Energy Systems

Manufacturability / Environmental Impact / Recycling

Zinc Versus Lead

"Changing the Way We Power the World™"

Begin with the End In Mind

Evaluation Without Scar Tissue

Zinc is the Ideal Chemistry to Meet Expected Energy Storage Growth:

- ✓ **Cost** – Chemistry and materials in construction are inexpensive and meet cost/benefit threshold of the targeted markets.
- ✓ **Safe** - Chemistry is safe and free from toxic materials
- ✓ **Energy Independence** - Chemistries are globally abundant
- ✓ **Scale** – Cells, manufacturing and chemistry are scalable.
- ✓ **Robust** - Chemistry and systems are flexibility to provide wide variety of power and energy services to drive the greatest economic benefit

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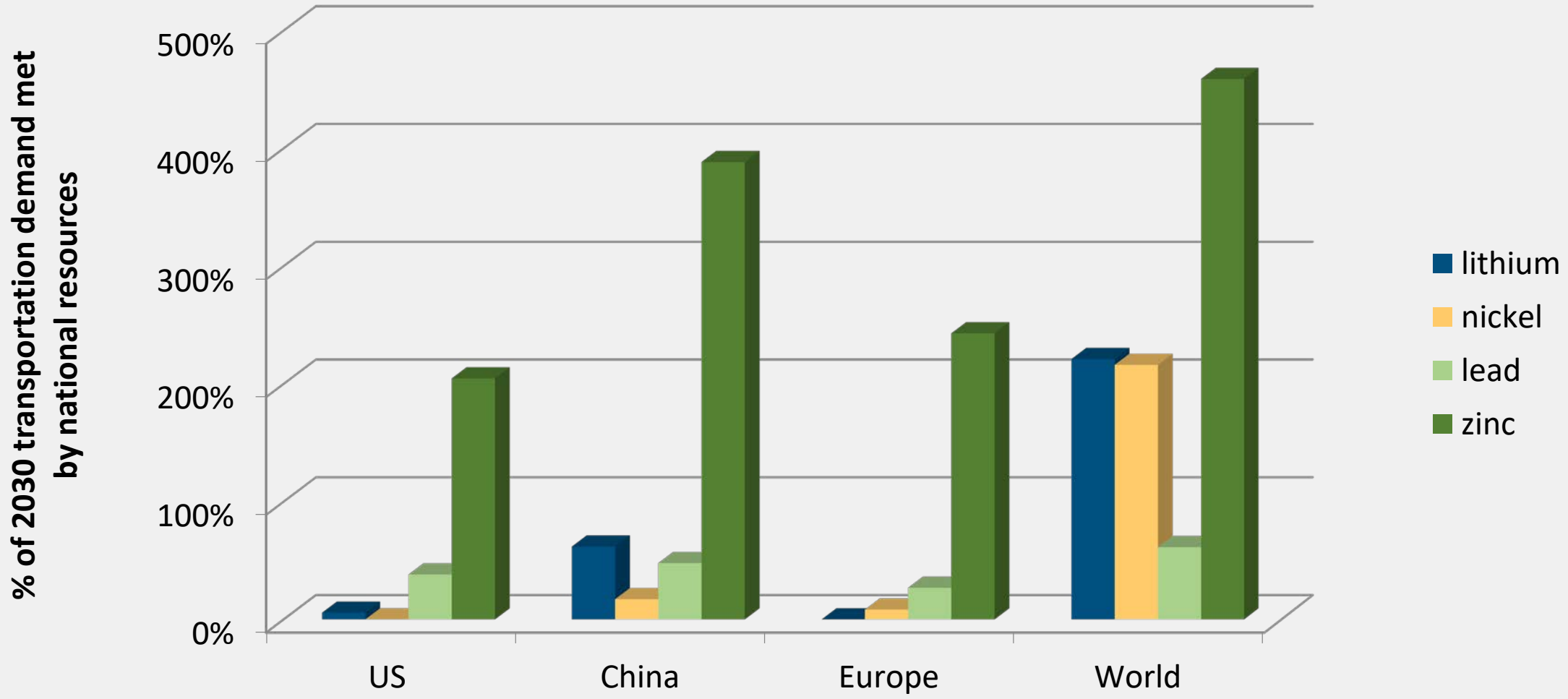
Comparison of Attributes

Diffusion Battery Chemistries

	Abundance	Globally Available	Enviro / Safe	Cost	Recycle / Impact	Energy Density
Zinc						
Lithium						
Lead						

Why Zinc? Global Abundance

Reduces Geo-Political Conflict



Designed for Manufacturing

Evaluation Without Scar Tissue

- **ZAF NiZn is specifically designed to allow for scaled manufacturing**
  - Tape coated anode and cathode engineering design
  - Proprietary slurry formulation to maximize embedding of active material
- **NiZn leverages 90% of existing lead acid equipment**
  - Lead acid manufacturing equipment can be repurposed for NiZn production with minimal modification.
  - Manufacturing equipment is pre-engineered and readily available from either domestic or international vendors.
  - Seamlessly integrates NiZn production lines into our licensee's factories with equipment they know how to operate.
  - Licensee's maintain existing relationships for service and warranty
- **ZAF's partnership with Wirtz allows us to scale with key licensees**
  - Largest lead acid equipment supplier in the U.S. and 2nd worldwide
  - We were able to coat our foam electrode with full penetration at over 20 inches per second. This is a game changer for our manufacturing process and will bring cost down and production volume up substantially.

Common Lead Acid Equipment Available For NiZn

- **Plate Making Pasting Lines**
  - Steel belt and fixed orifice pasters
  - Plate thickness measurement and control
  - Rotary plate cutters
  - Horizontal flash dry ovens
  - Plate stacking and robotic palletization
- **Paste Mixing Systems**
  - 550KG , 1100KG, 1300KG, 1500KG
  - Automatic batching and dispensing
  - Process control and data collection
  - Paste feeding
- **Battery Assembly**
  - Semi-automatic assembly lines
  - Fully-automatic assembly lines
  - High voltage polarity testing high pot
  - Weld testing
  - Air leak testing
  - Programmable data cod and serial numbering
- **Formation and Finishing**
  - Conveyors
  - Volumetric fillers
  - Electrolyte additive mix

Wirtz Validation

Anode and Cathode Pasting

All "Recycling" Isn't Equal

Developing Countries Pose Problems

Man standing on a pile of used lead-acid batteries. Some experts believe that lead poisoning from the improper recycling of used lead-acid batteries is the #1 childhood environmental health threat globally.

Source: "2016 World's Worst Pollution Problems"

PURE EARTH

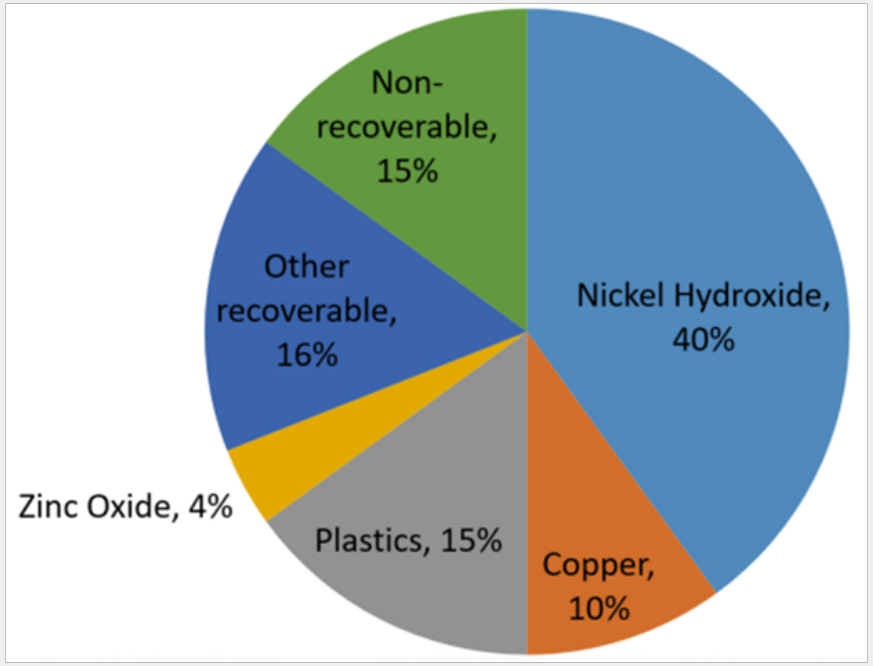
GREEN CROSS

A man in Indonesia uses an axe to break up old batteries by hand in order to extract the valuable lead within. The improper recycling of used lead-acid batteries takes place in almost every low- and middle-income country. Toxic lead is spilled everywhere in the process.

- Battery recycling contributes to more than 150 sites in the Pure Earth database, putting almost 1 million people at risk related directly to lead, mercury or cadmium pollutants.
- Geographically, the largest numbers of polluted sites are in Southeast Asia, with Africa, Central and South America also contributing a substantial amount.

Lead-acid vs. Nickel-zinc

85% Material Recovery yields
40% Reduction in Battery Cost



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Safety Matters

A table of toxicity

Li-Ion

Ni-Metal Hydride KOH, Nickel

Lead Acid HSO4, Lead

Ni-Cadmium KOH, Cadmium

RoHS Restricted Substance

ZAF NiZn Nickel, Zinc, KOH

ZAF Zinc-Air Zinc, KOH

Zinc/ Lead Comparison Summary

Summary

- ZAF has proven manufacturing scalability using existing lead acid equipment (anode)
  - Lead acid manufacturers are our PARTNERS, not competition
  - Maintain same equipment vendor relationships
  - Natural extension of product line for lead acid companies
- Zinc is environmentally friendly and safe in manufacturing, use and recycling
- Zinc combined attributes should drive further investment from industry

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