2026 DOE OE Energy Storage Peer Review - Redox Flow Batteries

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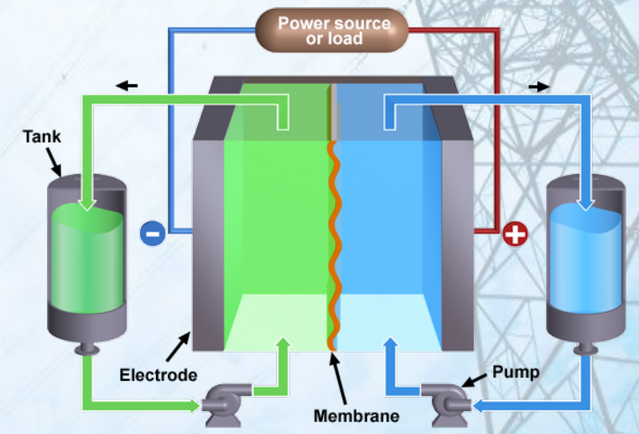

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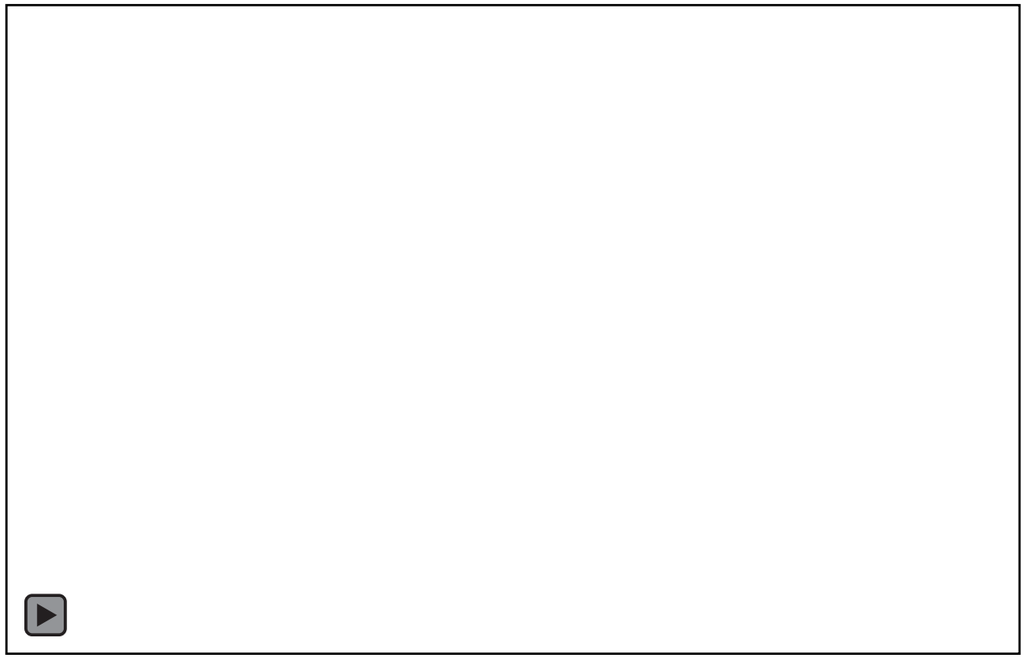
Why Flow Batteries Matter for Grid Storage



Technical advantages

- Long-duration energy storage capability
- Independent scaling of energy and power
- Improved safety relative to flammable LIB systems
- Potential for low-cost and earth-abundant chemistries
- Flexible stationary deployment

Strategic relevance

- Grid resilience and renewable integration
- Multi-hour to long-duration storage
- Domestic manufacturing opportunities
- Diversified energy storage supply chains beyond Li-ion
- Scalable and modular deployment

Session topics span organic, hybrid, membrane, and diagnostic-enabled flow battery innovations.

Flow Batteries Session Overview

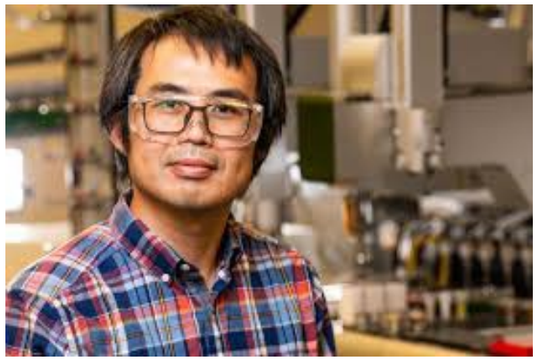
Advancing Long-Duration Energy Storage Through Chemistry, Materials, and System Innovation

Theme	Representative Topics
Alternative Chemistries	Organic electrolytes, bi-redox molecules, sodium-based hybrid systems
Electrolyte & Membrane Engineering	Voltage enhancement, ion-selective membranes, crossover control
Cell & Diagnostic Innovation	Flow-field design, Na plating behavior, operando impedance diagnostics
Accelerated Materials Development	High-throughput experimentation and automation-enabled screening
Grid & Supply Chain Relevance	Long-duration storage, earth-abundant materials, domestic manufacturing

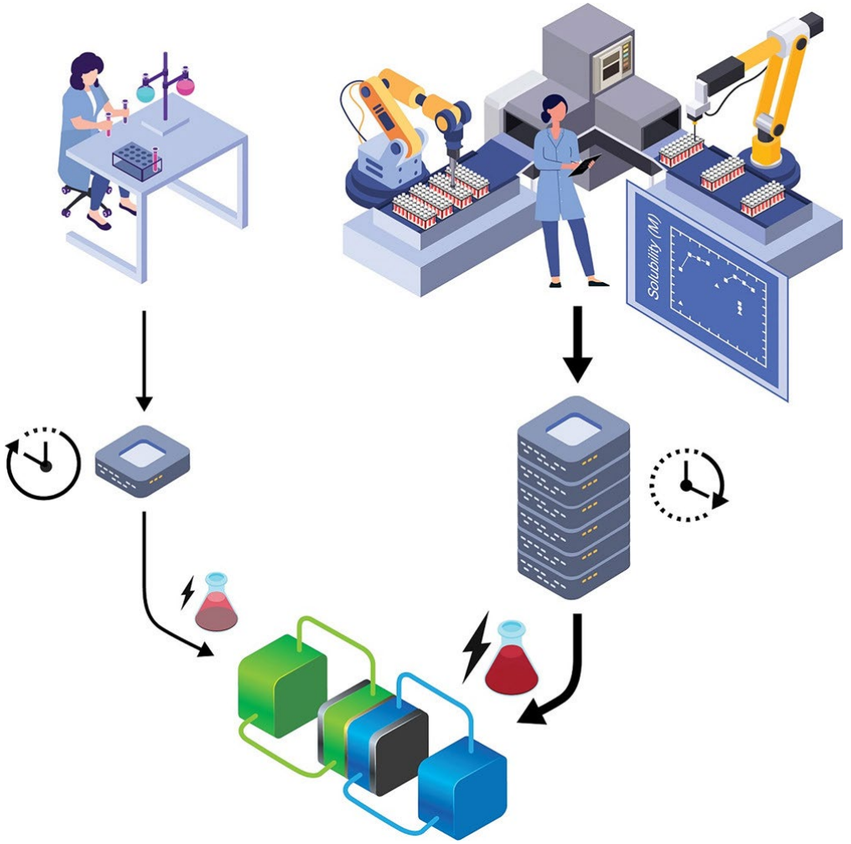
- Pacific Northwest National Laboratory (PNNL)
- Sandia National Laboratories (SNL)
- Oak Ridge National Laboratory (ORNL)

Today's presentations connect fundamental electrochemistry and materials innovation with engineering approaches for scalable long-duration energy storage systems.

Automation-Enabled High-Throughput Workflows for Redox Flow Battery Materials Screening and Validation



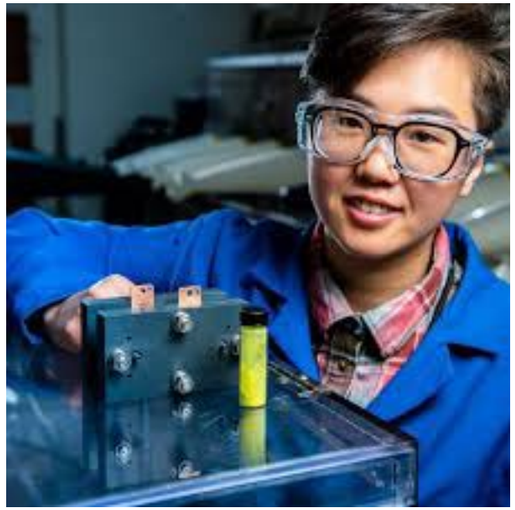
Dr. Yangang Liang



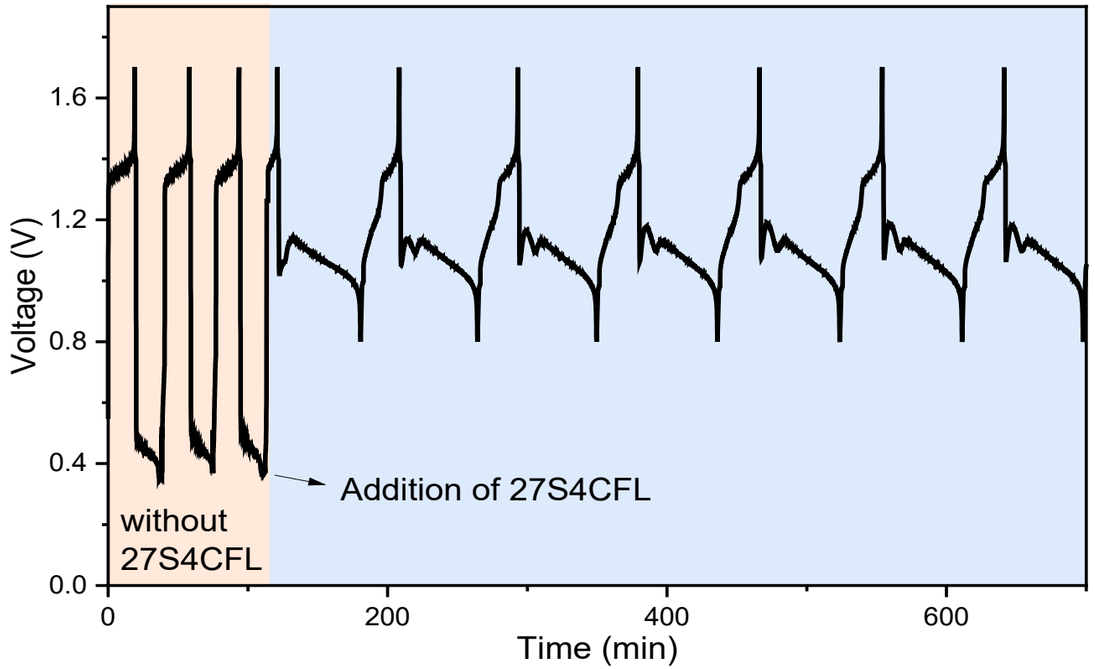
- Using automation to support RFB materials discovery.
- Combining high-throughput experiments with targeted electrochemical validation.
- Accelerating down-selection of promising flow battery chemistries.

Automation is used as a practical tool to accelerate materials screening and validation for lower-cost flow battery technologies.

Fluorenone-based Electrolyte for Flow Batteries



Dr. Ruozhu Feng



- Developing fluorenone-based organic electrolytes for low-cost flow batteries.
- Using electrolyte engineering to improve voltage and energy efficiency.
- Advancing robust, earth-abundant alternatives to vanadium systems.

Enabling low-cost organic electrolytes for scalable long-duration energy storage.

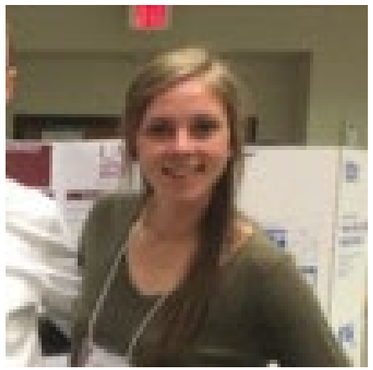
Sandia Membrane Development for Energy Storage Devices: Industry Partnerships

Dr. Cy Fujimoto

- Developing low-cost, ion-selective membranes for flow battery applications.
- Exploring structurally diverse membrane platforms for energy storage systems.
- Evaluating membrane performance through industry partnerships and battery testing.

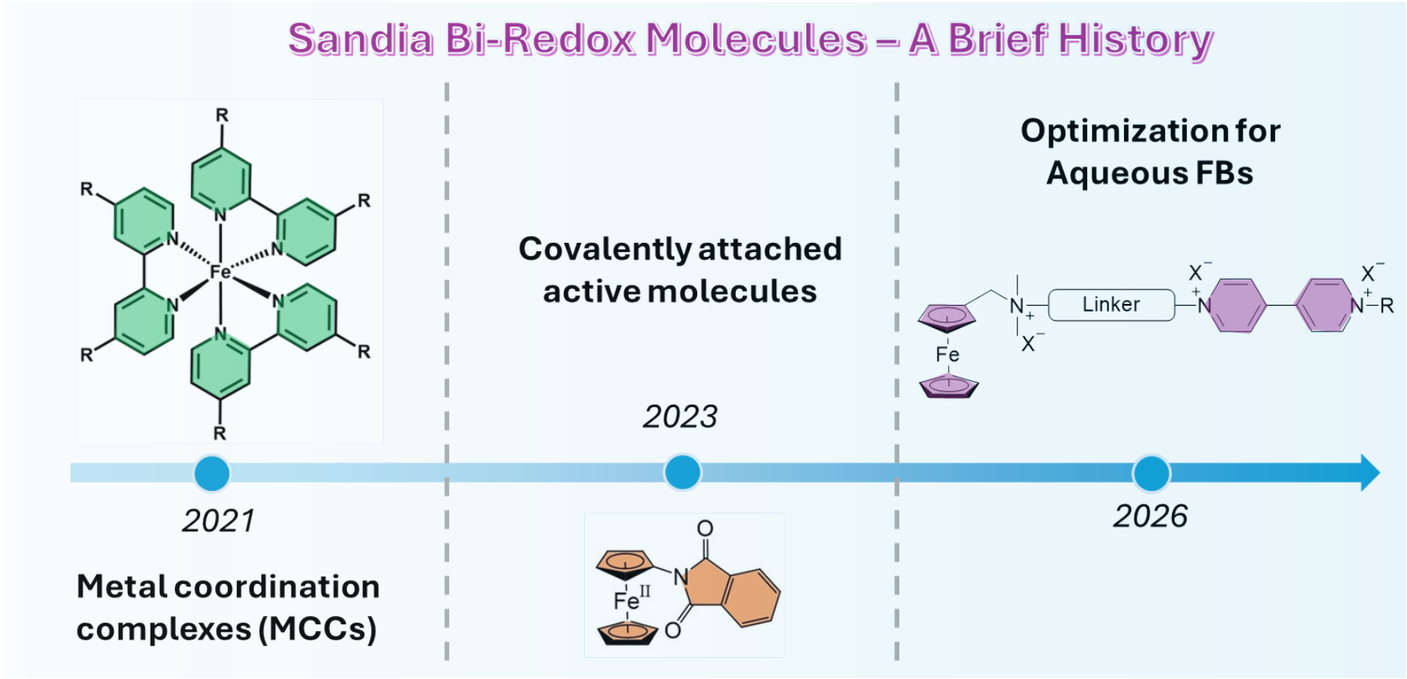
Advancing durable and scalable membrane technologies for next-generation flow battery systems.

A History of Bi-Redox Molecules (BRMs) for Next-Generation Flow Batteries at Sandia



Dr. Sam Macchi

Sandia National Laboratories



- Developing iron-organic BRMs for low-cost flow batteries.
- Linking molecular design to electrochemical performance.
- Advancing symmetric aqueous flow battery chemistries.

Molecular engineering of bi-redox electrolytes for scalable and sustainable flow battery systems.

Na-based Hybrid Flow Batteries for Low-Cost Energy Storage

Dr. Ethan Self

- Improving sulfur utilization and reducing crossover in Na-hybrid RFBs.
- Studying effects of flow fields, interlayers, and anode design.
- Using impedance diagnostics to identify cell overpotential sources.

Advancing sodium-based hybrid flow batteries as a low-cost pathway for long-duration storage.

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Thank you