

## ESGC BIG-DIG

# Aqueous Batteries Reimagined: A New Generation of LDES Focused on LCOS

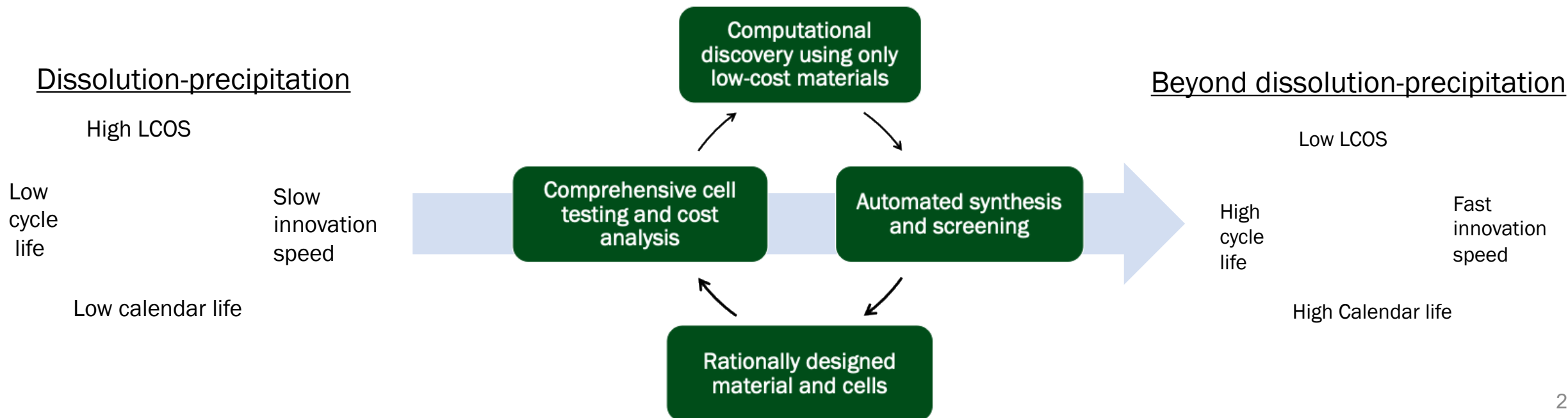
PRIMARY ESGC TRACK: Technology Development

Venkat Srinivasan (ANL)  
Gerd Ceder (LBNL)  
Kristen Persson (LBNL)  
Mali Balasubramanian (ORNL)  
Jordi Cabana (ANL)

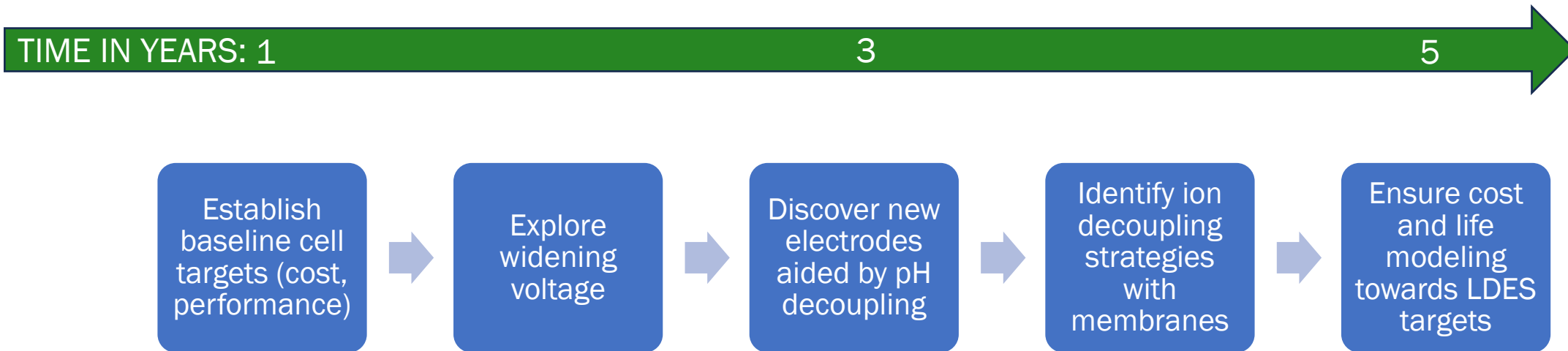
Sanja Tepavcevic (ANL)  
Chen Liao (ANL)  
Brett Helms (LBNL)  
Shabbir Ahmed (ANL)

# There is a strong imperative to devise new approaches to aqueous batteries

- **CHALLENGE:** Known low-cost aqueous couples (e.g., Zn, Pb) with dissolution-precipitation mechanisms have continued cycle life challenges. Latest innovations, common in lithium battery discovery, have not been applied for solving this challenge.
- **TARGETED OUTCOME:** A new generation of durable low-cost active materials that will invigorate LDES investments



**KEY ELEMENTS:** (1) Computational discovery using only low-cost materials  
(2) Automated synthesis integrated with AI/ML (3) Electrolyte innovations, such as solvent-binding and pH/ion decoupling (4) co-design materials and cells to accelerate progress



## PROGRESS TO DATE: We have a roadmap for the R&D

1. Identified Zn || MnO<sub>2</sub> as a low material-cost baseline and developed a preliminary cost model.
2. Comprehensive literature review on opportunities to go beyond baseline (widening voltage window, working ion, electrode materials, membranes)
3. Identified first cut of material classes (electrodes and electrolytes) for the discovery effort.

Proton intercalation trajectory

SEI design

Electrode discovery

pH decoupling

Alternate-ion (Na, Zn) intercalation trajectory

Solvent binding

SEI design

Electrode discovery

Ion decoupling

# THANK YOU



Scan to find me on linkedin

