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Energy Storage Program at Oak Ridge National Laboratory

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Power and Energy
Oak Ridge National Laboratory

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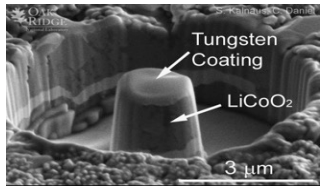
U.S. DEPARTMENT OF ENERGY

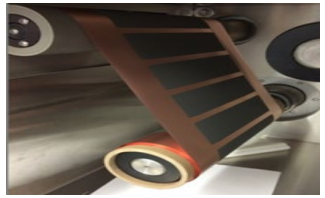
Core Areas

DOE Energy Storage Program

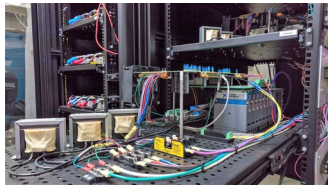
Cost Competitive



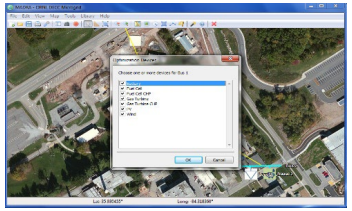
Validated Safety and Reliability



Industry Acceptance

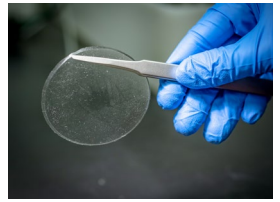


Equitable Regulatory Environment



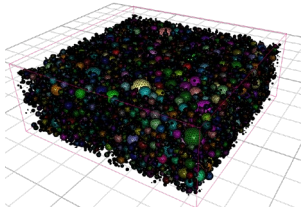
ORNL Thrust

Materials



Advanced Manufacturing

Computation and Analytics



Systems Integration

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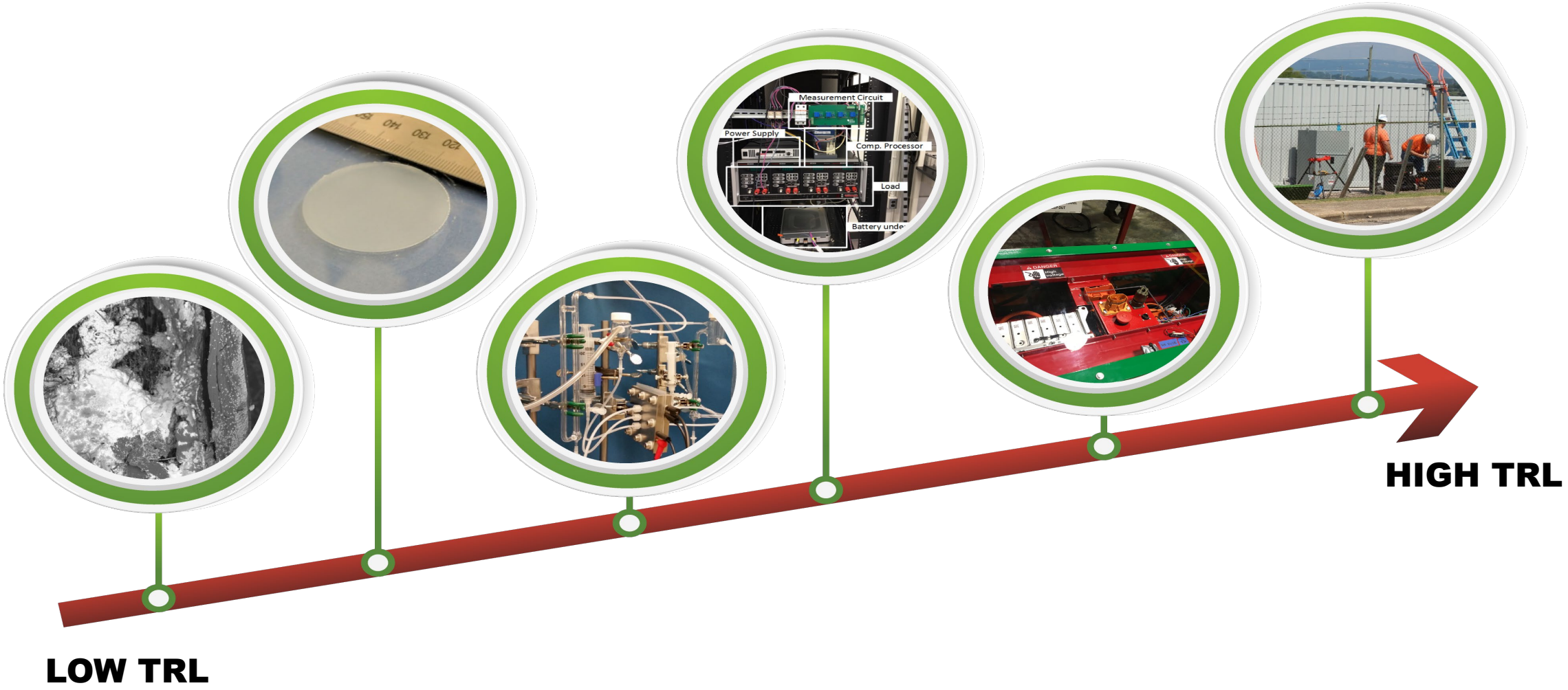
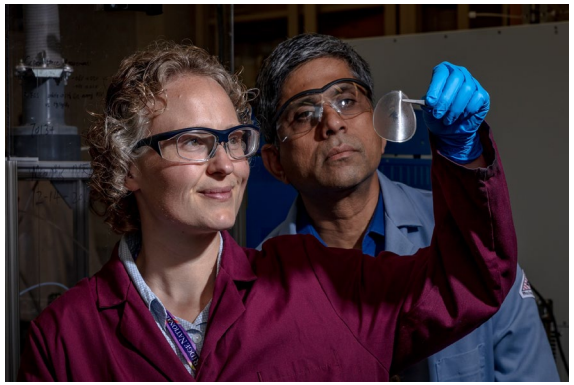
Research to application

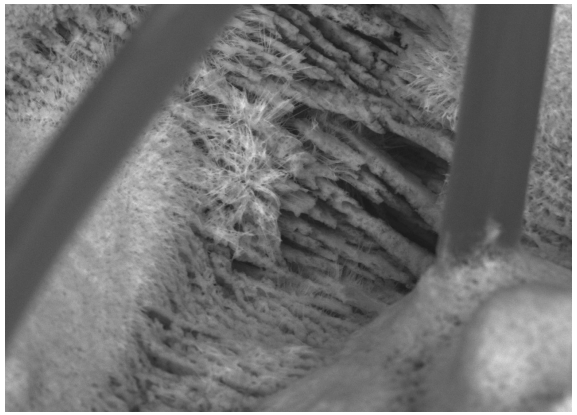


Cost Competitive Research

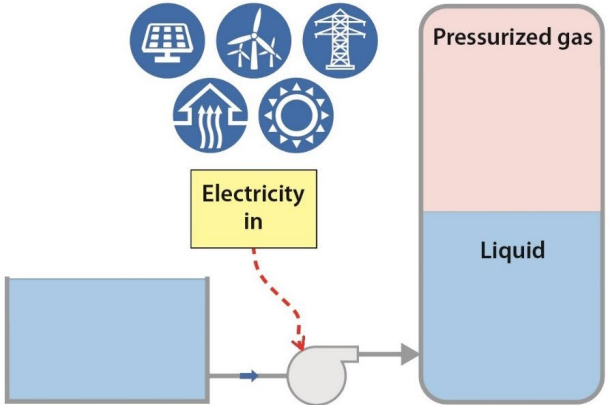
- Component Research to Reduce Costs:
  - Low Cost Membranes for High Energy Density Non-aqueous Redox Flow Batteries – Jagjit Nanda
  - Development Of Components and Cell Architectures for High Performance 'Open' Batteries for Grid Applications
- New energy storage technologies:
  - A near-isothermal-isobaric compressed gas energy storage combined with ground-level pumped-hydro storage

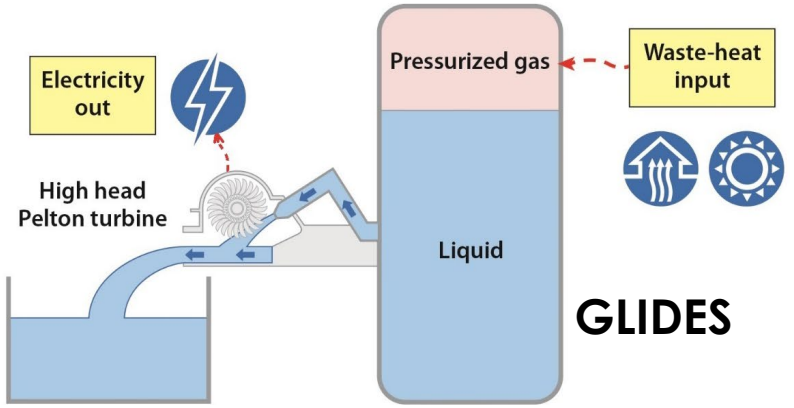


Crosslinked PEO



Zn Depositing



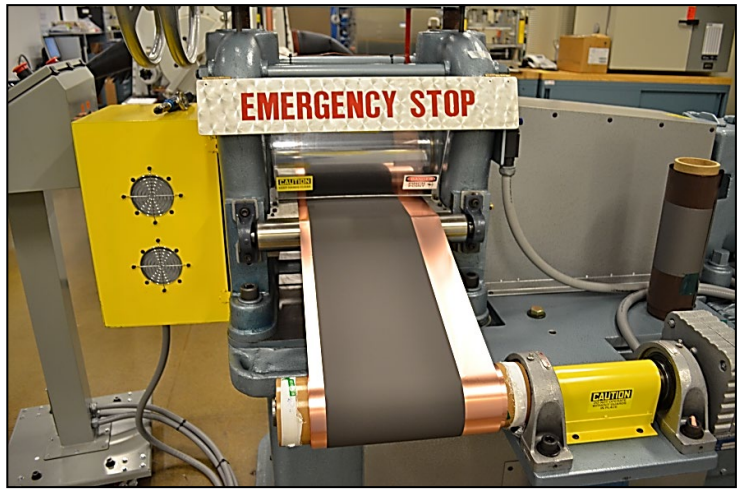


GLIDES

Validated Safety and Reliability

- Safety:
  - Establishing Thermal Runaway Risk Test Protocols and Database – An ORNL and SNL Collaborative Research on Battery Safety
- Reliability:
  - Low-Cost, Durable Electrochemical Energy Storage for Electricity Grid Applications

Electrode Stacking



Heated Calender

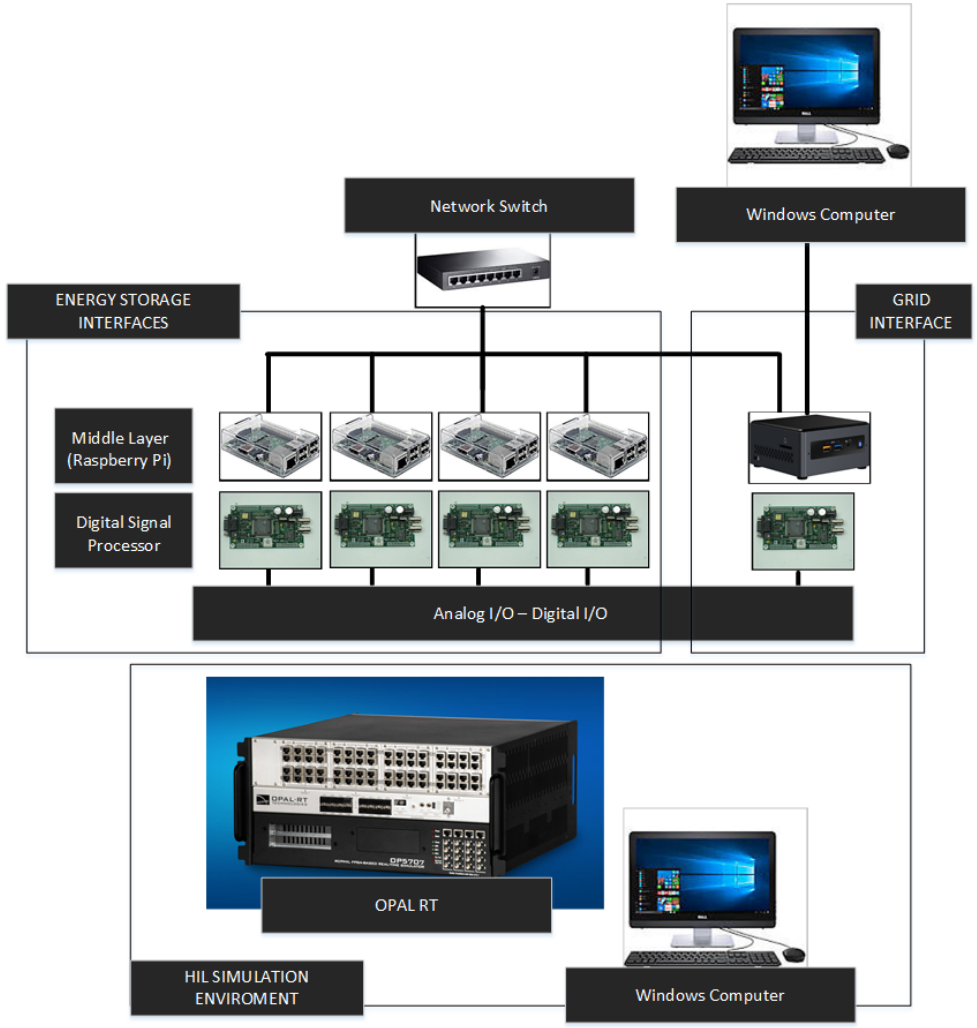
Ford Focus EV

Short Circuit Tester

Industry Acceptance

- Integration:
  - Development of a Battery Chemistry Agnostic Secondary Use Energy Storage System
- Deployment:
  - Collaborative Demo for Secondary Use and Use Case Validation

Secondary Use System Unit



Hardware in Loop Testbed

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Program Output

- Journals
  - Published: 2
  - Submitted: 5
  - In the works: 10
- IP:
  - Submitted: 5

1. R. E. Ruther, G. Yang, F. M. Delnick, Z. Tang, M. L. Lehmann, T. Saito, Y. Meng, T. A. Zawodzinski Jr., J. Nanda, Mechanically Robust, Sodium-Ion Conducting Membranes for Nonaqueous Redox Flow Batteries ACS Energy Lett. 2018, 3, 1640.

2. The ion and water transport properties of K+ and Na+ form perfluorosulfonic acid polymer
Jing Penga*, Mengkun Tiana, Nelly M. Cantilloa, Thomas Zawodzinskia,b*
ELECTROCHIMICA ACTA Volume: 282 Pages: 544-554 Published: AUG 20 2018

- Numerous presentations and conference papers also developed that support areas from materials to power electronics.

Acknowledgment and Collaboration

Special thanks to our sponsor Dr. Imre Gyuk, Manager, Energy Storage Program, Office of Electricity Delivery and Reliability, Department of Energy.

Thanks to our laboratory colleagues:

Vince Sprenkle, - Pacific Northwest National Lab

Babu Chalamala – Sandia National Lab

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