

Topics (<https://www.iea.org/topics>) / Critical Minerals ([/topics/critical-minerals](https://www.iea.org/topics/critical-minerals))

## A new frontier for global energy security

# Critical Minerals

Critical minerals such as copper, lithium, nickel, cobalt and rare earth elements are essential components of many of today's rapidly growing energy technologies – from wind turbines and electricity networks to electric vehicles. Demand for these materials is growing quickly as energy transitions gather pace.

The types of mineral resources used vary by technology. Lithium, nickel, cobalt, manganese and graphite are crucial to battery performance. Rare earth elements are essential for permanent magnets used in wind turbines and EV motors. Electricity networks need a huge amount of aluminium and copper, the latter of which is the cornerstone of all electricity-related technologies. Learn more about the various minerals in the short video below.

**These Rare Minerals Hold the Key to Scaling Up Renewable Energy**



## **Ensuring secure, sustainable and responsible supply chains**

In the years ahead, ensuring reliable supplies of critical minerals will be key to the security of energy systems. However, there are risks. Our analysis indicates that today's well-supplied market may not be a good guide for the future as demand rises. Additionally, the over-concentration in critical minerals markets today is unprecedented compared with any other major commodity we rely on in the modern world.

To support countries as they look to develop sufficient and resilient critical mineral supply chains – a top priority for governments, companies and investors globally – the IEA has been growing its work in this field, expanding its production of high-quality data, analysis and policy recommendations that can inform decision-making among stakeholders.

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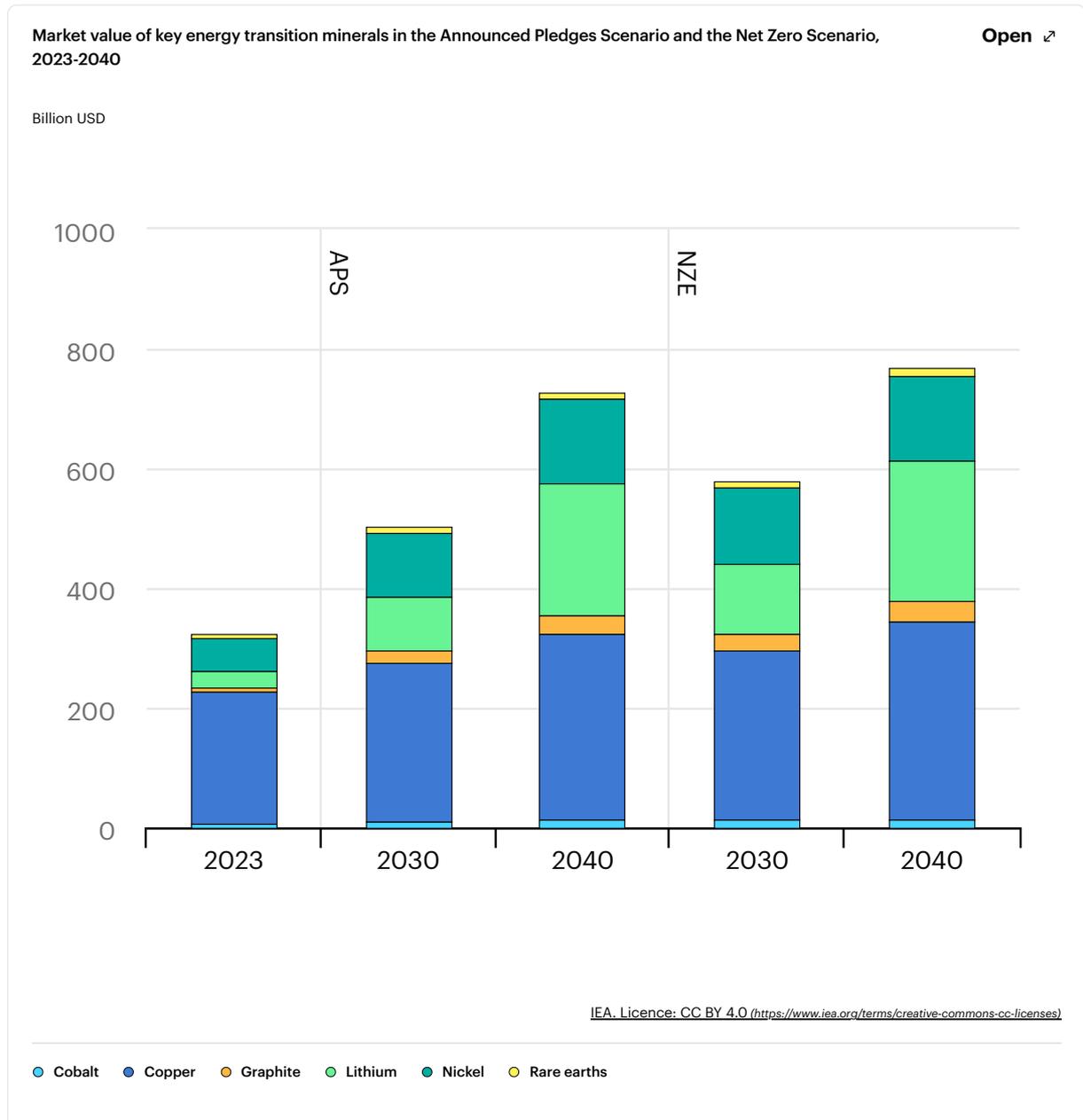
## **Key findings**

## Clean energy transitions are driving a significant increase in mineral demand

Driven mainly by clean energy applications, demand for critical minerals experienced strong growth in 2023. Lithium consumption rose by 30%, while demand for nickel, cobalt, graphite and rare earth elements all saw increases ranging from 8% to 15%. At around \$325 billion, today's aggregate market value of key energy transition minerals aligns broadly with that of iron ore.

Demand for critical minerals is set to expand as the uptake of clean energy technologies continues to accelerate. If countries fully implement the national energy and climate pledges they have announced, mineral demand for clean energy technologies would more than double by 2030 and triple by 2040, reaching nearly 35 million tonnes (Mt) annually.

**Critical Minerals Data Explorer** 



## Investment in new mineral supply continued to rise in 2023

A pullback in prices affected spending on new mineral supply in 2023, but investment in critical mineral mining nonetheless grew by 10% year-over-year. Investment by lithium specialists saw a sharp rise of 60% despite weak prices. Exploration spending also rose by 15%, driven by Canada and Australia.

Venture capital spending increased by 30%, with significant growth in battery recycling offsetting reducing investment in mining and refining start-ups. Meanwhile, China's spending on and acquisition of overseas mines has grown significantly in the past 10 years. It reached a record level of \$10 billion in the first half of 2023, with a particular focus on battery metals such as lithium, nickel and cobalt.

### Global Critical Minerals Outlook 2024 [▶](#)

