Think Zinc!
IZA's Zinc Battery Initiative

Dr. Josef Daniel-Ivad

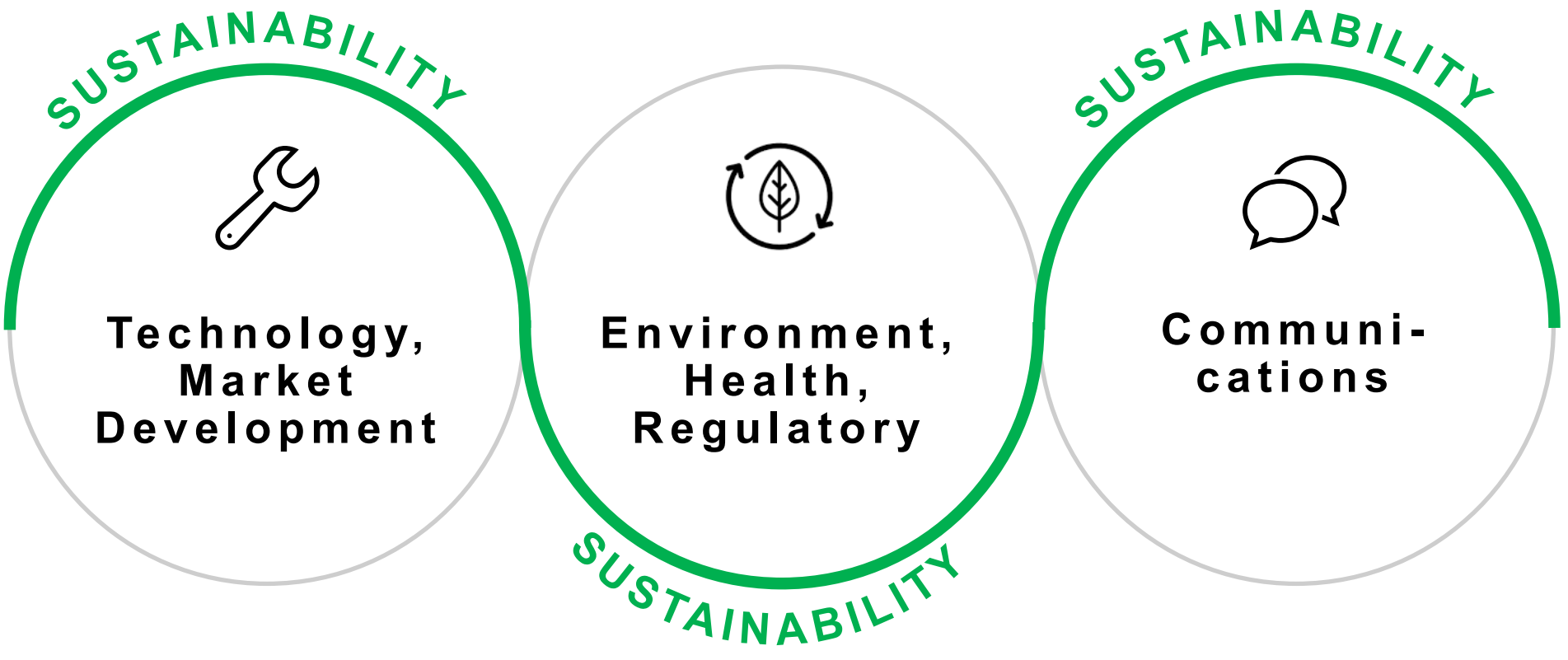
NAATBatt 2023 Meeting & Conference
February 20-23, 2023
Litchfield Park, AZ

International Zinc Association (IZA)

- 41 full members
- 185 affiliate and associate members
- Offices in North Carolina, Brussels, Delhi, Shanghai

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

IZA's Core Program Areas



ZBI - Zinc Battery Initiative

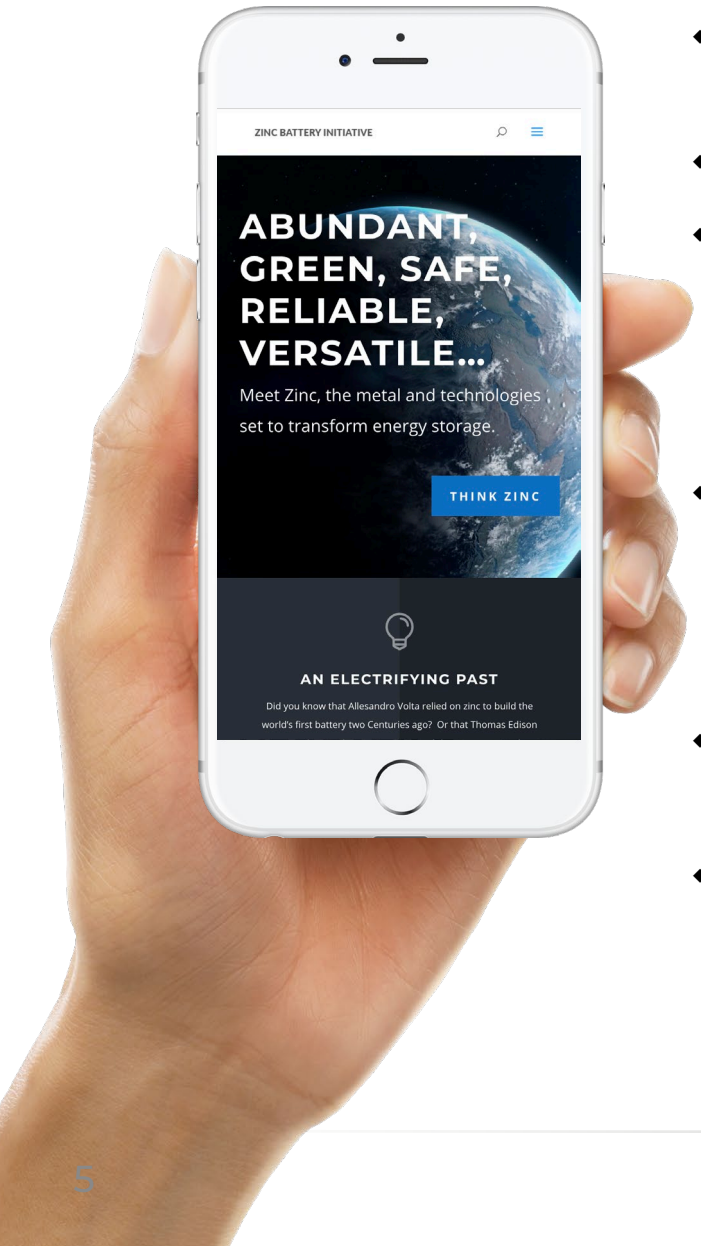
A Partnership to Advance Zinc-based Battery Technologies

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

ZBI – Status



- Formed late 2020 - Principal sponsor is the Int'l Zinc Association.
- Grown to 13 members / battery producers.
- Quarterly Newsletter reports issued
  - Outlining detailed actions for period
  - Good reference for regulatory items to be aware of
  - WW research paper high lights for Zn-based batteries
- Media Outreach through engaged PR firm Silverline Communication
  - Potential reach to 17.5M+ people in 2022
  - Sentiment: 67% positive, 33% neutral, no negative
- Presented talks on Zn batteries and supply
  - 6 conferences, 1 workshop
- Co-Hosted Webinars w LDESAC

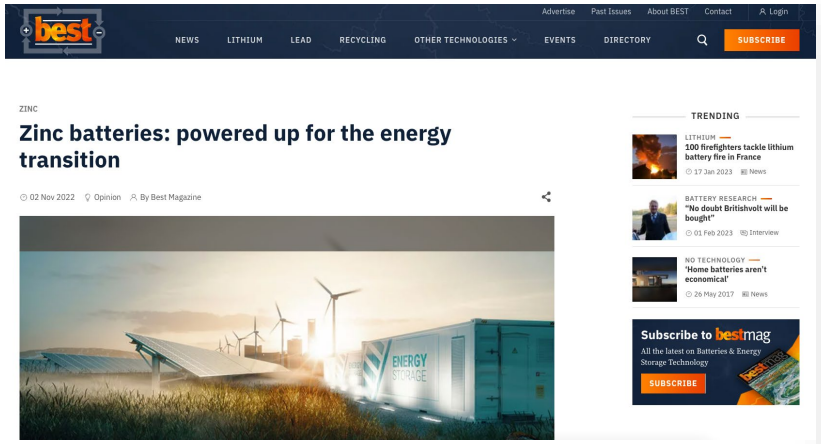
Silverline Communications

FORBES AGENCY COUNCIL Official Member | 2021

BULLDOG AWARD | BRONZE Most Innovative Agency

MARCOM AWARDS Multi-year award winner

From the IZA & Silverline press in 2022...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ZINC

Zinc batteries: powered up for the energy transition

02 Nov 2022 Opinion By Best Magazine

TRENDING

LITHIUM — 100 firefighters tackle lithium battery fire in France — 17 Jan 2023 News

BATTERY RESEARCH — "No doubt Britishvolt will be bought" — 01 Feb 2023 Interview

NO TECHNOLOGY — 'Home batteries aren't economical' — 26 May 2017 News

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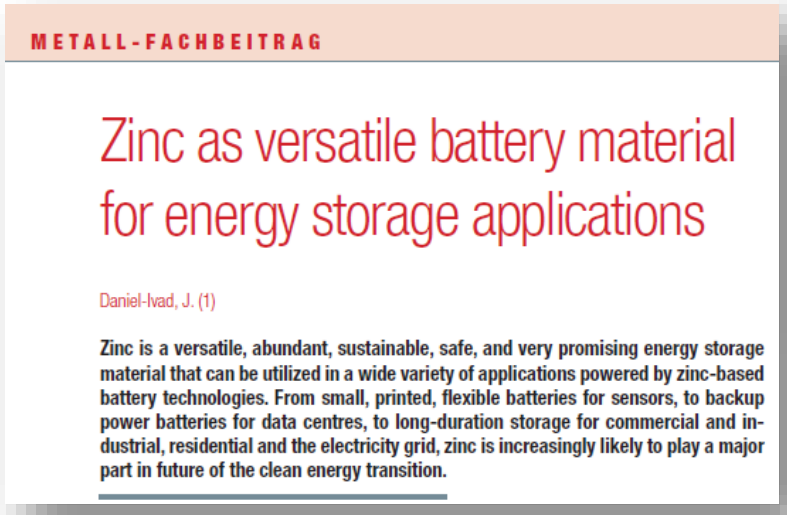
Published in Nov22 in:
BEST Magazine

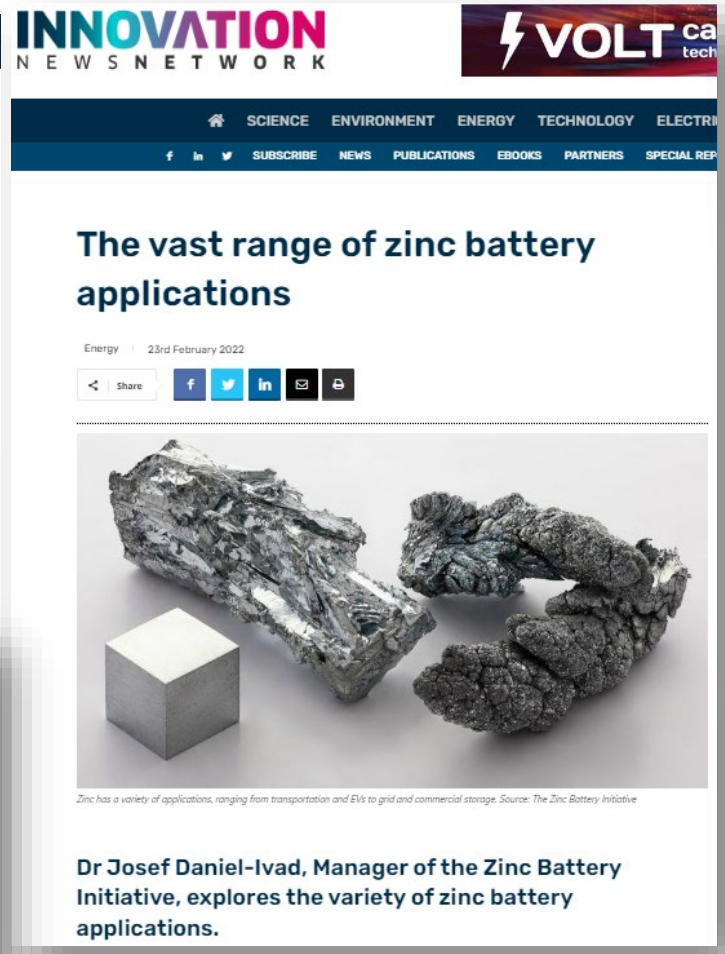

METALL-FACHBEITRAG

Zinc as versatile battery material for energy storage applications

Daniel-Ivad, J. (1)

Zinc is a versatile, abundant, sustainable, safe, and very promising energy storage material that can be utilized in a wide variety of applications powered by zinc-based battery technologies. From small, printed, flexible batteries for sensors, to backup power batteries for data centres, to long-duration storage for commercial and industrial, residential and the electricity grid, zinc is increasingly likely to play a major part in future of the clean energy transition.

Published in June22 in:
METALL, Fachzeitschrift für Metallurgie (Germany)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The vast range of zinc battery applications

Energy | 23rd February 2022

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Zinc has a variety of applications, ranging from transportation and EVs to grid and commercial storage. Source: The Zinc Battery Initiative

Dr Josef Daniel-Ivad, Manager of the Zinc Battery Initiative, explores the variety of zinc battery applications.

Published in March22 in:
Innovation News Network

Published in June22 in:
POWER magazine


Zinc Batteries: Rightly positioned to assist Energy Storage industry on sustainable goals

Energy Storage | Emerging Technology | TOP STORIES | Buzz | Tuesday, 25 October 2022 | Share

The energy storage industry is growing fast, it needs all solutions to reach its goals. All battery chemistries will play an important role to make the energy transition happening. Zinc batteries are cheap, safe, non-toxic, sustainable and recyclable, writes *Martin van Leeuwen of *Zinc Battery Initiative (ZBI)*.**


THEMENHEFT: ZINK

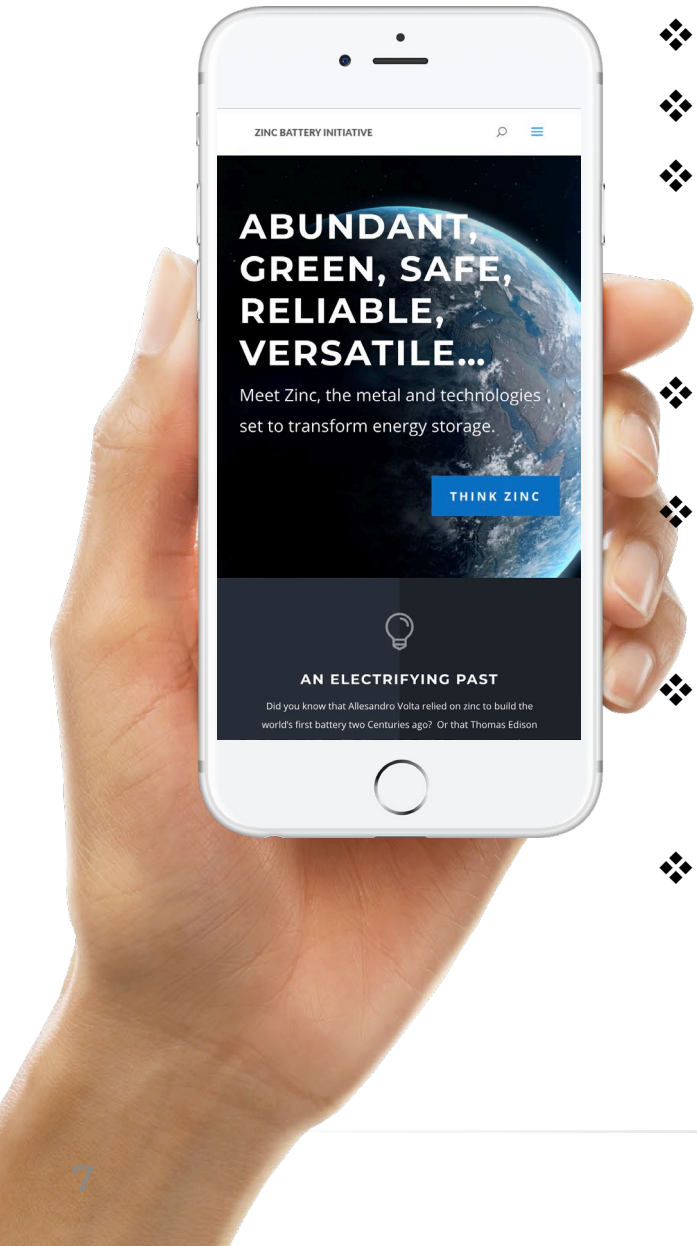
ZINK - WERKSTOFF FÜR ENERGIESPEICHER DER

VON DR. JOSEF DANIEL-IVAD

Published in Oct22 in:
ETN.NEWS

Published in
June22 in:
VDM magazine
(Germany)

ZBI – ‘23 Outlook



- Be the common voice of the zinc battery industry
- Continue to grow membership
- Educate stakeholders on the positive attributes of zinc batteries through public communication, studies, and events like meetings, seminars, workshops, webinars, and podcasts.
- Publish zinc battery related articles in relevant magazines and mainstream media
- Increase awareness of zinc-based batteries as one solution in the Green Energy Transition
  - Advocacy of zinc-based batteries in the investment community
- Raise awareness and importance of Zinc with congress and government agencies
  - Create a platform for zinc
- Establish zinc-based batteries as its own category in standards

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MARCOM AWARDS Multi-year award winner

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nal Zinc

Printed Energy any shape, anywhere

Zinc Batteries are Versatile

Zinc has been developed across a wide range of chemistries and applications.

Hybrid systems offer potential for zinc to meet most critical needs.

High power density;
Short duration storage

High energy capacity;
Long duration storage

Advantages of Zinc Batteries go Beyond Performance

SAFETY

Zinc batteries are **non-flammable** and non-toxic.

SUSTAINABLE

Zinc is abundant, recyclable, and has the lowest GHG emissions.

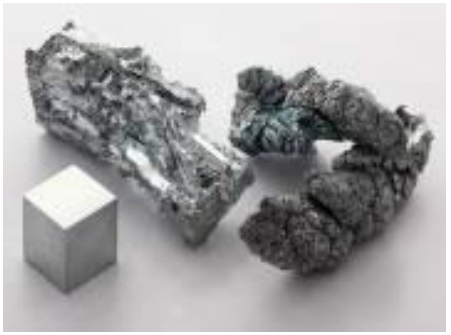
SECURE SUPPLY

Mined in 50+ countries globally, fully integrated supply chains in major regions.

- Long life (15-20 years)
- Flexible operating temps (-35°C to +75°C)*
- Low operating cost
- Non-hazardous transport

*.... Depending on Zn-tech used

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]

World zinc use/y **20 Mt[6]**

Mined zinc/y **12.8 Mt[4]**

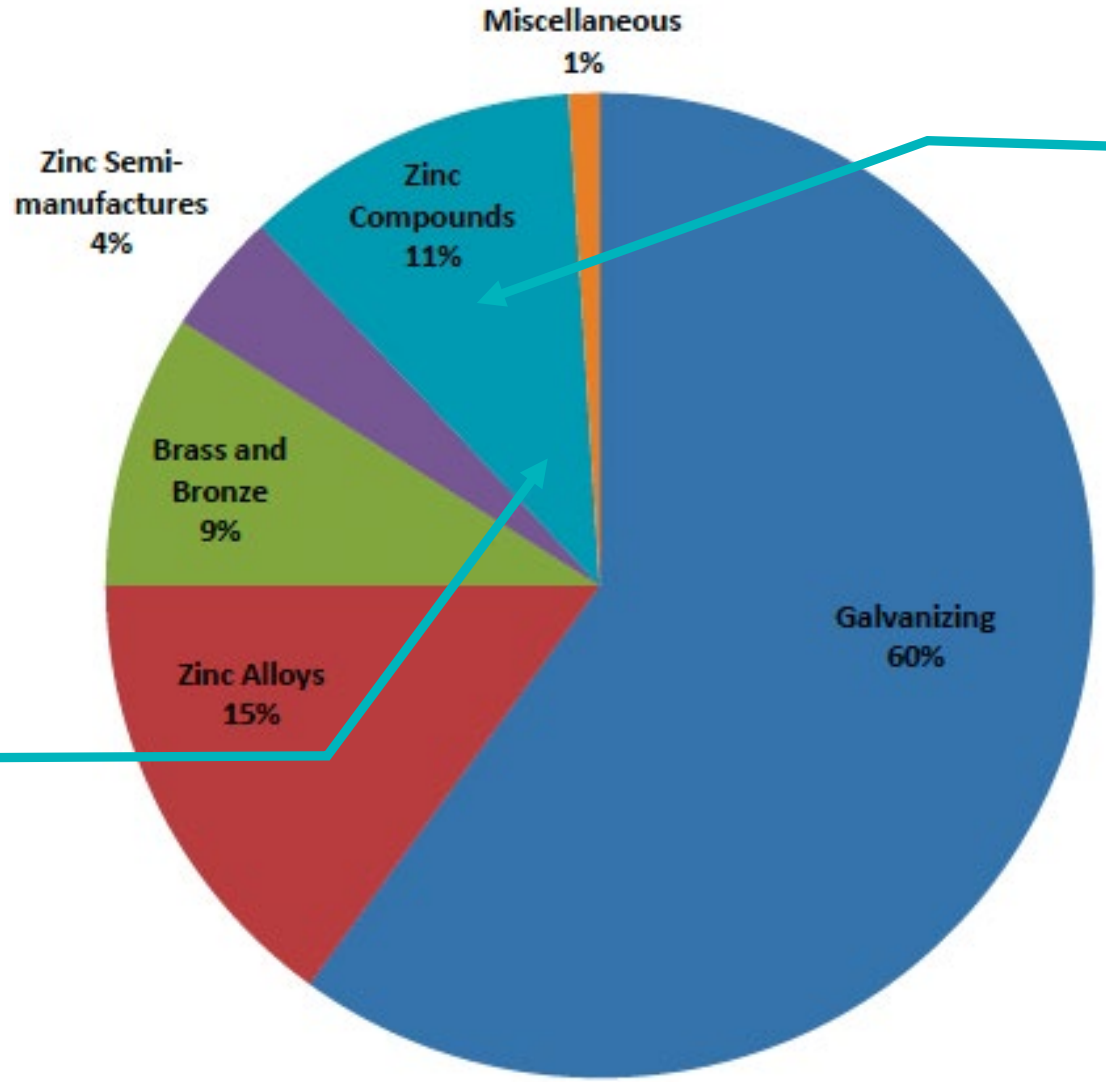
Zinc recycled/y **7.6 Mt[5]**

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 First Uses in 2019



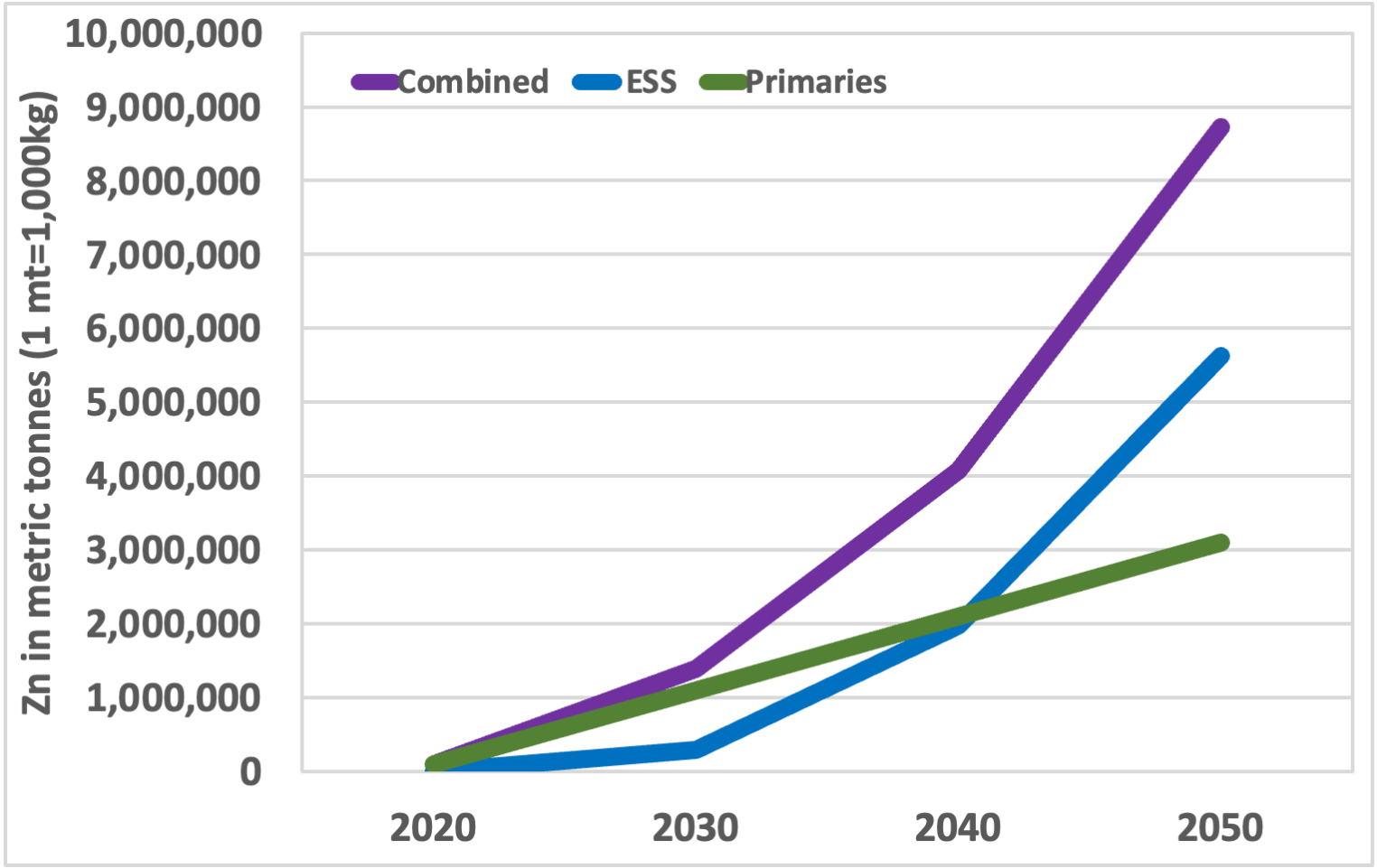
2.2 Million tonnes

Annual World Zinc use 20 Mt

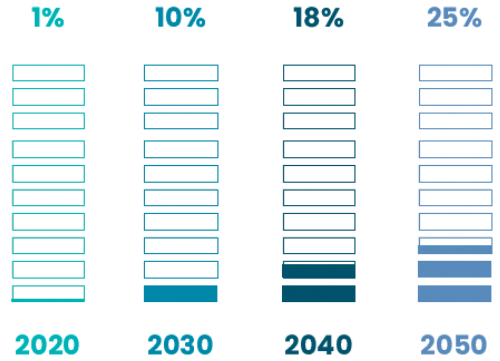
Main zinc chemicals in current use include:
▷ **ZnO**, $ZnCO_3$, **$ZnCl_2$**, **$ZnSO_4$**, ZnS_2, $ZnCO_3$, $ZnSeO_3$, Zn borate,
▷ **Zn powder** and nanoform Zn compounds.

Source: International Lead and Zinc Study Group (2020)

Cumulative Battery Zinc Demand Forecast



Zn Market Share Forecast in ESS'



- Zinc tonnage forecast for Primary Batteries based on EverZinc estimate and a 0% annual growth rate.
- Energy storage demand based on BloombergNEF NEO 2022 GWh forecast for storage batteries, percentage of zinc market share estimates based on consultation from Avicenne Energy, and an average zinc intensity of use of 2.5mt Zn/MWh for ESS.

Source: BloombergNEF (2022), Avicenne (2019), IZA (2022), EverZinc (2022)

Summary

- ***ZBI – Zinc Battery Initiative***
  - Single voice of zinc-based battery developers
  - Promote the awareness of zinc-based batteries for diverse application needs
  - Monitoring of regulatory landscape
- ***Zinc Batteries in Action***
  - Already deployed and in demonstration or full operation: NiZn, ZnBr, ZnMn, ZnAir
  - Getting ready for demonstrations: Zn-Ion
- ***Zinc Battery & Energy Storage Market***
  - Strong growth driven by renewables, electrification and electric mobility
  - Cumulative market of 300,000mt zinc by 2030

What Others are Saying...

I would expect Li to continue as the dominant storage technology

for the next Decade.

However, for Stationary Applications,

other technologies will slowly come to the forefront!

Zinc is eminently suited to accept this role!

Dr. Imre Gyuk

Director of Energy Storage Research,
Department of Energy

U.S. DEPARTMENT OF ENERGY

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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ZINC BATTERY INITIATIVE