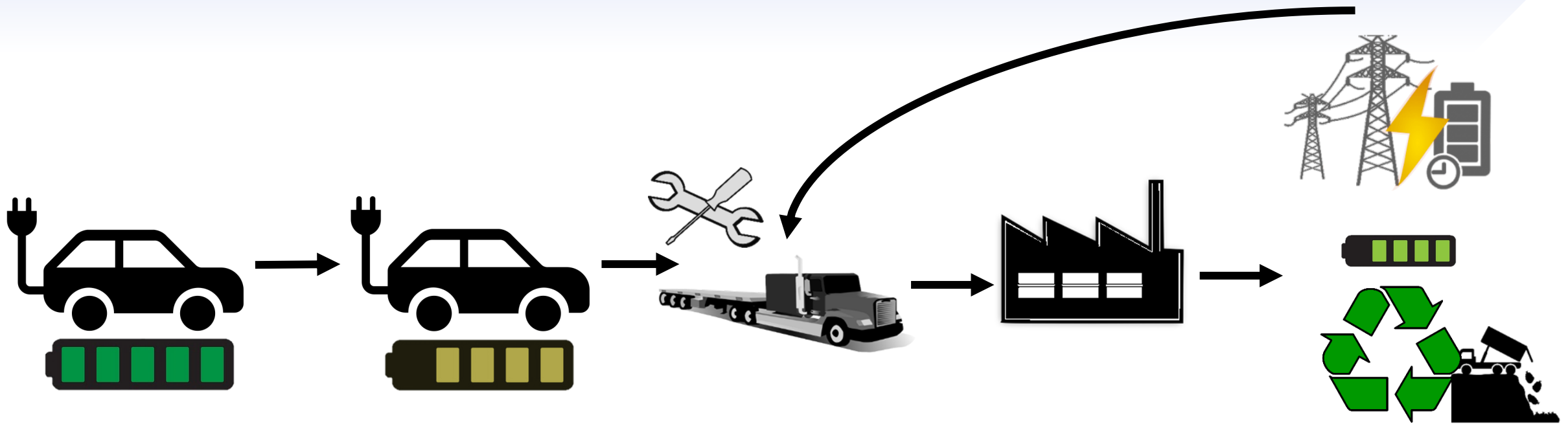


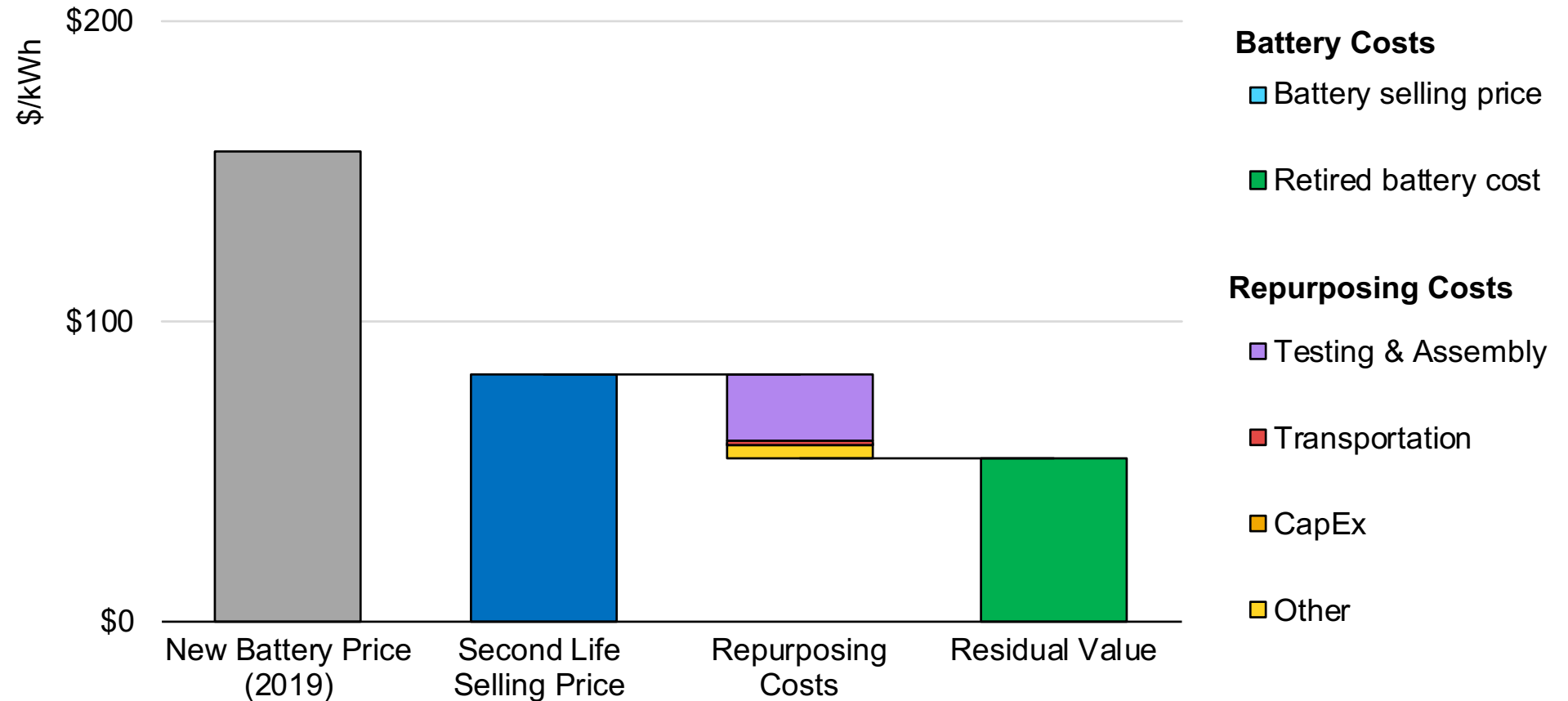
The LIB life cycle: What policies are required to ensure sustainable end-of-life management?



- Who pays?
- What are the metrics?
- What are the desired outcomes?

Second-life Batteries and Residual Value

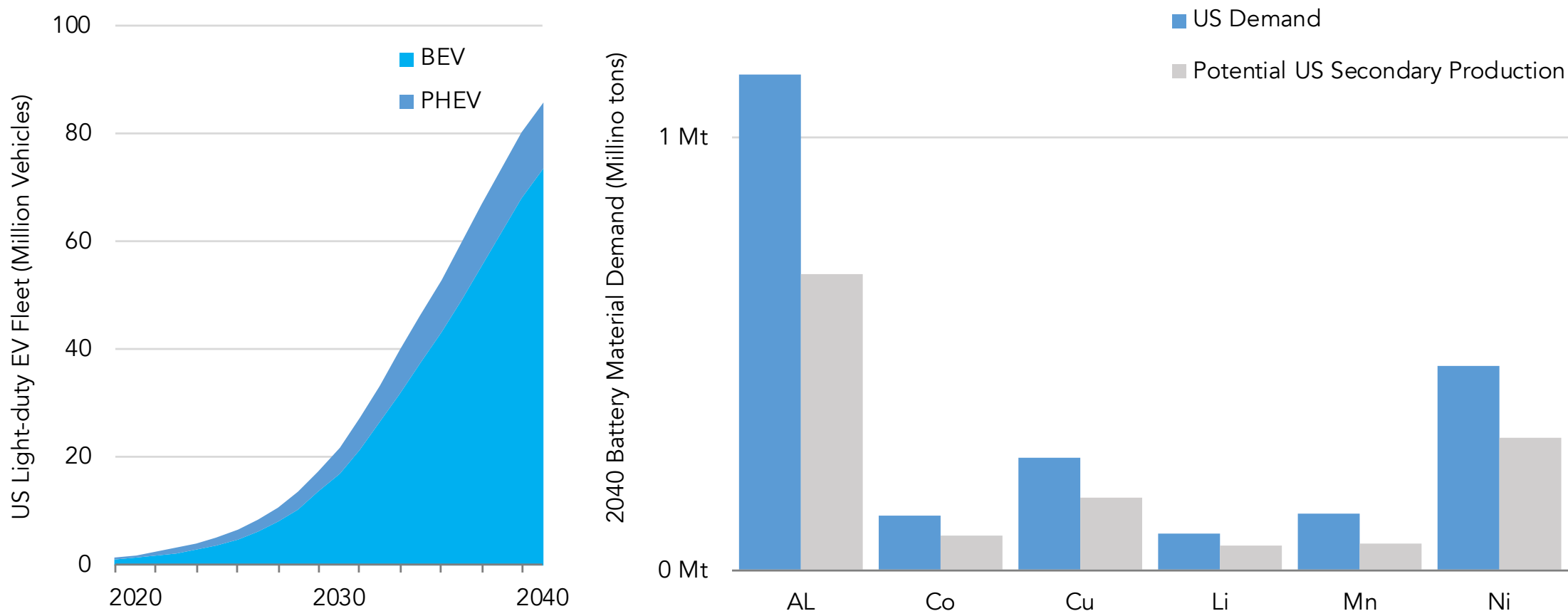
Second-life
could help to
lower the
costs of EVs



Generated using the NREL Battery Second-Use Repurposing Cost Calculator (<https://www.nrel.gov/transportation/b2u-calculator.html>), assumes 1 GWh/year volume, 60kWh pack.

Battery Recycling and Material Recovery

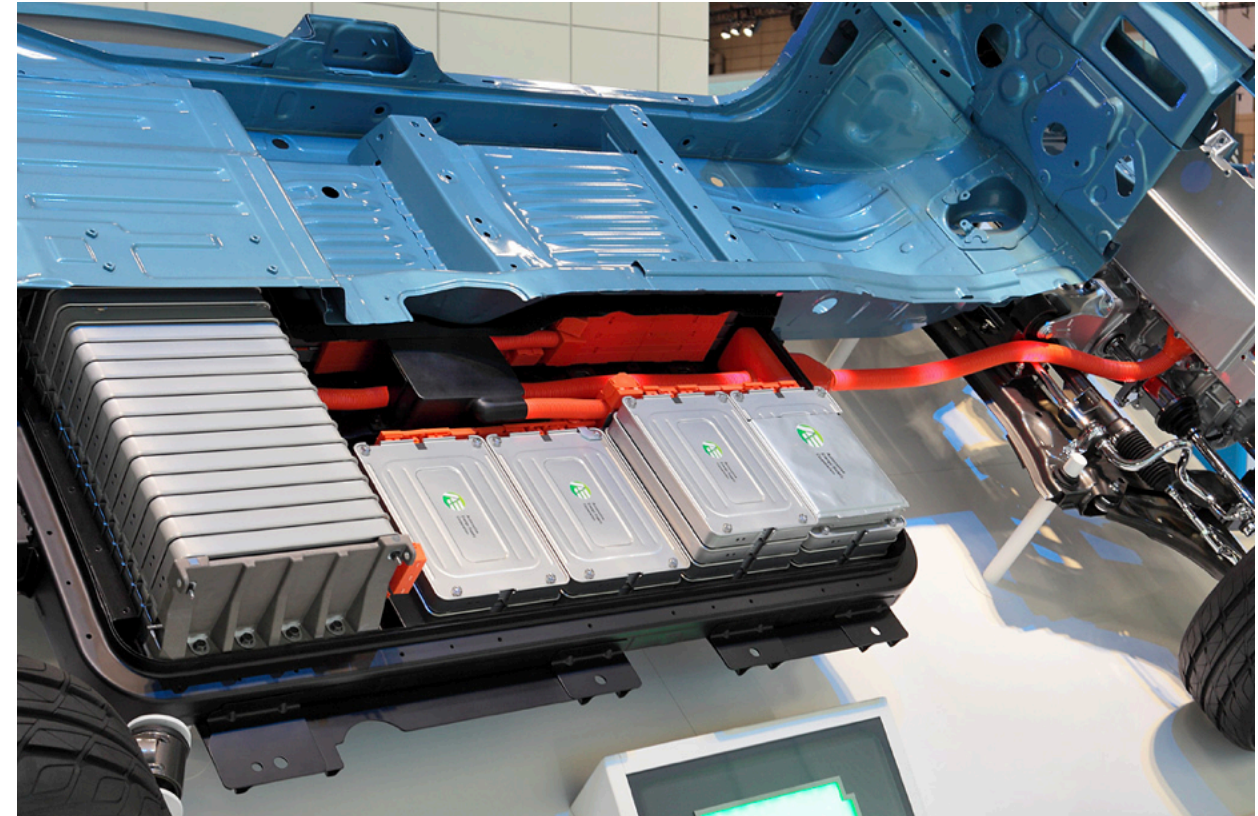
US could meet more than half of material demand for new batteries with recycled materials by 2040



Summary of LIB Policies across the world

Region	Policy	Year	Created for LIBs?	Landfill ban	EPR	Labelling requirement	Penalty enforcement	Other Characteristics
EU	The Battery Directive	2006	No – lead & cadmium batteries	✓		✓	✓	Reporting required; 50% recycling rate
Germany	The Germany Battery Act	2009	Yes	✓	✓	✓	✓	Reporting required; 45% recycling rate
China	Promotion Plan for EPR System; The Interim Measures for the Management of Recycling and Utilization of Power Batteries of New Energy Vehicles	2016; 2018	Yes	✓	✓	✓		Design for recycling encouraged; material tracing
India	Policy announced but under development	2019	Yes		✓			Subsidy provided
Japan	End-of-life Vehicle Recycling Law	2005	No - EOL vehicles	✓	✓	✓	✓	Upfront fee; reporting required

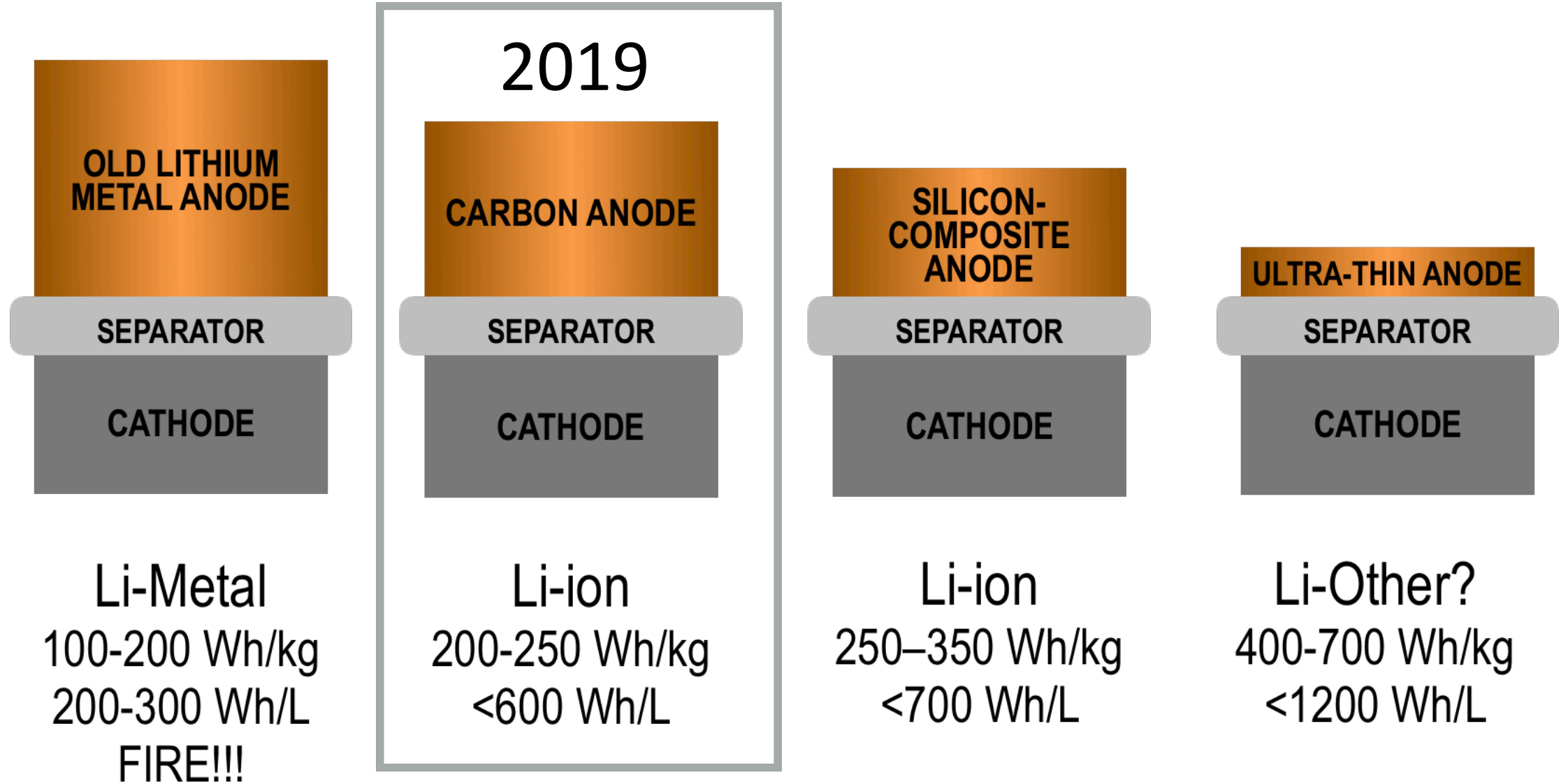
Lead Battery Recycling: A Good Example?



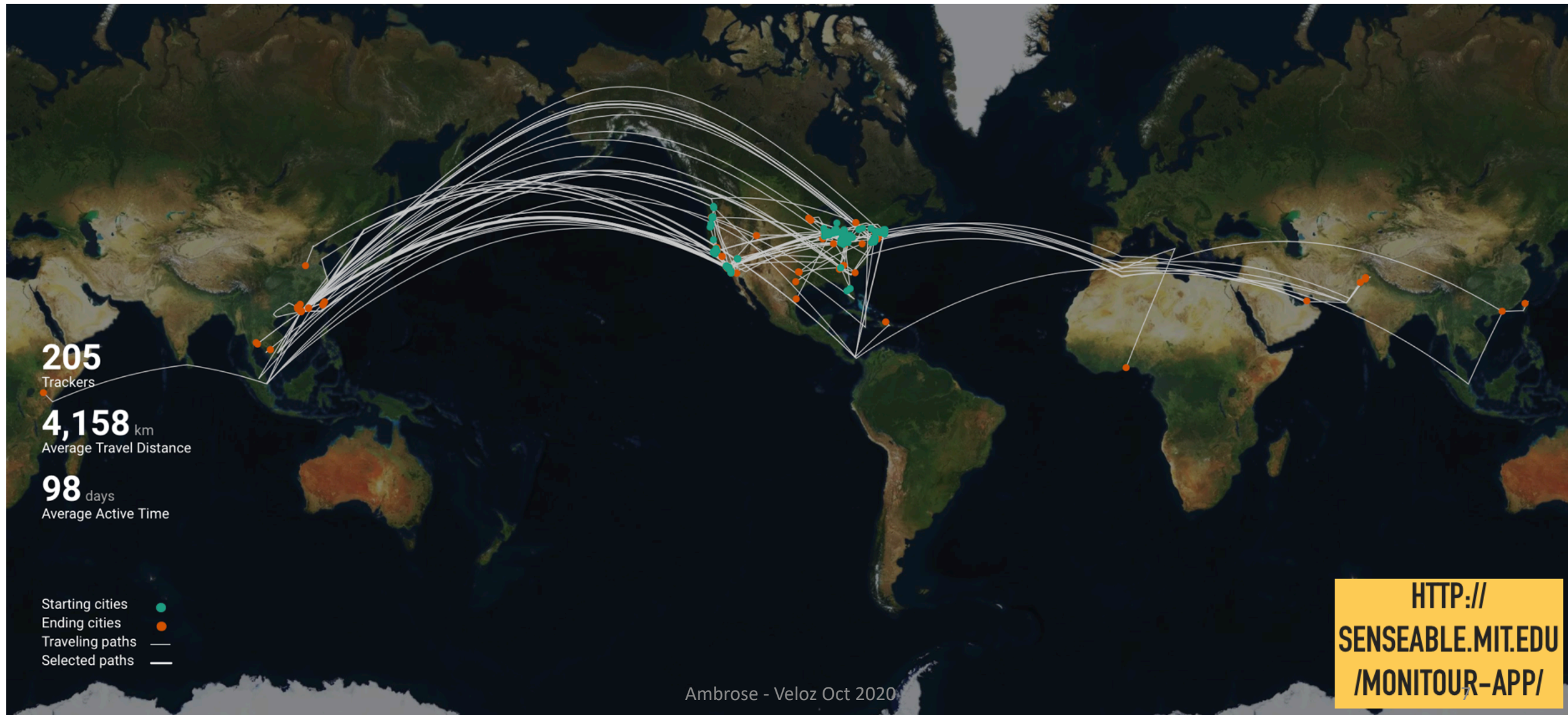
<https://circuitdigest.com/tutorial/lead-acid-battery-working-construction-and-charging-discharging>

https://en.wikipedia.org/wiki/Electric_vehicle_battery

Battery Design Continues to Evolve



Global value chains for e-waste



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