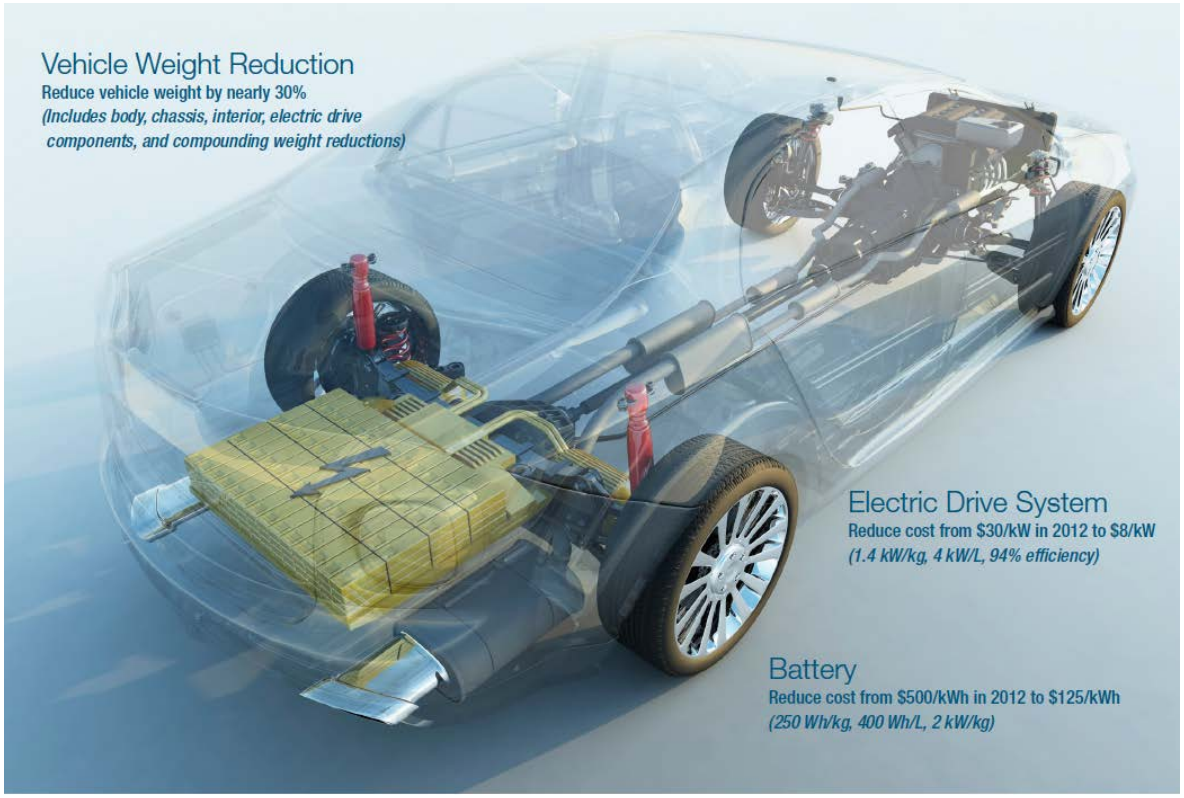
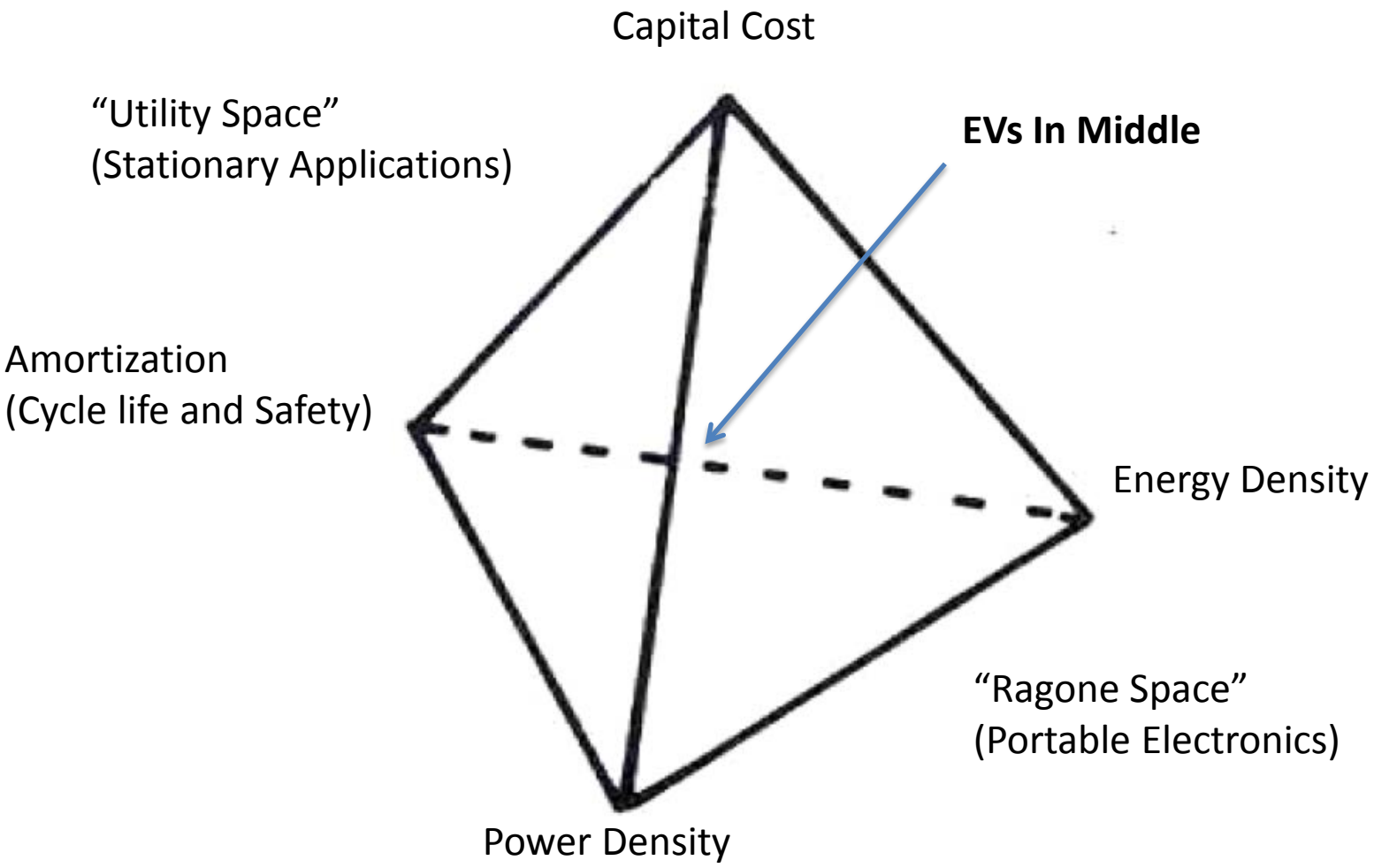
Battery Anxiety?

Dan Steingart (Princeton University) and Jeff Sakamoto (University of Michigan)



The Bounding Relations for Closed Loop Electrochemical Energy Storage



Take Away: EV batteries are exceptionally difficult

Alvaro Masias, Ford Motor Company
“Electrochemical Prozac:
Relieving Battery Anxiety through Life and Safety Research”

Sarah Stewart, Robert Bosch LLC
“Challenges in Batteries for Electric Vehicles”

Claus Daniel, Oak Ridge National Laboratory
“Lithium Ion Batteries and Their Manufacturing Challenges”

Shirley Meng, University of California San Diego
“Materials Design and Diagnosis for Rechargeable Battery Energy Storage”

Jargon (and deceptions)

Power: Watts = Ampere * Volts (current * potential)

Energy: Watts·time = Watt·hours (3600 J = 1 WHr)

Specific Energy: Wh/kg

Energy Density: Wh/liter

Electrode capacity: how much charge/mass (mAh/g)

C-rate: battery electrical Capacity/time (hours), e.g. C/5 = 100% capacity discharged over 5 hours; 2C = 100% capacity discharged over 30 minutes
=> C is *non linear in practice*

Cycle Life: how many times it can be charged or discharged or % capacity retained/lost between cycles
=> always ask what the *capacity fade* is