



# PNNL Energy Storage Introduction

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PNNL is operated by Battelle for the U.S. Department of Energy



# Energy Storage Engagements Across the Nation

## PNNL:



 **4,414** Staff

 **1,124** Peer-reviewed Publications

 **\$960M** Budget

 **99** U.S. & Foreign Patents

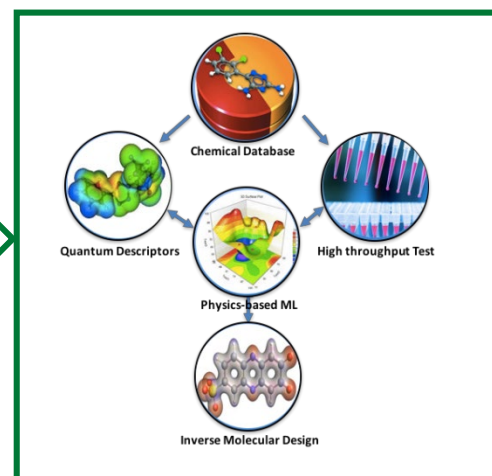




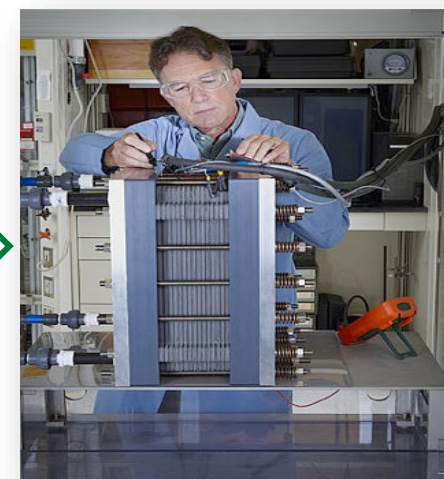
# PNNL Energy Storage Research Strategy



**Economic and grid  
scale analysis**



**Innovative synthesis:  
Synthesis and  
characterization of storage**



**Rapid prototyping and  
validation**

**Cost effective solutions**

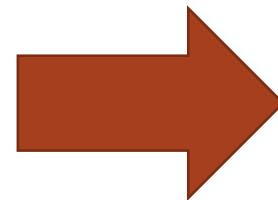
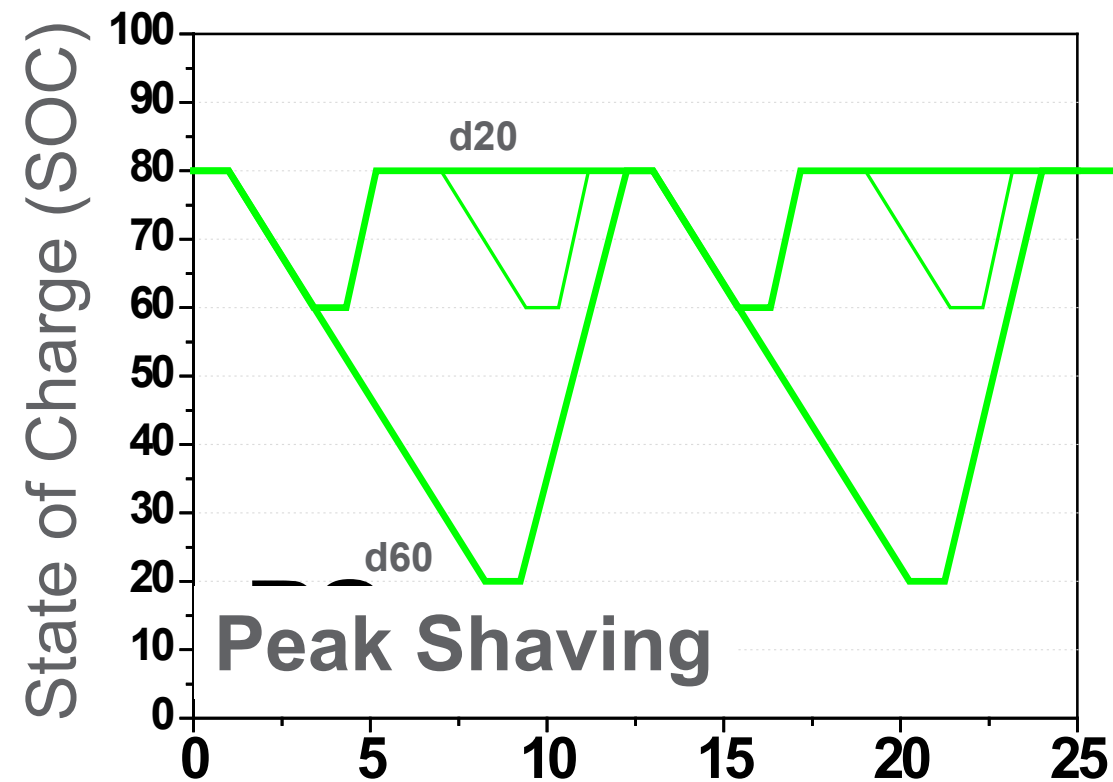
**Li-ion and Li metal  
batteries  
For EV and grid;**

**Advanced redox flow, Na  
and Zn batteries for grid.**

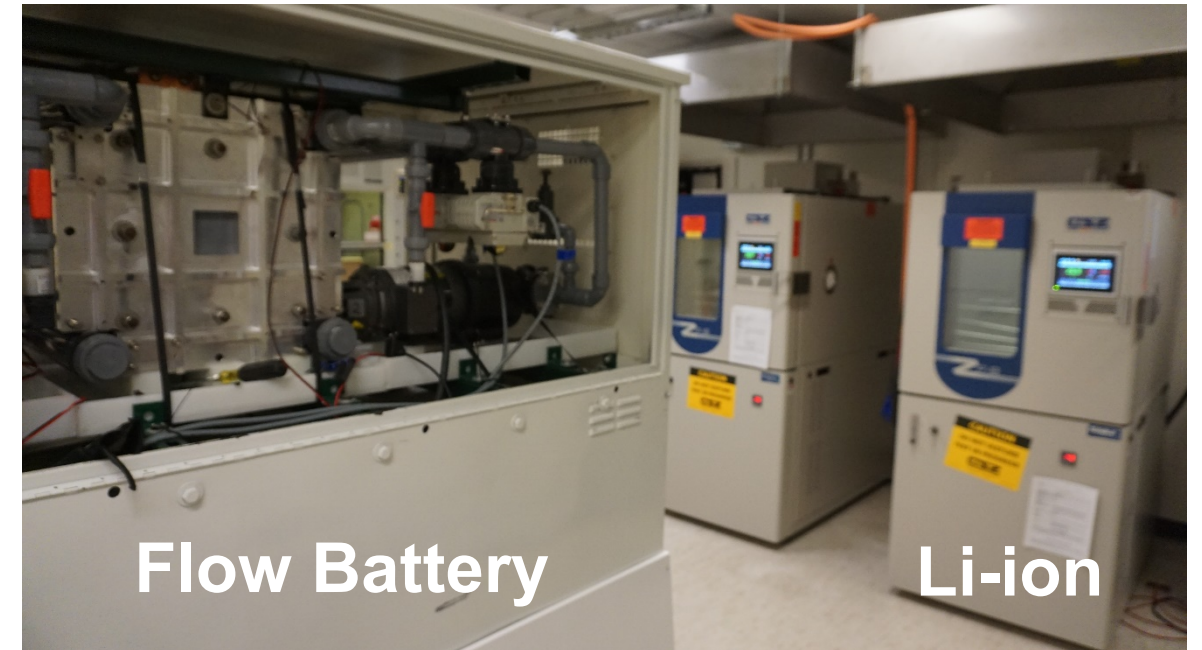
**Collaborate with  
industry partners**

# Vision and Strategy for Grid Storage Reliability

Common testing methodology for different technologies



PNNL Reliability Test Lab

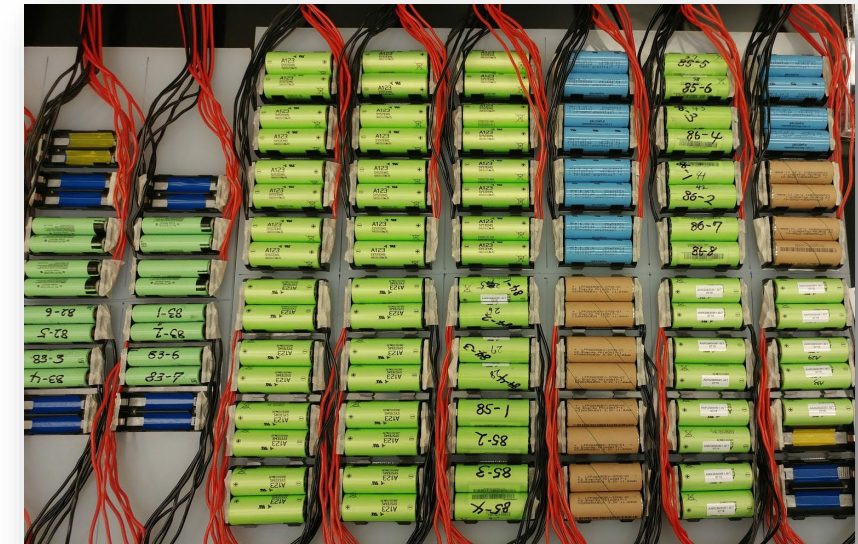
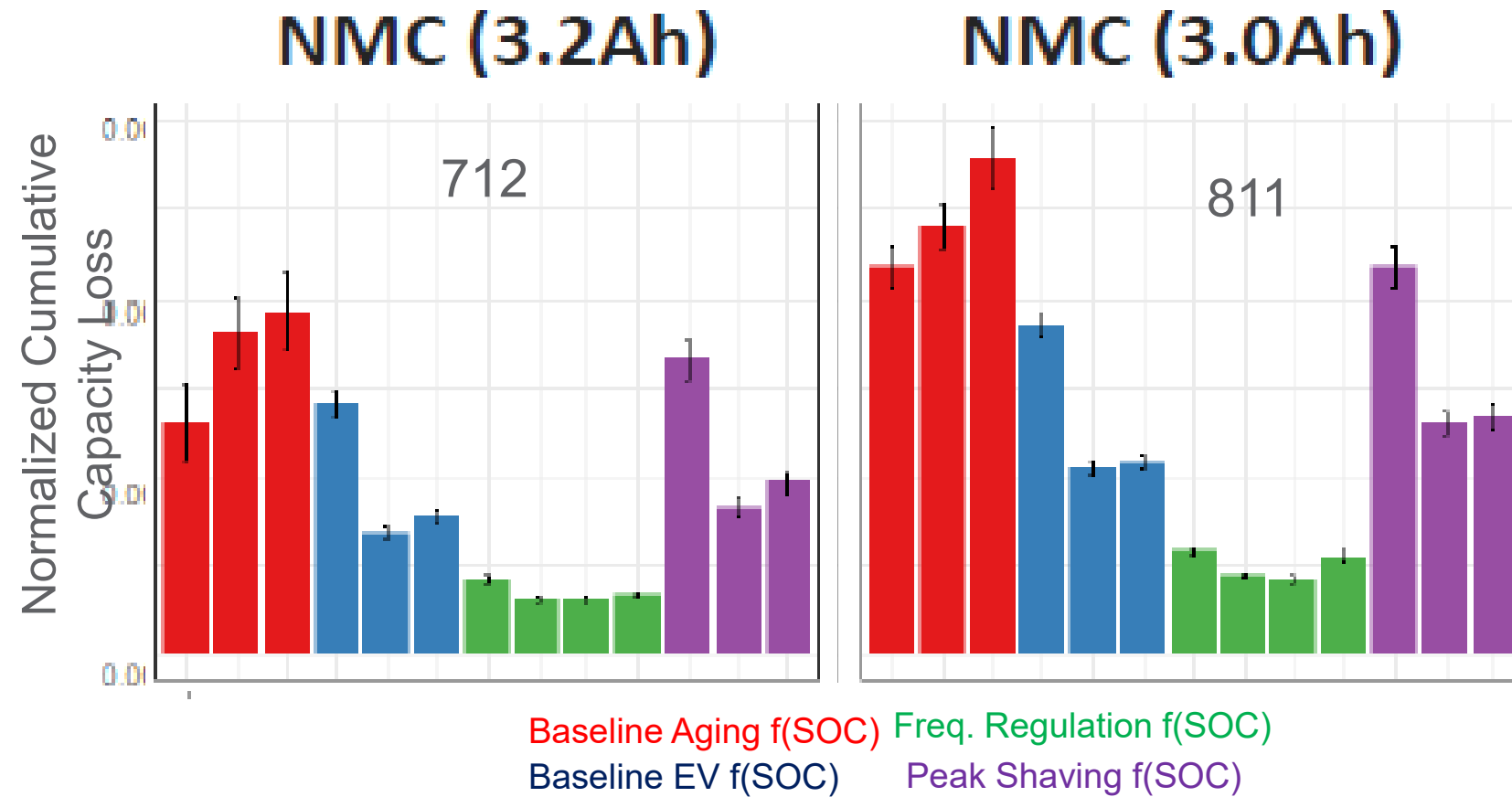


Pb-acid  
Na-ion



# Validating Safety and Reliability of Grid Storage

Continued testing on Li ion cells (NMC, NCA, LFP) showing impact of grid duty cycles



# Grid Energy Storage Launchpad

## Mission

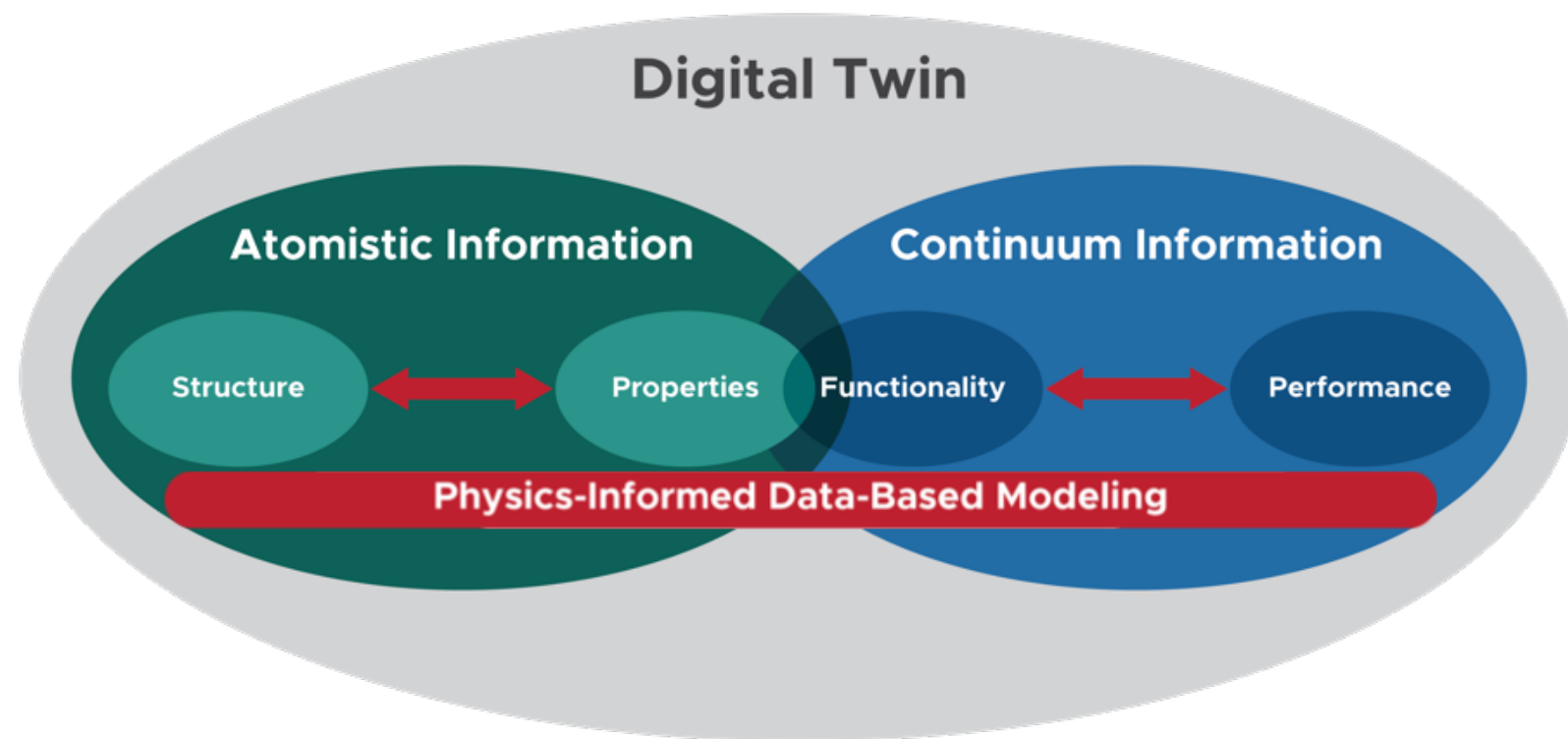
- **Validation**: This facility will provide independent testing of next generation grid energy storage materials and systems under realistic grid operating conditions
- **Acceleration**: The facility will reduce risk while speeding the development of new technologies by propagating rigorous grid performance requirements to all stages of storage technology development
- **Collaboration**: By linking the DOE and storage R&D communities in a new collaborative facility, this facility will lower barriers to solving key crosscutting industry challenges



**Grid Storage Launchpad at PNNL:**  
Advancing the Next  
Generation of Grid Energy  
Storage Technologies

# Energy Storage Materials Initiative (ESMI)

ESMI is a multi-year PNNL investment that will pioneer in the digital twin approach for an accelerated material discovery and validation for energy storage through physics-informed data-based models.





# Thank you