OE Energy Storage Program at PNNL

Cost Competitive Technologies

Flow Batteries | Na-ion | Na metal | ZnMnO₂ | Pb Acid | Prototyping | Universities

Safety and Reliability

Safety & Reliability C&S | Reliability Testing | In-situ testing | GIMRE & 2nd Life

Regulatory Support

Industrial Acceptance
Aqueous Soluble Organic (ASO) Flow

- W. Wang, 10/1 10:35 pm – RFB Summary
- A. Hollas, 10/1 11:00 am – Phenazine ASO Development
- M. Aziz (Harvard), 10/1 1:05 pm – Flow Battery Capacity Fade
- V. Murugesan (Poster #179 – Accelerated Designing of Materials)
- X. Zhang (Poster #180 – Crystallization Kinetics Vanadium Flow)
- A. Hollas
  - Poster #181 – Degradation Mechanisms,
  - Poster #182 – Dihydrophenazine isomers
- J. Bao (Poster #184 – Machine Learning Modeling)
**OE Energy Storage Program at PNNL**

**Cost Competitive Technologies**

<table>
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<tr>
<th>Flow Batteries</th>
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**Lead-acid**

- V. Murugesan/T. Fister 10/1 11:55 am – Optimal Electrolytes for Pb-acid
- V. Murugesan (Poster #196 Pb-acid Solvation Chemistry)

**Na Batteries**

- G. Li 10/1 2:40 pm - Intermediate Temperature Na-metal
- B. Xiao, 10/1 2:55 pm - Advanced Na-ion
- D. Wang (Penn State –Poster #171 Sulfur base solid electrolyte)
- F. Omenya (Poster #175 Na-ion Scale-up)

**Zn- batteries**

- X. Li (Advanced Zn/MnO$_2$ 9/30 4:25 pm
- M. Fayette (Poster #157 Zinc anodes)
- H.J. Chang (Poster #158 H$_2$O based binders)
- X. Liu (West Virginia – Poster #168 MnO$_2$ cathodes)
- I. Rodriguez-Perez (Poster #195 –Dual-Ion Graphite| Zn Batteries)

**Long Duration Storage**

- G. Li 10/1 3:25 pm – Strategies for long duration storage
OE Energy Storage Program at PNNL

Safety and Reliability

Safety Codes and Standards
• M. Paiss – 9/30 11:40 am Energy Storage Safety Collaborative,

Storage Reliability Testing
• C. Vartanian, 9/29 3:20 pm – Reliability Overview
• A. Crawford 9/29 3:40 pm – Li ion State of Health
• D. Choi 9/29 3:55 pm – Reliability Assessment
• E. Thomson 9/29 4:10 pm - kw Scale Reliability Testing
• S. Willard (EPRI) 9/29 4:25 pm - Reliability Database
• Q. Huang (Poster #124 – Li-ion degradation)
• N. Shamin (Poster #125 – Pb-acid Testing)
• G. Li (Poster #126 – Na metal Halide Testing)
• V. Viswanathan (Poster #127 – ESS standards)
• T. Swanson (KCM Poster #134 – 2nd Use Testing)

2020 Storage Safety and Reliability Forum
Largest attendance to date ~ 130
OE Energy Storage Program at PNNL

**Regulatory Support**
- J. Twitchell, 9/29 1:35 pm
- J. Twitchell (Poster #122 – Storage Ownership Models)
- C. Holland (Poster #123 – Retrofitting PV with Storage – North Carolina)

**Industrial Acceptance**
- D. Wu 10/1 5:25 pm – MASCORE Microgrid Tool
- J. Alam 10/1 5:40 pm – Realizing Economic Benefits
- J. Alam, (Poster #100 – Marine Renewable Integration)
- D. Wang, (Poster #101 – Northampton Microgrid)
- T. Ramachandran, (Poster #102 – Power to Gas)
- S. Hanif, (Poster #103 – Distribution Modeling ESS)
- V. Fotedar, (Poster #104 – Partial String Failure)
- A. Crawford (Poster #105 – Data Management)
- X. Ma (Poster #107 – Policy-Based Dispatch)
- D. Huang (Alaska-Fairbanks Poster #108 Thermal+Electrical Storage)
Grid Storage Launchpad (GSL)

*Advancing U.S. R&D leadership in energy storage technologies*

- **Validation:**
  Independent testing of next generation storage materials and systems under realistic grid operating conditions

- **Acceleration:**
  De-risk and speed the development of new technologies by propagating rigorous grid performance requirements to all stages of development

- **Collaboration:**
  Link DOE and storage R&D communities in a new collaboration center, to solve key crosscutting challenges


