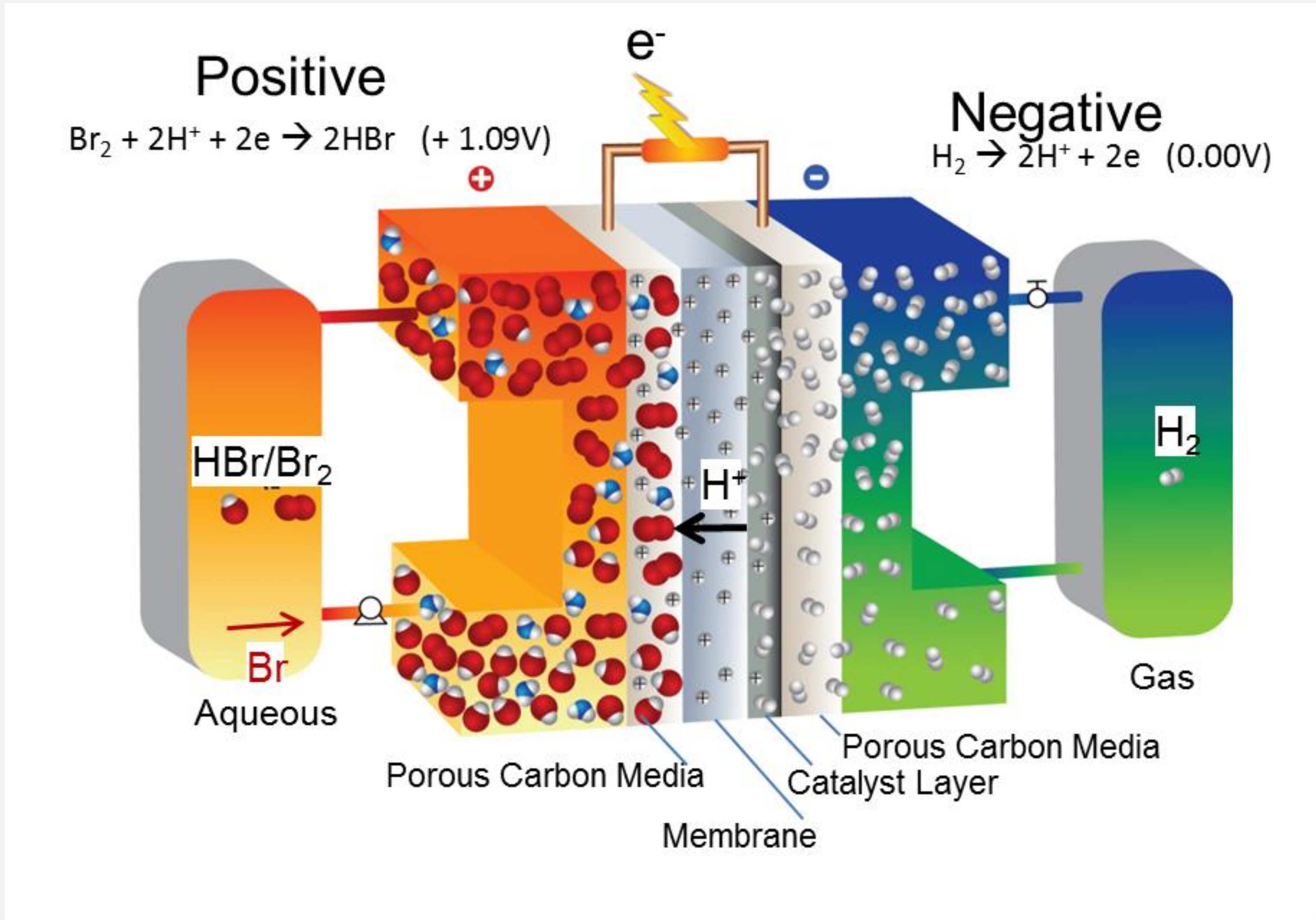


High Power Br_2-H_2



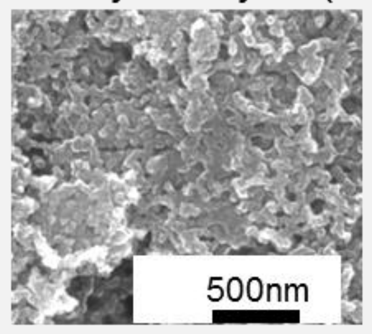
Bromine-Hydrogen Redox Flow Cell

High-power, low-cost system

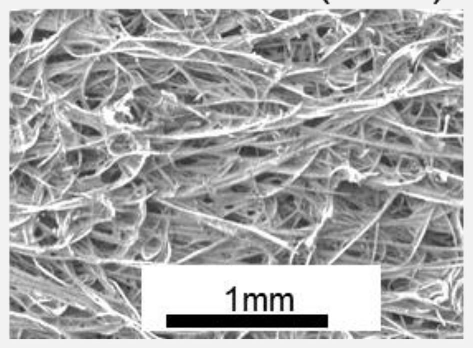


	\$/kg	Ah/\$
Vanadium (V2O5)	18	16
Hydrogen	10	2680
Bromine	1	335

Catalyst Layer (CL)

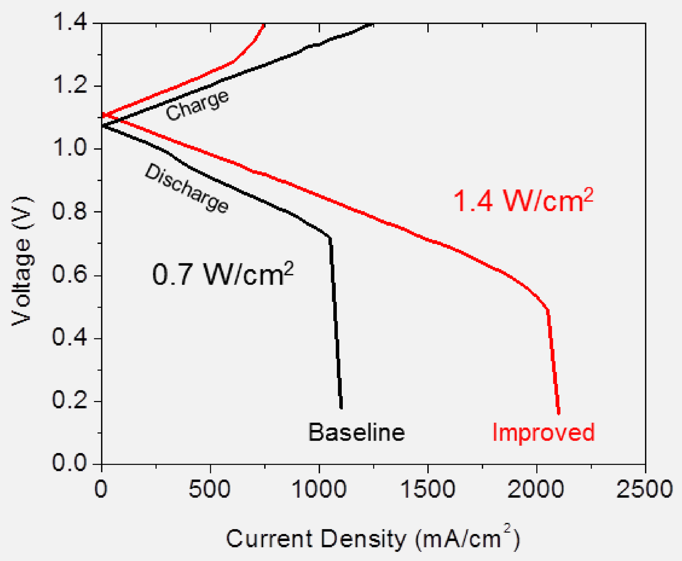


Porous Carbon Media (GDL)



Improving Cell Metrics

Cell Performance

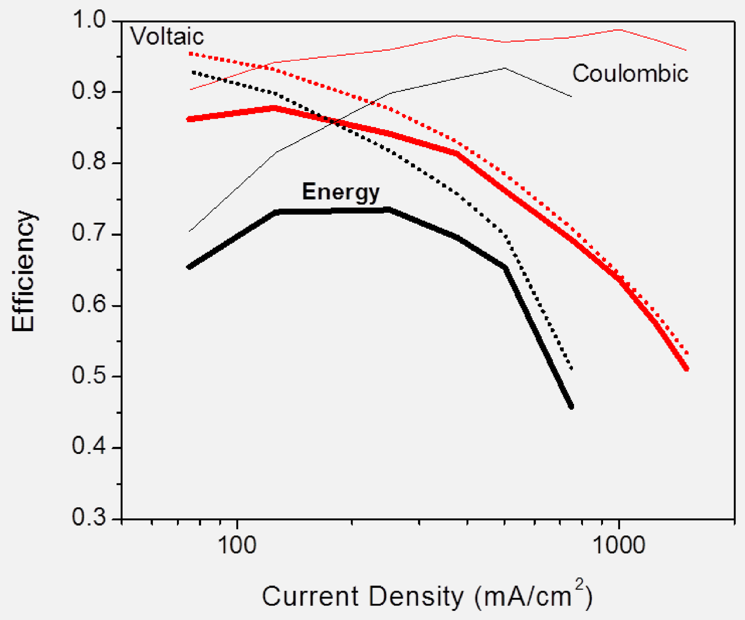


Electrode and membrane optimization:

Electrodes
- Br- adsorption on Pt (-)
- Cell compression
- Hydrogen pressure
- Porous media type
- Microporous media coating
- Catalyst placement

Membrane
- Pretreatment
- Thickness
- Reinforcement
- Equivalent weight

Energy Efficiency

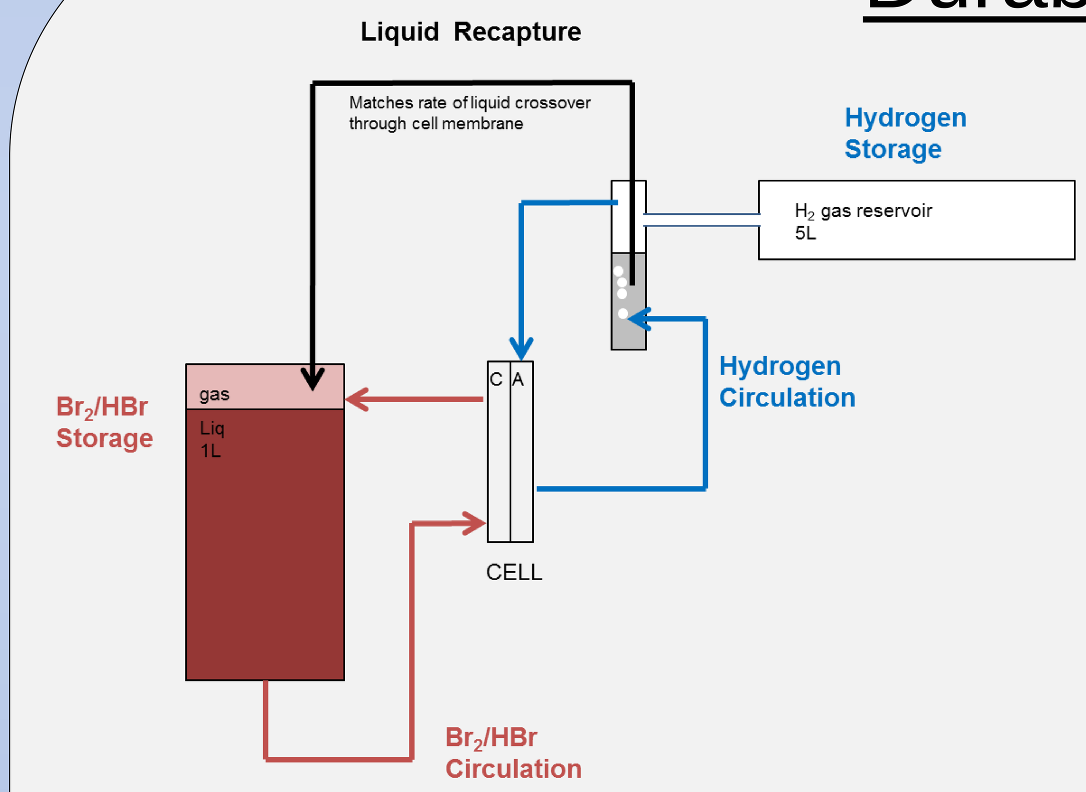


Coulombic Efficiency
- Self Discharge
- Crossover
  - Thickness, equivalent weight
- Pretreatment
  - Assembled wet/dry

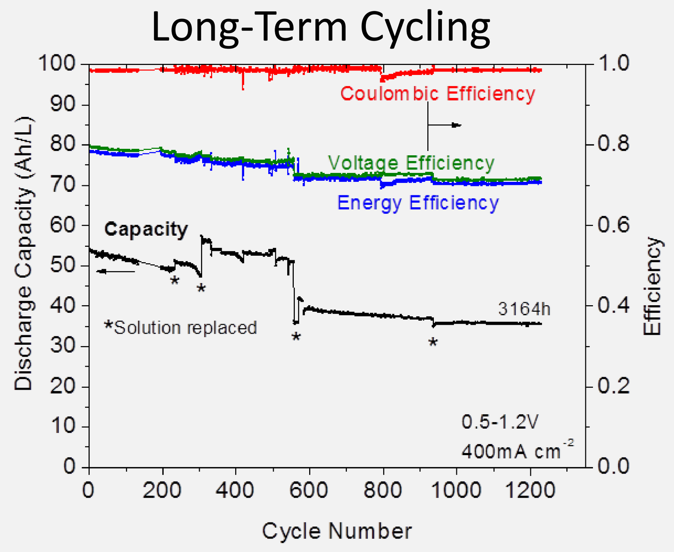
Voltaic Efficiency
- Hydrogen Pressure
- Optimization of (-) and (+) electrodes

Durability Testing

Liquid Recapture

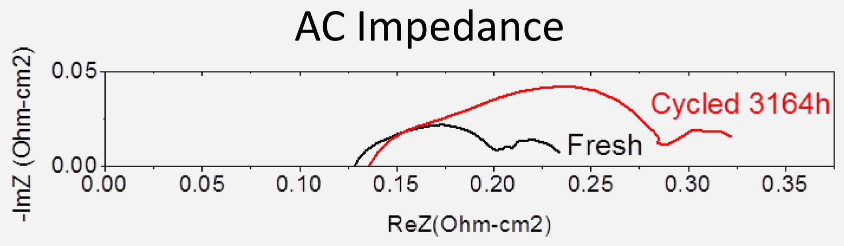


Long-Term Cycling



Slow loss of capacity
- Lower utilization due to voltaic losses
- Br_2 escape via leaks (minor)

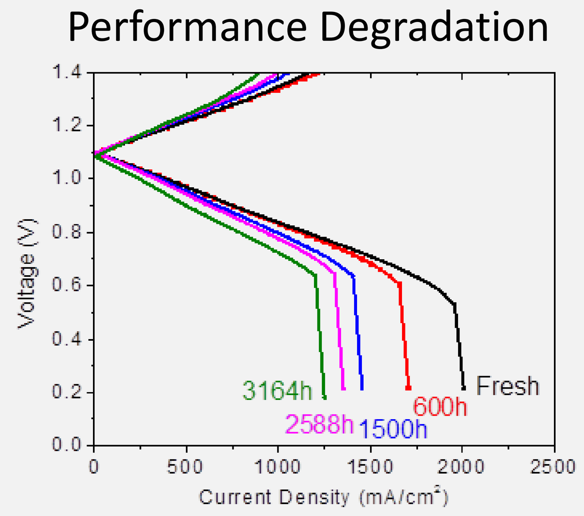
AC Impedance



Ohmic impedance increases
- reduced membrane conductivity

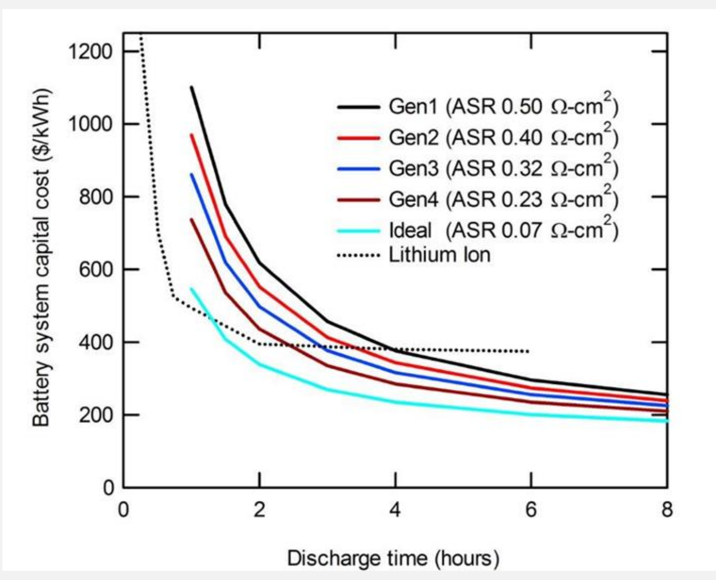
Polarization impedance increases
- loss of catalytic activity

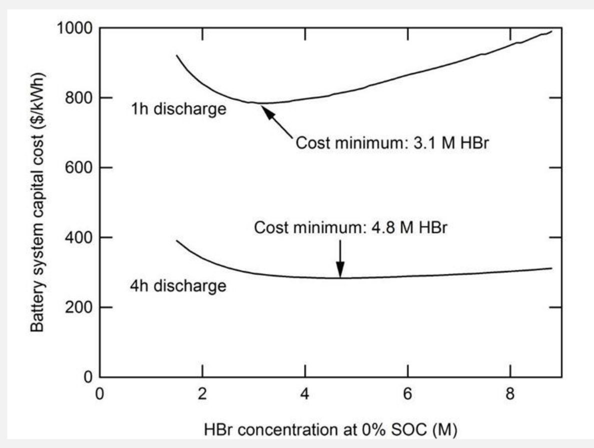
Performance Degradation



Cost Model

LBNL: Kyu Taek Cho
Bosch: Paul Albertus, Edward Knudsen





Below minimum, tank and pump costs increase
Above minimum, cell ASR increases

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