Think Zinc!
The Zinc Battery Initiative

Dr. Josef Daniel-Ivad

NAATBATT Annual Meeting & Conference
Feb. 17 - 20, 2025
Orlando, FL

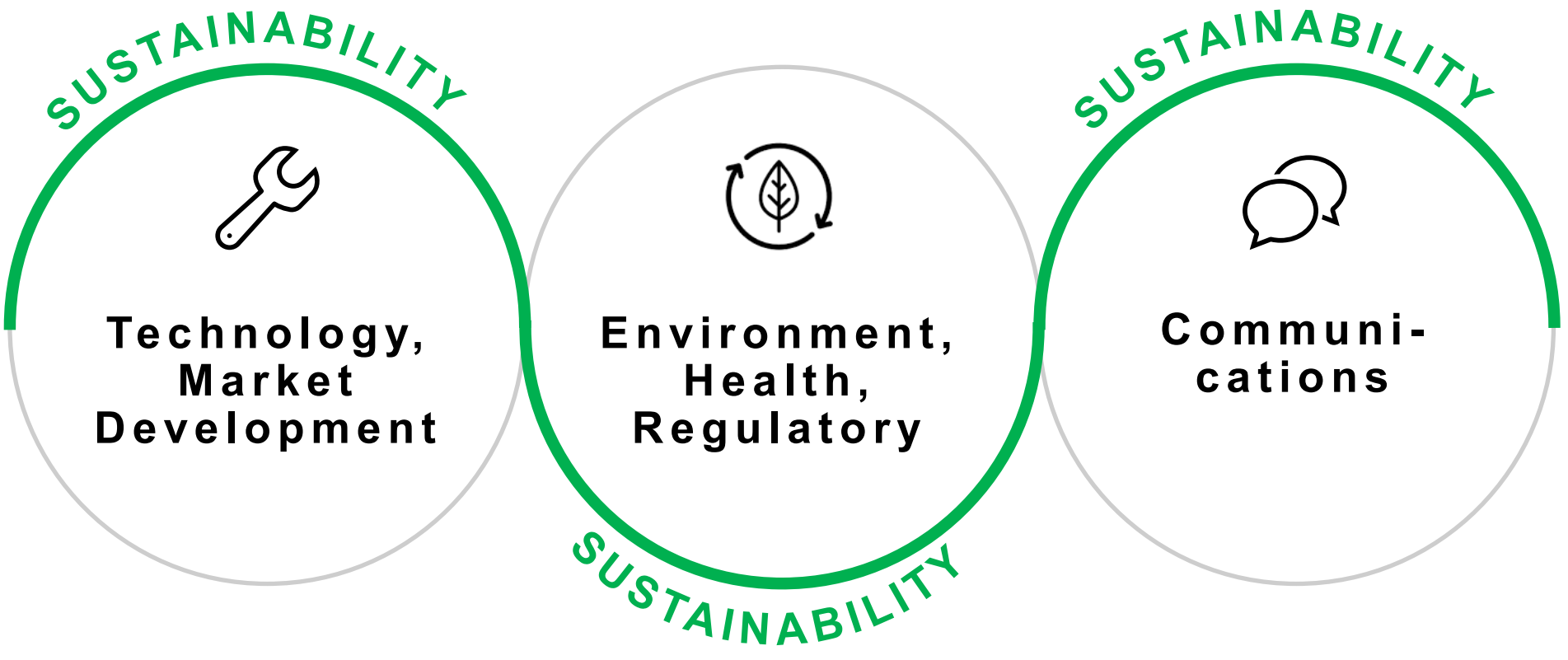
International Zinc Association (IZA)

- 42 full members
- >200 affiliate and associate members
- Offices in North Carolina, Brussels, Delhi, Shanghai

IZA represents the global zinc industry in mining, production, first use production and recycling

IZA Full Members

IZA's Core Program Areas



Responsible

Why Zinc ? – Essential for Modern Life

- ✓ Sustains Life, Strengthens Immune System
- ✓ Helps Plants Grow
- ✓ Protects Infrastructure
- ✓ Enables Lower Cost Autobody Parts
- ✓ Provides Shelters, Building Material
- ✓ Die Castings for Fixtures & Faucets etc.
- ✓ Helps Power Our World → Batteries
- ✓ Recyclable, Sustainable
- ✓ Low Carbon Footprint

THE ZINC MARK®
RESPONSIBLY PRODUCED ZINC

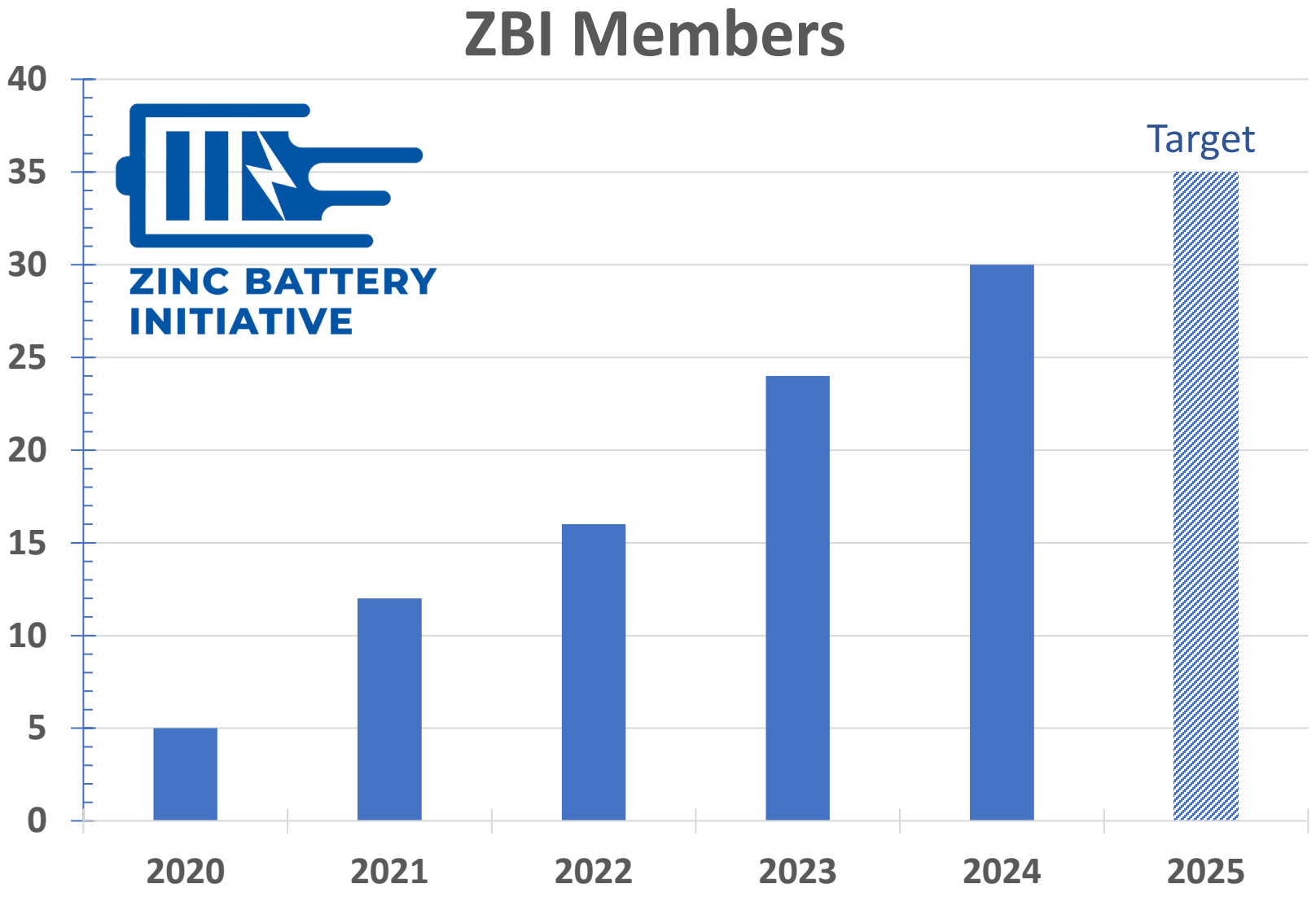
ZBI - Zinc Battery Initiative

A Partnership to Advance Zinc-based Battery Technologies

The ZBI serves to champion zinc batteries and ensures that all potential customers and other stakeholders understand the value and advantages of zinc-based power and energy storage products.

ZINC BATTERY INITIATIVE

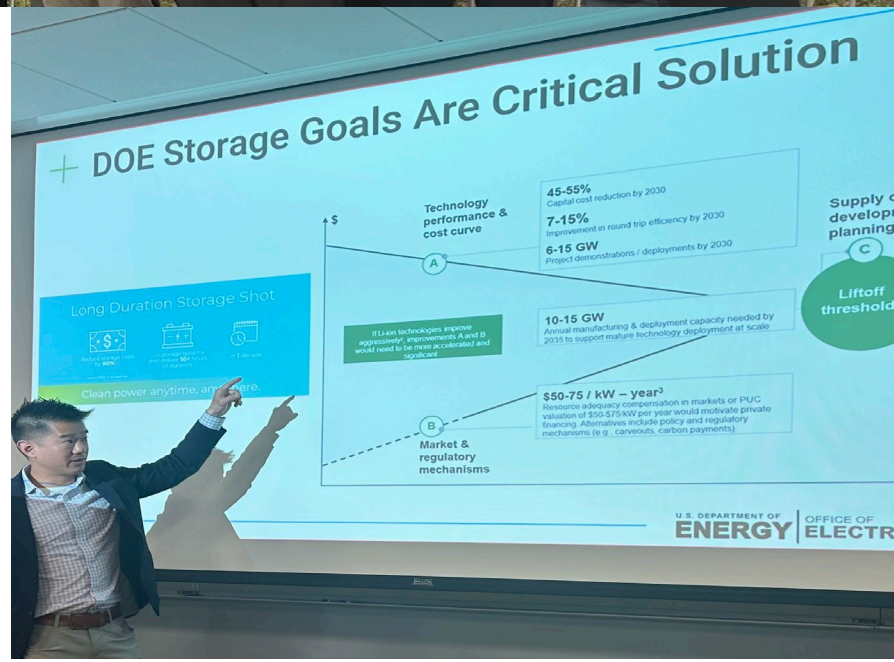
ZINC | international zinc association



Starting with 5 members in 2020, the ZBI grew to 30 members in the span of 4 years.

Zinc Battery Workshop at West Virginia University

- ✓ Seven Zinc battery developers & manufacturers
- ✓ Six zinc producers & suppliers
- ✓ International Zinc Association & ZBI
- ✓ West Virginia University
- ✓ DOE Office of Electricity
- ✓ DOE Office of Energy Efficiency & Renewable Energy
- ✓ DOE Pacific Northwest National Lab
- ✓ DOE Sandia National Lab



U.S. DEPARTMENT OF ENERGY

ZINC BATTERY INITIATIVE

WestVirginiaUniversity.
BENJAMIN M. STATLER COLLEGE OF ENGINEERING AND MINERAL RESOURCES

Pacific Northwest NATIONAL LABORATORY

"What if the DOE offered to be the first customer? How many cells would we need to buy?" Eric Hsieh, DOE Deputy Assistant Secretary for Energy Storage

Workshop Outcomes: Challenges and Opportunities

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1. High cost for investments in pilot production lines

* Shared pilot production lines would be valuable for zinc battery developers

2. Derisking first business with batteries produced with a pilot production line (PPL) or full-size line (FSL)

* Off-take agreements for supply of batteries

3. Industrial awareness and adoption

* Look beyond utilities: The EV charging industry, energy intensive industry (e.g. steel), and potential other industries, are good targets for adoption of non-Lithium battery chemistries

* Re-designed charging-discharging strategies offer new opportunities for batteries, such as the addition of (high cycling) grid stabilization functionality to (low cycling) UPS batteries.

Workshop Outcomes: Challenges and Opportunities

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4. Safety standards for battery transportation and applications

* Application standards to include zinc-based batteries

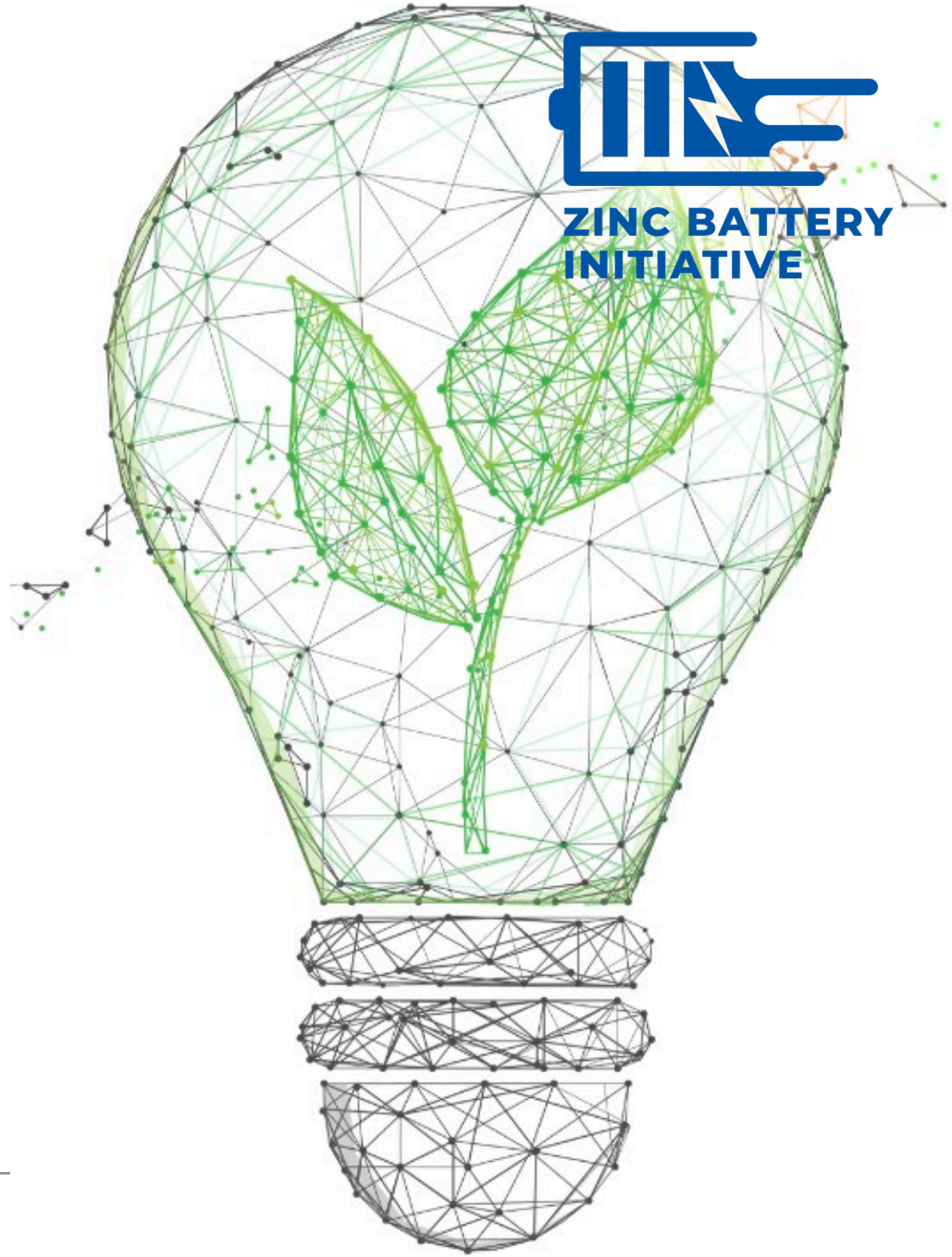
* Work with insurance companies to derisk zinc batteries for indoor use and in critical applications (datacenters)

* Work with other battery associations to get zinc batteries specified as unique category in UN battery transportation standards.

5. Supply bottlenecks in battery raw materials and components

Action Plan

- ✓ **Promote and raise awareness about the benefits of zinc batteries to a wider audience of stakeholders**
- ✓ **Collaborate with the federal government and other key stakeholders to bolster the supply chain and offer cost-effective energy storage solutions**
- ✓ **Advocate for the inclusion of zinc batteries in both safety and application standards**



ZINC BATTERY INITIATIVE

www.zincbatteryinitiative.com

ZINC BATTERY INITIATIVE

In-Kind Support for DOE Funded Projects

- ❖DOE Grant - Newlab and Sandia's HiDEZ consortium
  - ❖FOA3020 – Newlab and Sandia's HiDEZ consortium (short for "High-capacity long Duration Energy storage Zinc battery consortium"). IZA/ZBI in-kind support.
- ❖LDES National Consortium Teaming Partner
  - ❖IZA/ZBI in-kind support
  - ❖Participation in 'Tiger Teams'
- ❖Oak Ridges Nat'l Lab project Aqueous Zn-Ion Batteries
  - ❖Pledged IZA/ZBI in-kind support

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Sandia National Laboratories

OAK RIDGE National Laboratory

Zinc batteries charged for another banner year

Energy Storage | Emerging Technology | TOP STORIES | Buzz | Wednesday, 07 February 2024 | Share

Zinc is advancing to deliver as a top battery chemistry for energy storage in 2024, following a breakthrough in both funding and demonstration projects last year, writes *Dr. Josef Daniel-Ivad** of the Zinc Battery Initiative (ZBI).

Zinc battery people feeling confident

21 Apr 2024 | General | By Best Magazine

Dr. Josef Daniel-Ivad, manager of the Zinc Battery Initiative industry body, provides an upbeat assessment for zinc batteries.

Zinc batteries are generating confidence in 2024. This follows promising market outlooks announced at the 2024 annual International Zinc & Zinc Oxide Conferences, the forming of key commercialisation partnerships and a full slate of upcoming demonstration projects designed to prove the value of this sustainable, safe, and scalable technology.

POWER

Jul 24, 2024
by Josef Daniel-Ivad

Energy Storage

Zinc Battery Manufacturers Partner to Speed Commercialization

The Zinc Battery Initiative (ZBI) and its members have collaborated with experts from the U.S. Department of Energy (DOE) and West Virginia University (WVU) to develop an effective path to

ALSO IN THIS ISSUE
July 24, 2024

2024 Media Accomplishments

- ✓ 187 articles mention Zinc Battery Initiative
- ✓ Three editorials by Dr. Josef Daniel-Ivad
- ✓ S&P Global profiles the zinc battery market

2025 Goals

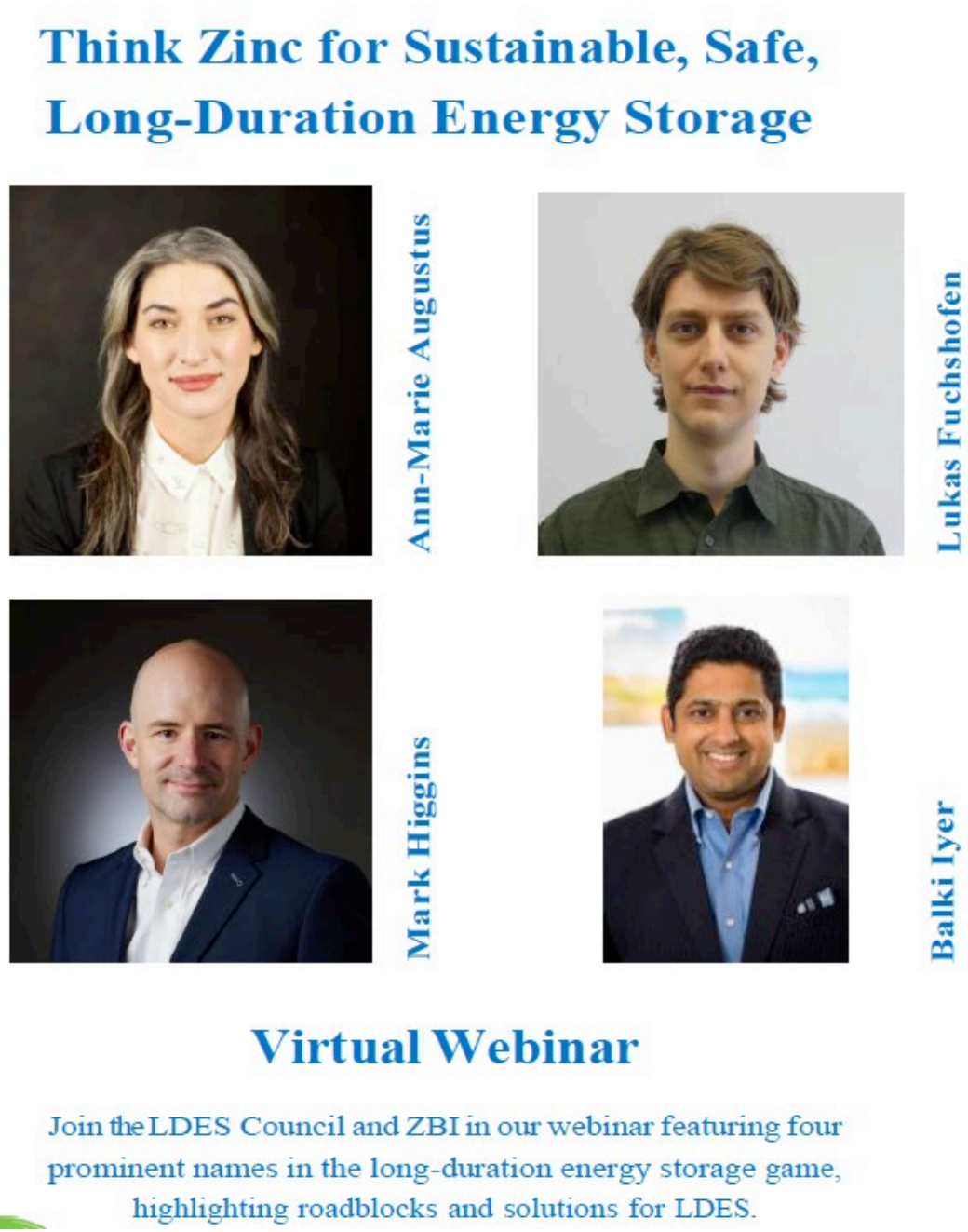
- ✓ Top-tier publication coverage
- ✓ European media coverage
- ✓ Opportunities to feature ZBI members

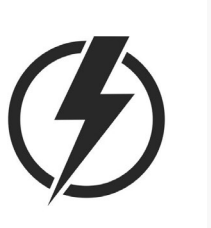
Joint Webinars

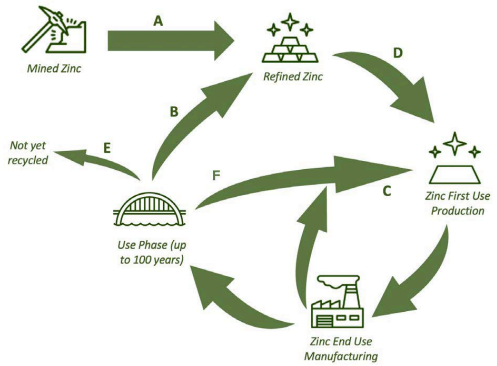
LDES LONG DURATION ENERGY STORAGE COUNCIL

ENERGY STORAGE CANADA

ZINC BATTERY INITIATIVE







Why Use Zinc for Batteries ?

- ✓ High specific capacity at 820 Ah/kg, 5820 Ah/L
  - ✓ Better volumetric capacity than Li at 2060 Ah/L
- ✓ Versatile, powerful anode material, can be combined with several cathodes
  - ✓ Silver
  - ✓ Nickel
  - ✓ Manganese
  - ✓ Intercalation cathodes, MnO_x, VO_x, PBA, etc…
  - ✓ Bromine, Iodine
  - ✓ Air
- ✓ Fire-safe, water-based electrolytes
- ✓ Low-cost, abundant, sustainable commodity raw material available around the world

ZBI – Members 2-2025

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ZAF Energy Systems

Ærsir Technologies, Inc.

eos

exro

cellex

ENZINC

e-zinc

ZincFive

URBAN ELECTRIC POWER

coulomb TECHNOLOGY

ZĒLOS

BATRICITY

SALIENT ENERGY

enerpoly

ABOUND an energy solutions company

hilabs

AZA Electrically Rechargeable Zinc-Air Batteries

Suppliers

everZINC

GRILLO

Brüggemann

Zochem ZnO

Diamonchem

NIPPON SHOKUBAI

IMR GROUP

Octet Scientific

Easyl Zinc

JG CHEMICALS

bdj

Silox

Versatility of Zinc Batteries

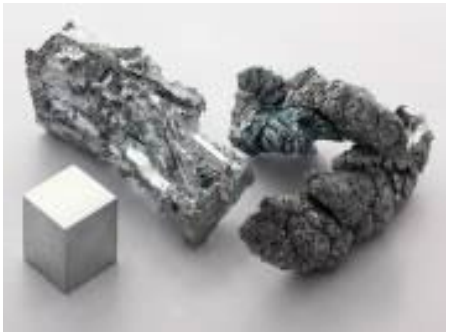
Chemistry

Zinc-Nickel	Zinc-Manganese	Zinc-Ion	Zinc-Halide	Zinc-Air
Aesir Technologies	Urban Electric Power	Enerpoly	EOS Energy	Abound Energy
Enzinc	Zelos	Salient Energy		AZA Battery
ZincFive		Hilabs GmbH		E-Zinc
		Coulomb Tech.		Hilabs GmbH

Application

Zinc-Nickel	Zinc-Manganese	Zinc-Ion	Zinc-Halide	Zinc-Air
UPS Data Center	Backup Power	Residential ESS	Grid Services	Long Duration Energy Storage
Intelligent Transportation	C & I Energy Storage	C & I Energy Storage	Microgrids	C & I Energy Storage
Defense	Residential ESS	Backup Power	Remote and Off-Grid Energy Storage	Remote and Off-Grid Energy Storage
e-mobility		Internet of Things	C & I Energy Storage	

Availability of Zinc



Accessible crustal content
198,000,000 Mt[1]

Zinc currently in use
247 Mt[2]

Extractable global resources
63,000 Mt[1]

Proven and Probable reserves
250 Mt[3]

@12.5Mt/yr
= 5,040 yrs.

World zinc use/y
20 Mt[6]

Mined zinc/y
12.8 Mt[4]

Zinc recycled/y
7.6 Mt[5]

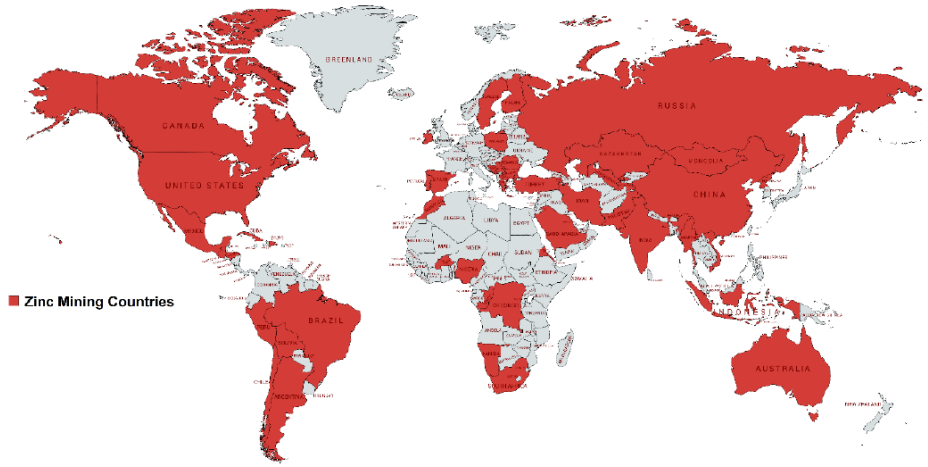
Mt = million tons

1. "Zinc resources – a state of knowledge" by Eric Pirard, 2021 (5 km mineable depth scenario)
2. IZA and Fraunhofer ISI 2021 zinc stocks and flows update (based on 2019 data)
3. U.S. Geological Survey, 2021
4. International Lead Zinc Study Group. 2019
5. IZA and Fraunhofer ISI 2021 update, post- and pre-consumer scrap
6. IZA and Fraunhofer ISI 2021, zinc entering first use stage

Source: International Zinc Association (2022)

Zinc can be sourced LOCALLY

ZINC MINING COUNTRIES IN 2023



- Since 1960 over 60 countries have mined zinc ore
- In 2023, 50 countries were actively mining zinc
- Top 5 mining countries are China, Peru, Australia, USA and India
- Top 10 mining companies contributed to 84% of the world concentrate production capacity

ZINC PRODUCING COUNTRIES IN 2023

- In 2023, 30 countries had zinc metal smelting and/or refining activities
- Top 10 refined zinc metal producing countries contributed 83% of world total output

Source: International Lead and Zinc Study Group (2024)

IZA Sustainable Development

1. Responsible Sourcing

LME Requirements – Joint DD Standard, passport

Full ESG and Assurance - Zinc Mark

Harmonizing Frameworks

2. LCA and Carbon Footprint

Sector - LMEpassport CF Guidance for SHG Zinc

Material – Profiles at site and global level

3. Climate Action and Energy

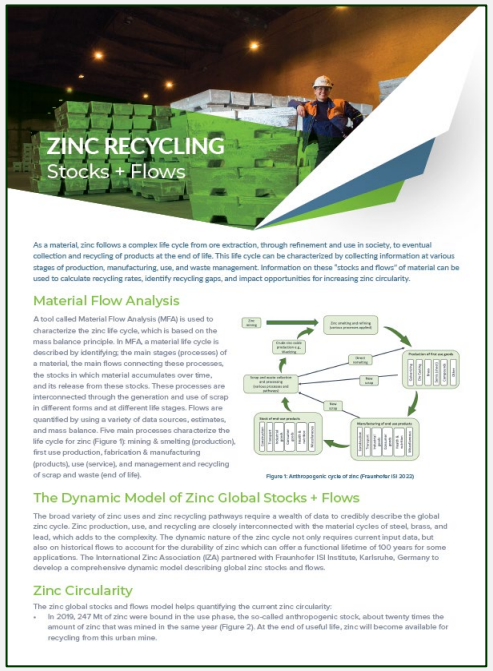
Coordination – IZA Climate Change Task Force

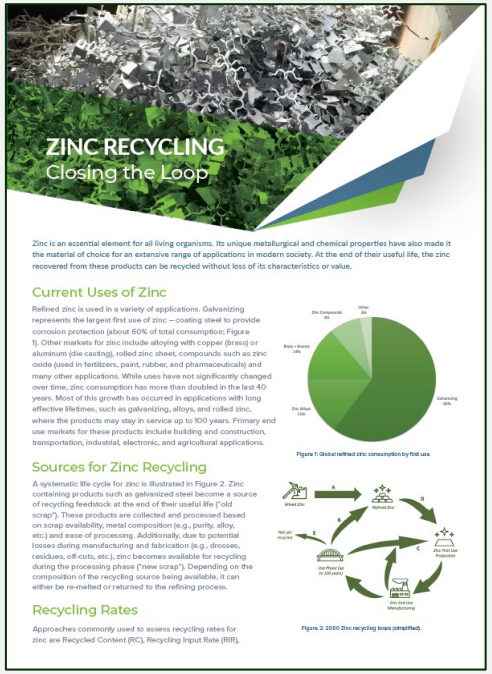
Strategy – Decarbonization Roadmap

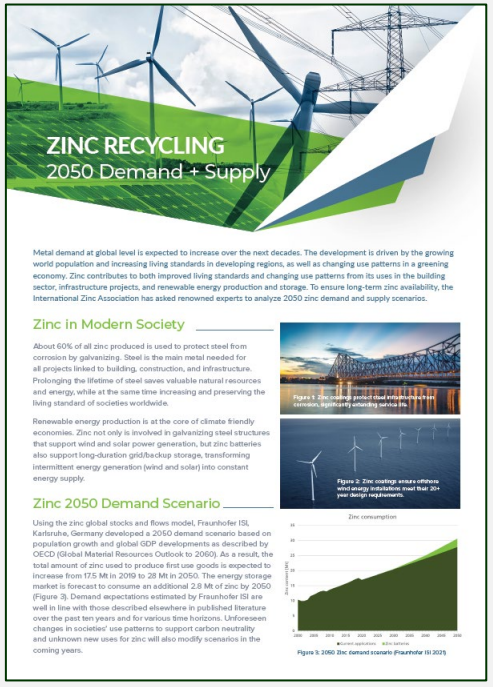
4. Circular Economy and Availability

Demand – 2050 scenarios

Supply – Material Flow Analyses







Maximizing Zinc Circularity

Fact Sheets

- Zinc Stocks and Flows (link)
- 2050 Supply and Demand (link)
- Material Supply (link)
- Closing the Loop (link)

CALL FOR MEMBERSHIP!

Join IZA's ZBI – the voice of the zinc battery industry

Thank You!

PLEASE VISIT OUR WEBSITES

www.ZincBatteryInitiative.com

www.zinc.org

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