Battery energy storage

- Use ecological-based approaches:
  - Migration between applications
  - Aging across populations
  - Incomplete data/information

- Funded NSF CAREER Award (2017-2022)
Large scale immersive testing in real-life conditions

Environment 1  Environment 2  Environment M

Each environment for 1st and 2nd life and its variations modeled in the Raspberry Pi 3 and run in real-time

Battery cells and modules (detached from mini lab) in thermal chambers for controlled temperature testing cases

Day data recorded in central workstation

Data display on lab wall-mounted screen

1 student per mini-lab. Remote access through Ethernet
Mobility through battery multiple lives

- Develop causality networks that consider ecosystem surrounding the battery
- Data-enabled approach
- Adaptable for each life
- Formulate multi-scale (space and time) theory
Collaborations

• Testing at APSRC directed by Prof. Naber (ME-EM)
• Real GM vehicles
• PNM utility PV-storage installation Albuquerque (NM)
• With real EV and HEV used cells from SpiersNT (Oklahoma)

• Prof. Zhang (CEE): Traffic flow and driving style effect
• Prof. Brown (CS): Bayesian networks
• Prof. Froese (Forestry): Ecological testing and modeling

![Diagram of battery capacity over time]