

BATTERY SUSTAINABILITY

PRESENTATION AT BATTERY STORAGE WORKSHOP WEST AFRICA REGIONAL ENERGY SUMMIT

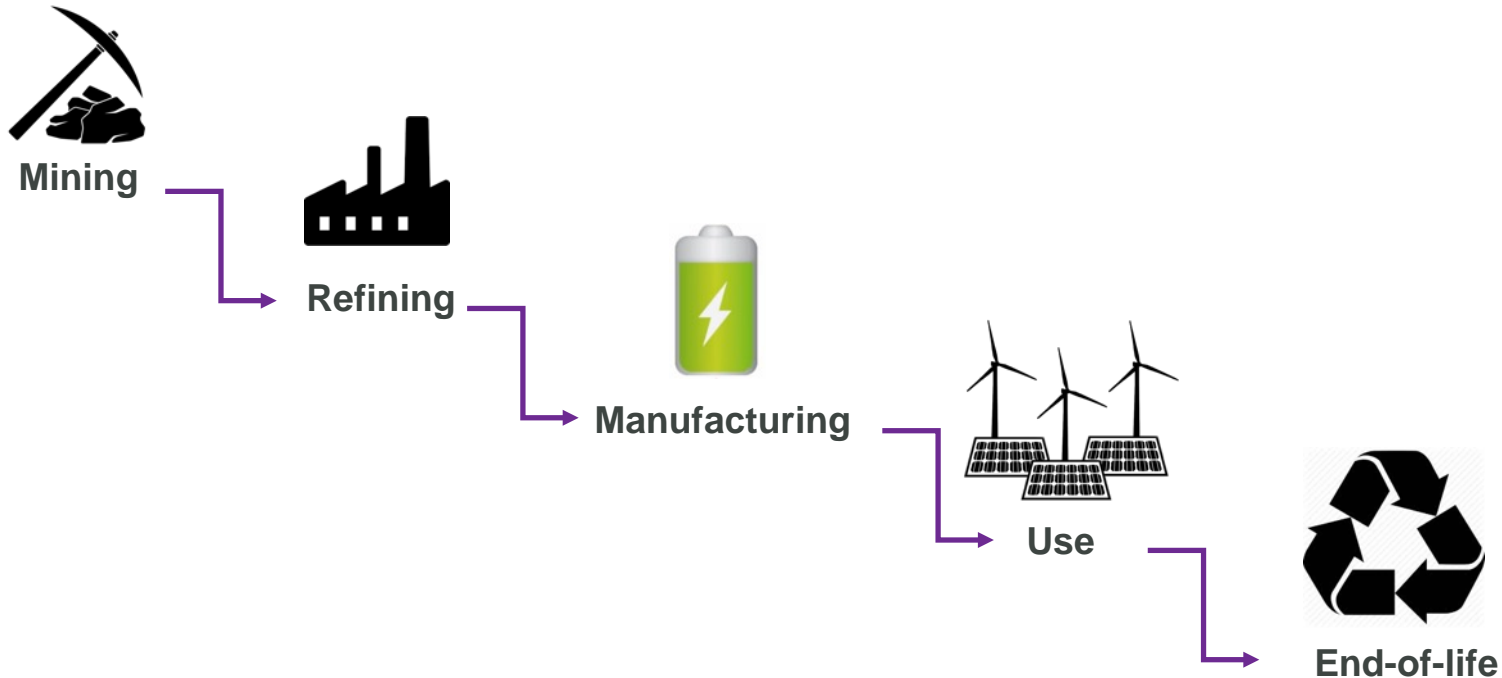
December 2019 | Jesse Gerstin
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BATTERY SUPPLY CHAIN

How can we talk about **CLEAN ENERGY** unless we look at the environmental and human impacts of the batteries we use?



MINING



COBALT MINING: HUMAN IMPACT






The Democratic Republic of Congo continues to be the world's leading source of mined cobalt, supplying more than 60% of world production. (United States Geologic Survey, 2019)

There are around 200,000 informal copper and cobalt miners in the DRC (Financial Times, 2019)



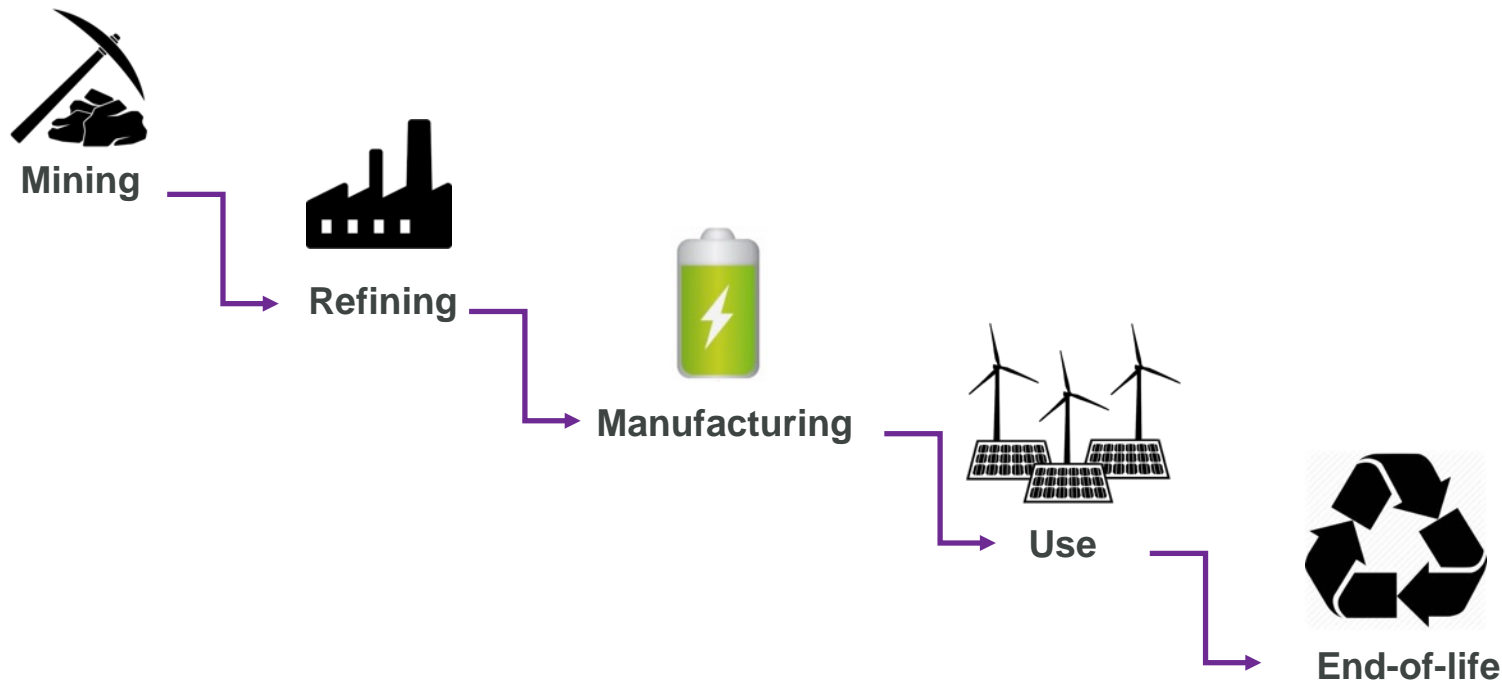
THE SAFEST LITHIUM ION BATTERY CHEMISTRY



Lithium Ion Chemistry Comparison	LFP Lithium Iron Phosphate	NMC Lithium Nickel Manganese Cobalt Oxide	LMO Lithium Manganese Oxide (May Contain Cobalt)	NCA Lithium Nickel Cobalt Aluminum Oxide	LCO Lithium Cobalt Oxide
 Danger of Thermal Runaway & Fire	NO	YES	YES	YES	YES
 Toxic Elements	NO	YES	YES	YES	YES
 Landfill Safe	YES	NO	NO	NO	NO
 Involves Abusive Mining Practices	NO	YES	YES	YES	YES
 Ventilation Required	NO	YES	YES	YES	YES
 Cooling Equipment Required	NO	YES	YES	YES	YES
 Safety Monitoring Equipment Required	NO	YES	YES	YES	YES
 Able To Withstand High Temperature Environments	YES up to 140°	NO	NO	NO	NO

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END-OF-LIFE

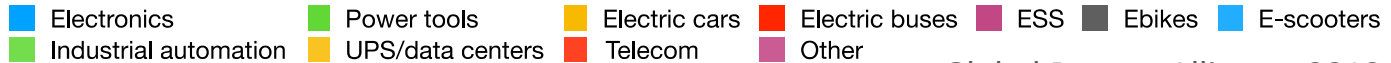
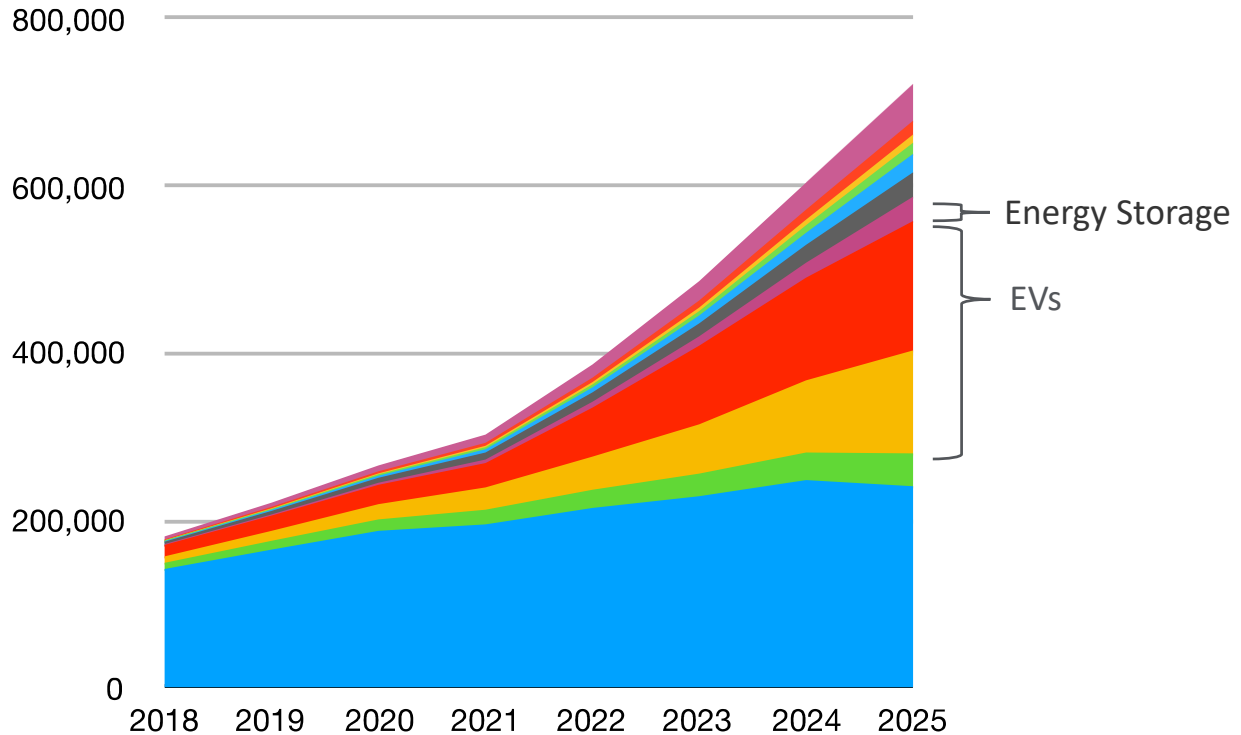


LEAD-ACID BATTERY RECYCLING: WHAT TO AVOID



Estimated that lead exposure and poisoning has cost nearly **\$1 trillion US dollars**, driven largely by battery demand.

PROJECTED LI-ION BATTERIES REACHING END-OF-LIFE (GLOBAL, TONNES)

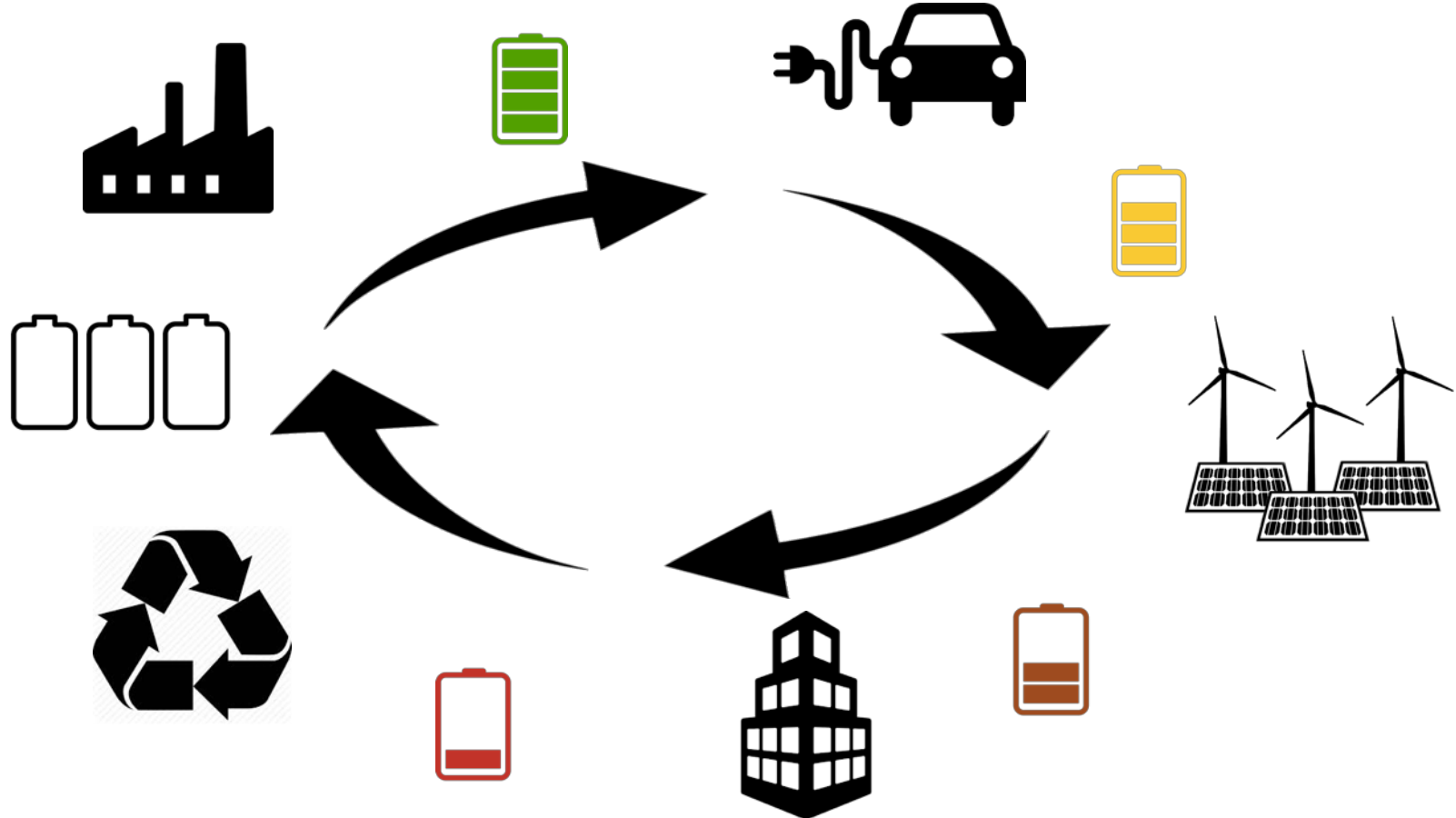


Global Battery Alliance, 2019

GLOBAL RECYCLING PARTNERSHIPS



CIRCULARITY OF BATTERY INDUSTRY



CONCLUSION

- How can battery industry stakeholders collectively support the development of global recycling standards and infrastructure?
 - How to avoid “dumping” in developing countries?
- Who should be responsible for end-of-life?
 - How can companies be incentivized to develop end-of-life strategies in place from the very beginning with project cycles typically 20+ years?
- Can batteries be designed with second and third life in mind from the beginning?
- Are we really accelerating a cleaner and more sustainable energy future if we use toxic and hazardous materials?
- **We believe the energy storage sector has to keep sustainability at the forefront at all stages of the supply chain if we are going to scale to achieve broader clean energy and Sustainable Development Goals.**



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THANK YOU!