

Gridscale Energy Storage: Safety, Reliability, and Beyond ...

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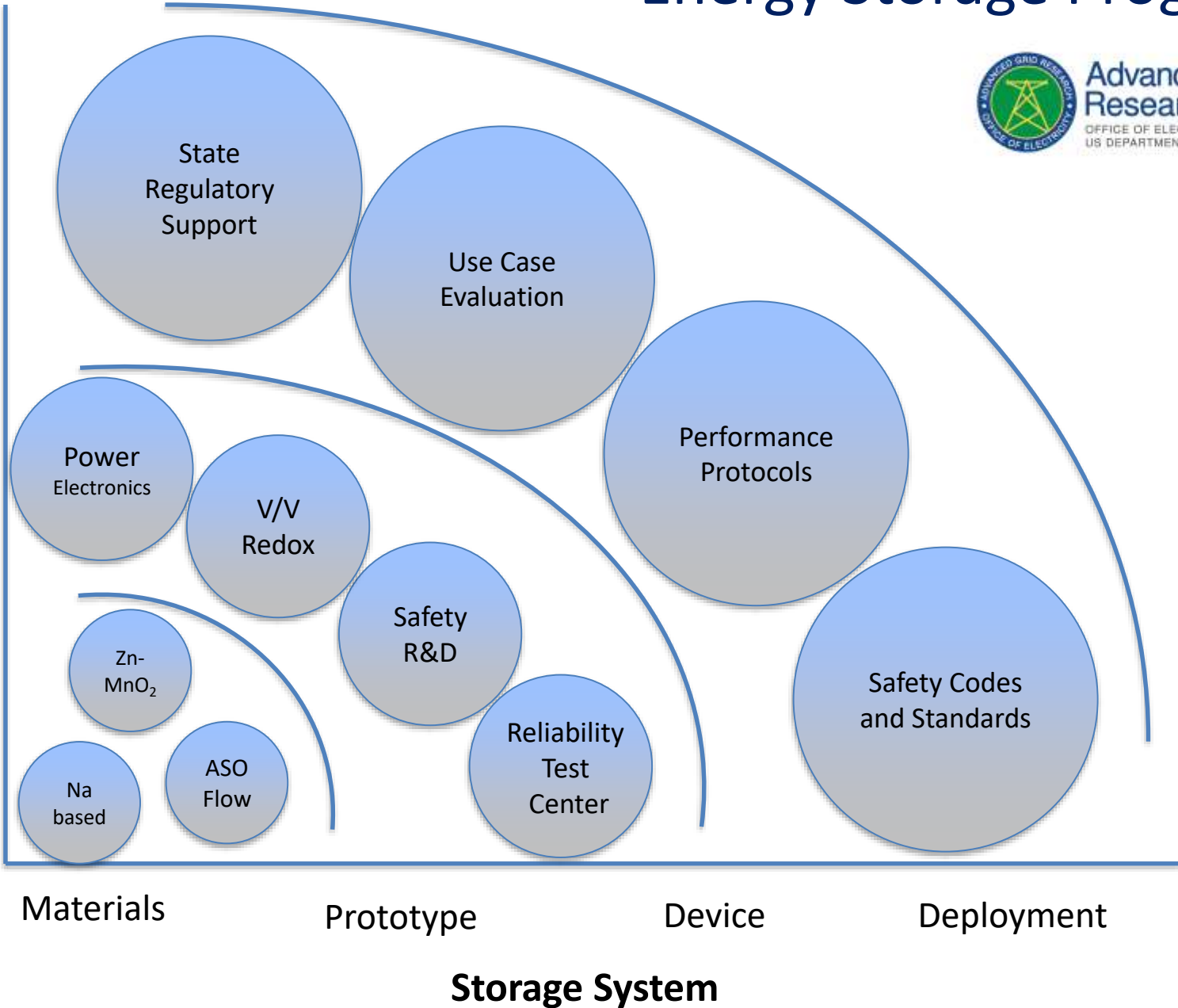
Advanced Grid
Research
OFFICE OF ELECTRICITY
US DEPARTMENT OF ENERGY

Stakeholder Engagement

Industry

Developers

Researchers



Obstacles and Impediments to Commercialization:

Safety, Reliability,

Ecological and Sociological Issues,

Re-Use, Recycling, Disposal



Safety is Essential!!

Statistics needed:

- Casualties?
- Damage to Property?

How much would Liability Insurance be?

Or is it a no-go?

Can the Technology improve? E.g. seatbelts

Should the Technology be replaced? E.g. H₂ airships

Safety should not be a Patch but part of Design!

Reliability is also Essential!!

Energy Storage is introduced to make the Grid more reliable!

Predictable Capacity Fade → reduced Cycle Life
Catastrophic Failure → costly Outage
Inherent or Fixable?

Maintenance Cost or LCOE? Valuation?
Do we go for Cheap Replacement or Durability?

Reliability should be part of the Design!

Ecological and Sociological Issues.

Cheap for whom?

Who will pay?

Who will benefit?

What is the Total Carbon Footprint?

Are you ripping off your children? (Global Warming)

Are you ripping off less developed countries?

Is the Technology Sustainable?

Re-Use, Recycling, Disposal

EV Batteries retain ~80% Capacity

- Reuse for Stationary Application
- or the Trash-heap?

But:

Ownership? Collection? Transport? Warranty?

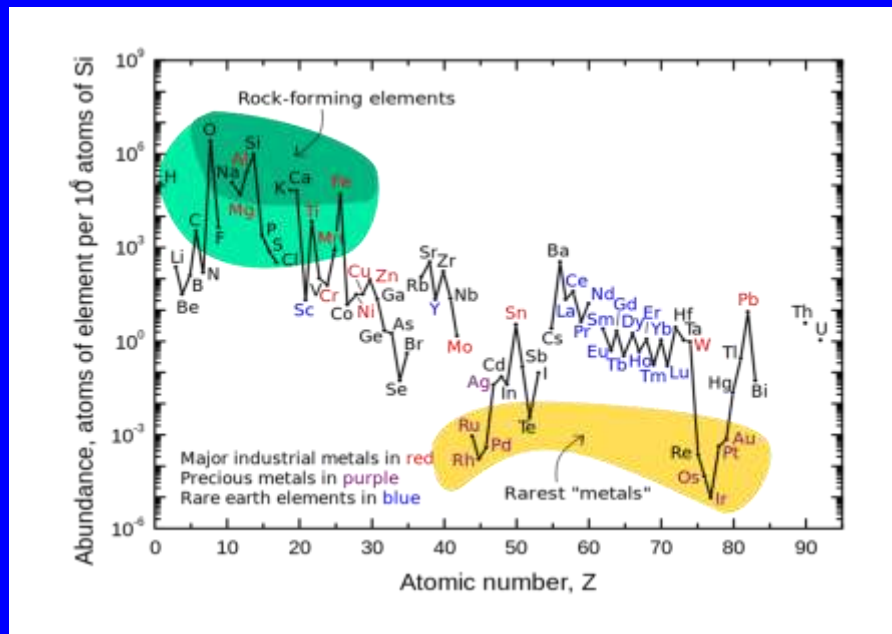
Recycling – is it commercially feasible

Or does Entropy win again?

The Midden is not an Answer!

We must design for the Waste Stream!!

To develop Safe, Inexpensive, and Environmentally Benign Batteries We must look towards Earth-Abundant Materials



Cost Goals for Focus Technologies

Manufactured at scale

Li-ion Batteries (cells) \$100/kWh

V/V Flow Batteries (stack+PE) \$300/kWh

Zinc Manganese Oxide (Zn-MnO₂)
2 Electron System \$ 50/kWh

Low Temperature Na-NaI
based Batteries \$ 60/kWh

Aqueous Soluble Organic (ASO)
Redox Flow Batteries (stack+PE) \$125/kWh

Advanced Lead Acid \$ 35/kWh

New Technology Solutions
will cut Costs, increase
Safety and Reliability.

Re-Use, Recycling, Disposal
Need to be Resolved.

More jobs will be created!!