Lithium, Cobalt & Nickel (batteries)

Source Metadata

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IEA Technology Definition

The IEA's Global Critical Minerals Outlook classifies lithium, cobalt, and nickel as essential battery minerals driving the energy transition. Lithium is the core element in all major lithium-ion battery chemistries (LFP, NMC, NCA). Cobalt and nickel enable higher energy density in NMC and NCA cathodes used in EVs and grid storage. The IEA tracks demand, supply, prices, and geopolitical concentration for each mineral.

Technology Readiness & Deployment

Mining and refining of all three minerals are commercially established industries. Lithium demand rose by nearly 30% in 2024 alone, significantly exceeding the 10% annual growth rate seen in the 2010s. In the IEA Stated Policies Scenario, lithium demand grows fivefold from today to 2040. Nickel demand is projected to double, while cobalt demand grows 50-60% by 2040. The shift toward LFP chemistry reduces cobalt and nickel intensity per battery but total demand still grows with fleet electrification.

Key Metrics & Benchmarks

Global lithium production exceeded 180,000 tonnes (lithium carbonate equivalent) in 2024. Australia, Chile, and China dominate lithium supply. The Democratic Republic of Congo supplies over 70% of cobalt. Indonesia has become the world's largest nickel producer. Near-term lithium markets appear well-supplied, but the IEA projects markets will move into deficit by the 2030s as EV adoption accelerates beyond current mine project pipelines.

LATAM Relevance

Latin America supplies 35% of the world's lithium, led by Chile (26%) and Argentina (6%), and holds more than half of global lithium reserves in the Lithium Triangle (Chile, Argentina, Bolivia). The region's lithium is primarily extracted from brine deposits in salt flats. Regional efforts to move up the battery value chain include Chile's national lithium strategy and Argentina's investment incentives for lithium processing. Brazil has emerging hard-rock lithium deposits.

Critical Minerals Link

This is the core critical minerals page for battery supply chains. Lithium, cobalt, and nickel demand are directly driven by EV and storage battery deployment. Recycling and second-life applications are emerging but currently recover less than 5% of lithium and 10-15% of cobalt from end-of-life batteries. Diversifying supply and developing recycling infrastructure are IEA priorities for supply chain resilience.

Cleantech Taxonomy Crosswalk

Maps to Cleantech Taxonomy sectors: IN (Industry) — mining, refining, battery manufacturing; TR (Transport) — EV battery demand; ES (Energy Systems) — grid storage battery demand; XS (Cross-Sectoral) — supply chain governance, ESG standards in mining.

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