CRITICAL MINERALS

Battery Supply Chain

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Major components of Li-Ion Batteries

1. **Anodes** are commonly made of **carbon** and store Li$^+/e^-$ on charge.

2. **Cathodes** are commonly made from **metal oxides** with a layered structure and store Li$^+/e^-$ on discharge.

3. **Li$^+$ ions** carry the charge between the anode and cathode.

4. **Electrolyte** conducts Li$^+$ ions between the electrodes – ions move between the interstitial space between layers of electrode material.

5. **Separator** is placed between the electrodes and allows ionic conduction (Li$^+$) while preventing electric short circuiting (e$^-$).
Critical Minerals are major cell cost drivers

Battery costs driven by raw material costs…

Raw materials driven by cathode costs…

Cathode costs driven by lithium, nickel and cobalt

Battery metals supply are geologically constrained

- Raw material costs: Production costs, Raw material costs, Cathode
- Cathode costs: Electrolyte, Anode, Cathode
- Processing: Cobalt, Nickel, Lithium

Maintains stability during charge/discharge and improves battery safety
Enables higher energy density and longer range
Carries the charge between the anode and cathode

Reserve life of major battery materials

Higher prices required to deliver increase in global reserve base
Global battery capacity driven by EV growth in China

Demand for battery-grade lithium and nickel to increase by ~8X and ~19X respectively

Global battery capacity to grow ~5X from 500 GWh to 2.7 TWh by 2029, driven by EV growth in China...

Planned cell capacity

Cathode raw material demand

... which will increase demand for battery-grade lithium and nickel by ~10X and ~21X respectively

Source: Benchmark Minerals
Value In = Value Out
Quality sourcing, manufacturing, and recovery

- 100% of original battery materials remain at end of life
- Metals have infinite closed loop recycling potential
- Recycling technology will enhance knowledge in battery materials processing further fueling innovation
- Continuous iteration of R&D loop will result in reduced costs and improved sustainability of battery life cycle thus reducing mining requirements for resources
- Combines principle of industrial ecology in our factory design