



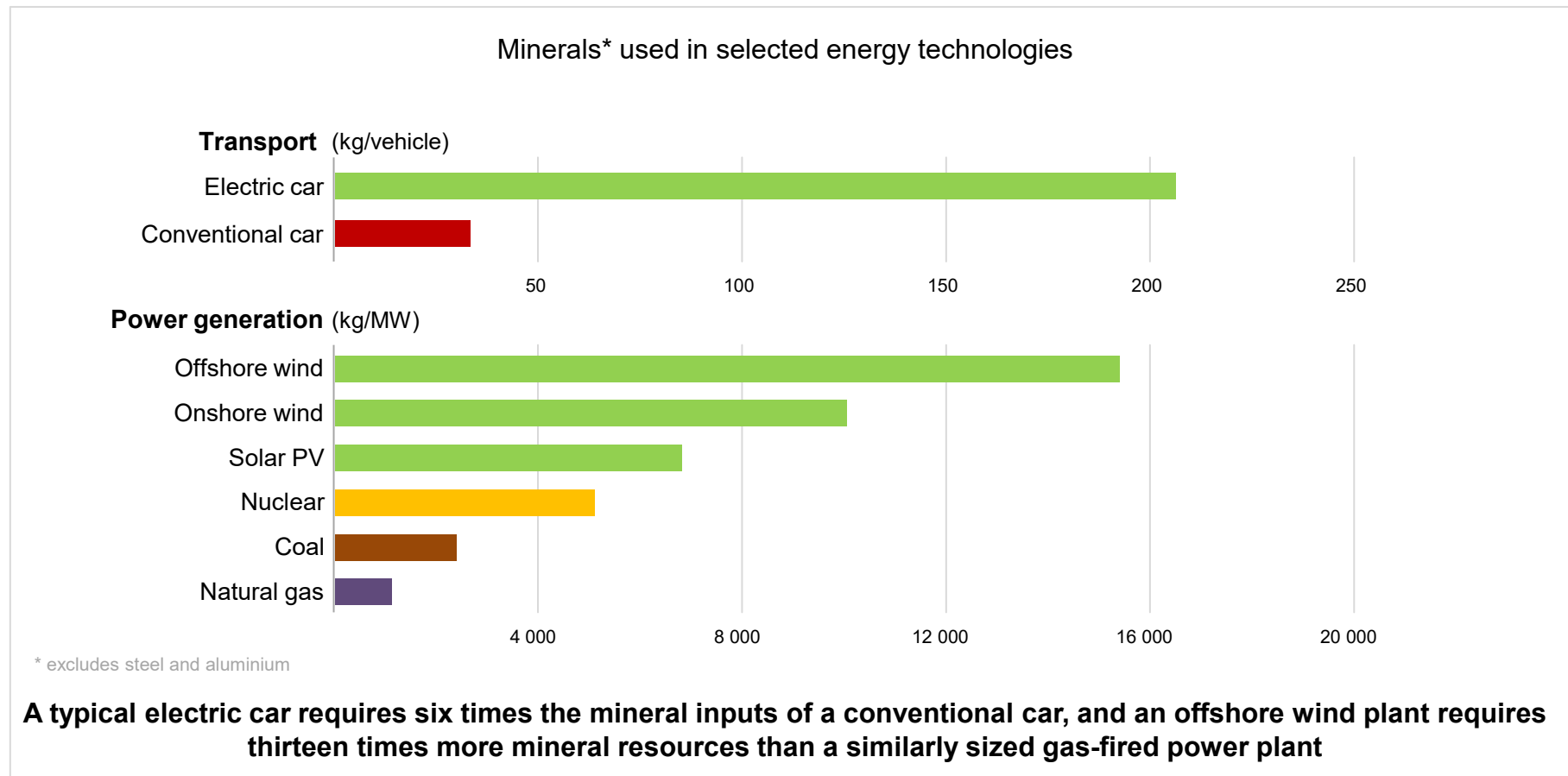
# The role of critical minerals in clean energy transitions

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Toru Muta, Senior Energy Analyst

# Context: the shift to a more mineral-intensive energy system



Where do existing policies take us?



Stated Policies Scenario

What is the impact of announced net zero and other pledges if they are met in full?



Announced Pledges Scenario

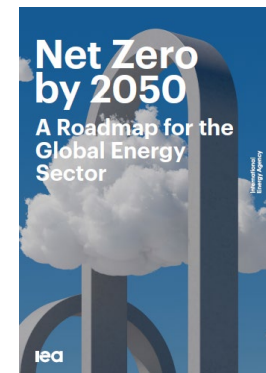
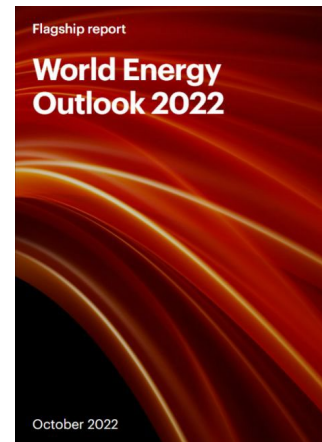
What is required for the energy sector to reach net zero CO<sub>2</sub> emissions by 2050?



Net Zero Emissions by 2050 Scenario

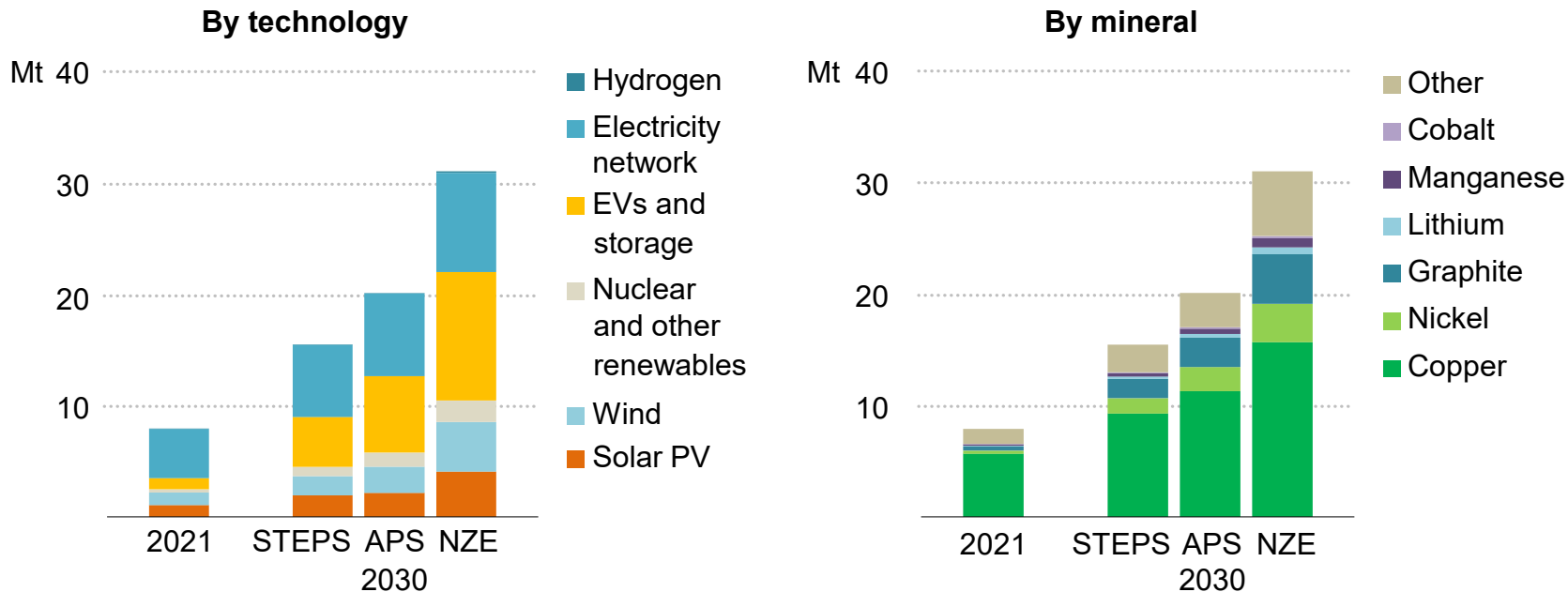
## 3 core scenarios

Since its 2021 flagship report on critical minerals, IEA updates and uses the latest available data to analyze energy, emissions and climate trends, based on the 2022 *World Energy Outlook (WEO)*.



# Meeting climate goals will turbo-charge demand for minerals

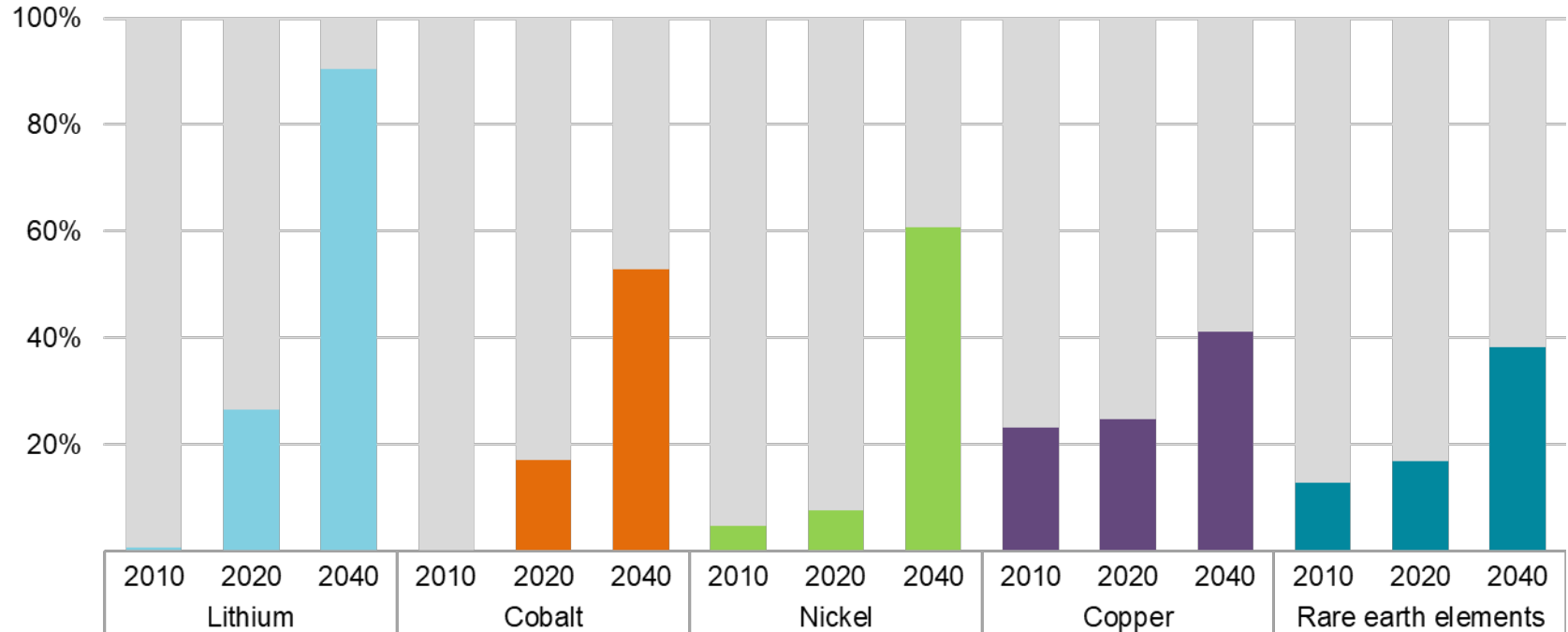
Mineral demand for clean energy technologies by scenario



**Demand for critical minerals is set to soar over the next two decades as the world pursues net zero goals; overall requirements rise by as much as 4 times, but individual minerals, led by lithium, rise even faster**

# Clean energy in the driving seat for mineral demand growth

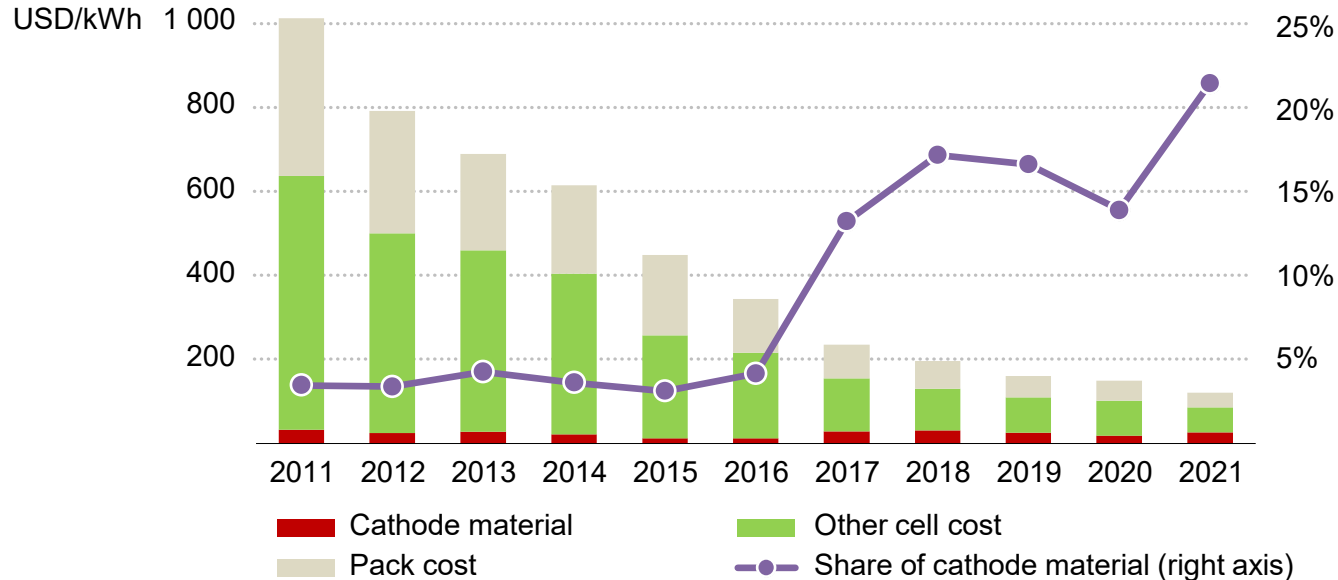
Share of clean energy technologies in total demand for selected minerals in the APS



**Clean energy technologies emerge as the fastest growing segment of demand for most minerals, evolving from a niche consumer to a leading source of demand**

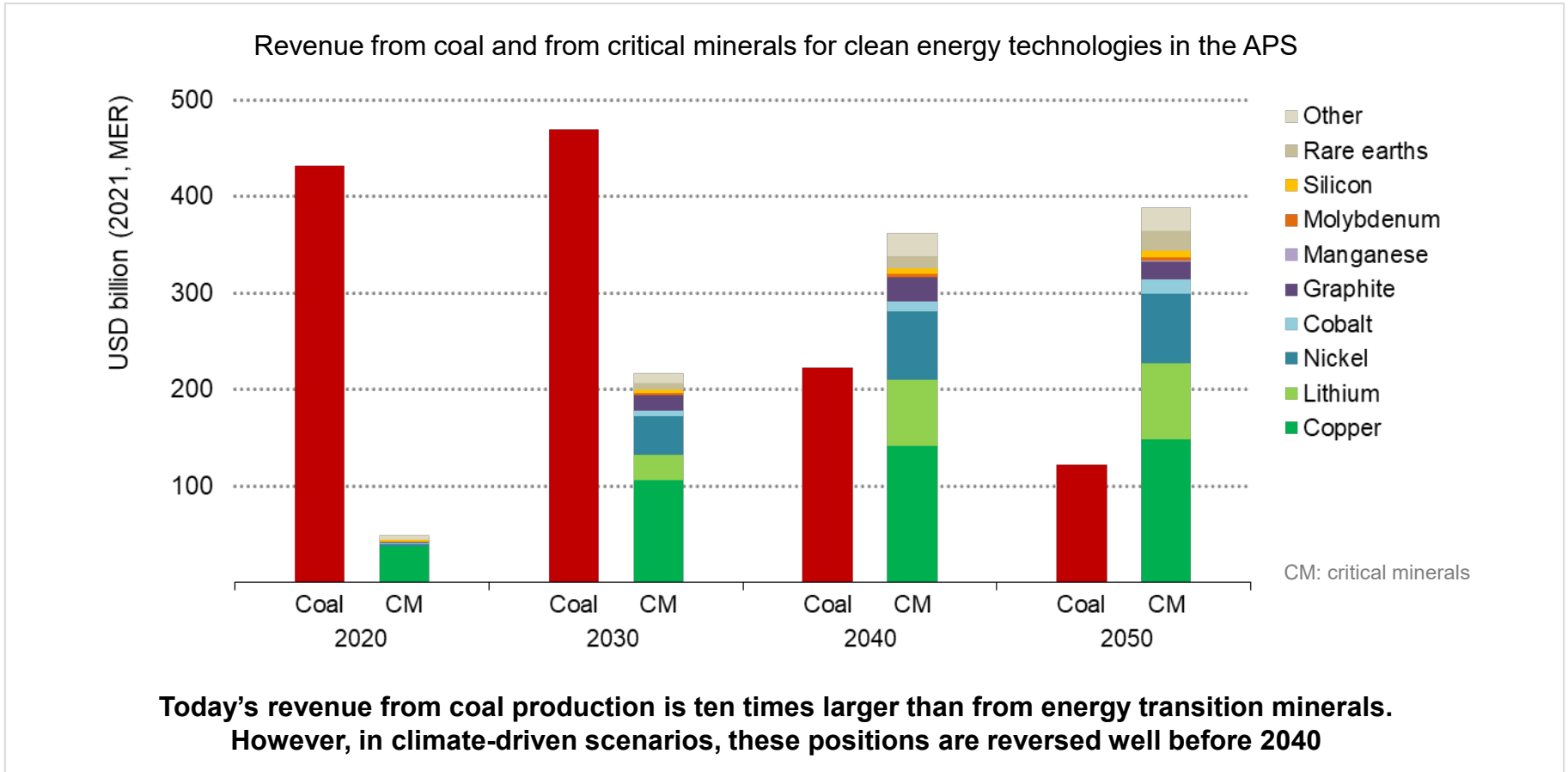
# Growing impacts of commodity prices on clean technology cost

Average pack price of lithium-ion batteries and share of cathode material cost



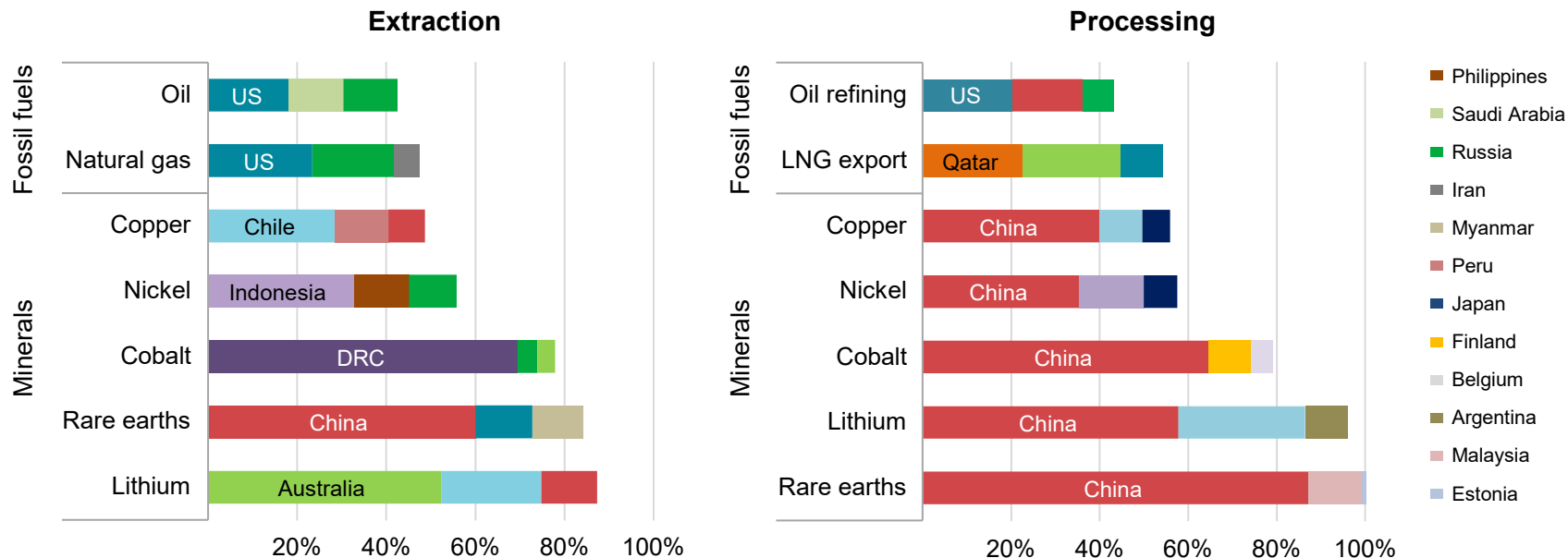
**As learning and economies of scale bring down other cost components, raw materials account for an increasingly large share of the total cost of batteries and other key clean energy technologies**

# New reasons to go underground



# Many mineral supply chains lack diversity

Share of top three producing countries in production of selected minerals and fossil fuels, 2019

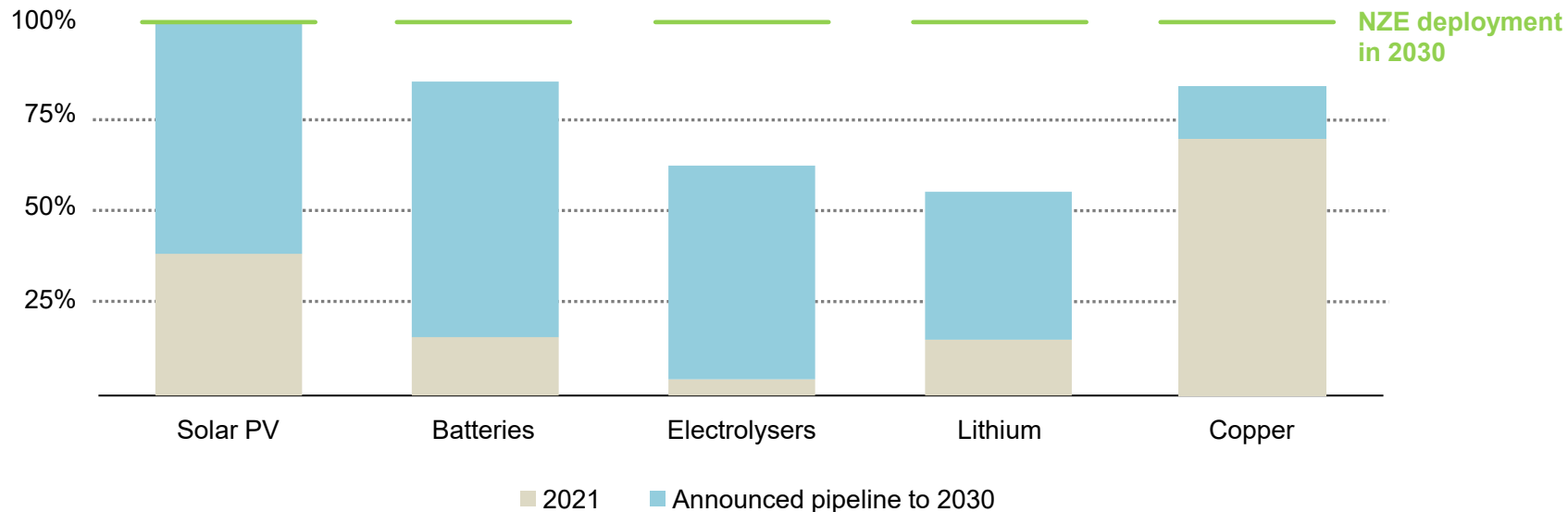


**Production and processing of many minerals such as lithium, cobalt and some rare earth elements are geographically concentrated, with the top three producers accounting for more than 75% of supplies**



# Uneven pace of supply chain developments

Announced manufacturing capacity pipeline compared with NZE Scenario deployment in 2030



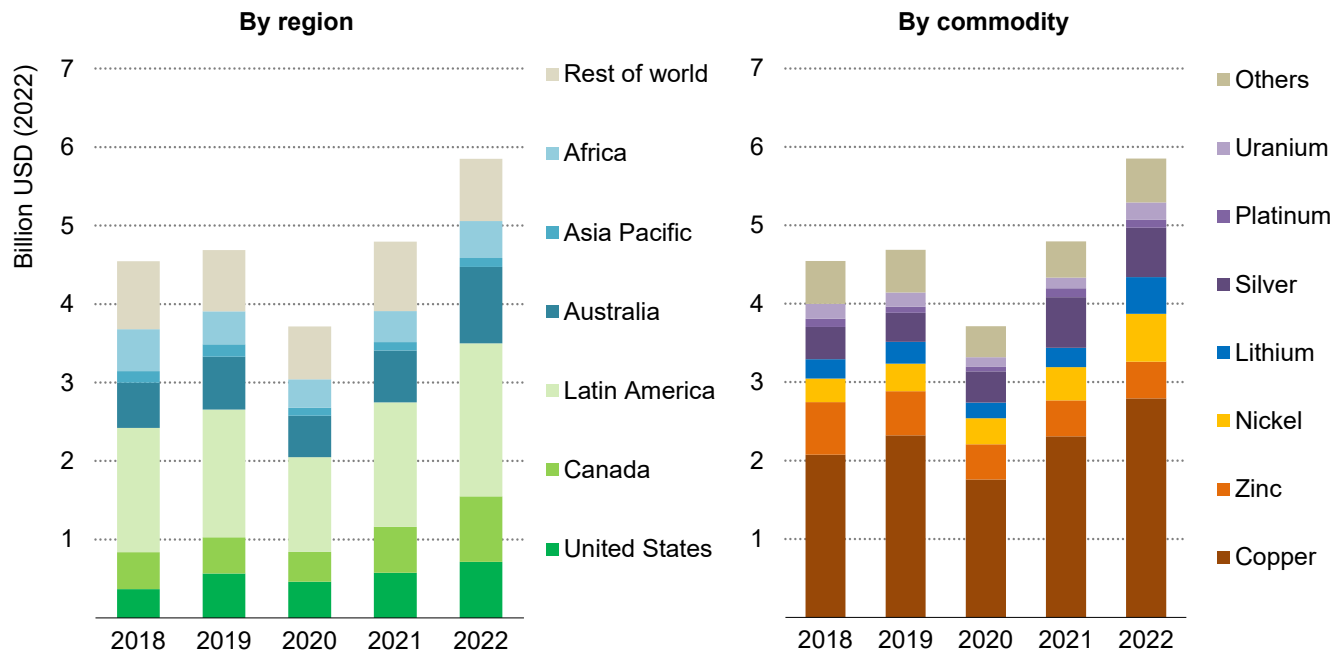
**Announced plans to scale up clean energy manufacturing capacity help to put the world on track with a 1.5 °C pathway, but not all parts of the value chain are moving at a similar pace**

Building on the IEA's leadership role in energy security, these six key areas of action can ensure that critical minerals enable an accelerated transition to clean energy

- 1. Ensure adequate investment in diversified sources of supply**

# Investment shows signs of rebound, but trends need to be sustained

Exploration spending for selected non-ferrous mineral resources



**Exploration spending for mineral resources also rebounded strongly in 2021 and 2022, led by the Americas**

Building on the IEA's leadership role in energy security, these six key areas of action can ensure that critical minerals enable an accelerated transition to clean energy

- 1. Ensure adequate investment in diversified sources of supply**
- 2. Promote technology innovation at all points along the value chain**
- 3. Scale up recycling**
- 4. Enhance supply chain resilience and market transparency**
- 5. Mainstream higher environmental, social and governance standards**
- 6. Strengthen international collaboration between producers and consumers**

On April 16<sup>th</sup>, G7 Ministers committed to a Five-Point Plan for Critical Minerals Security that the IEA will support, including by producing medium- and long-term outlooks for critical minerals demand and supply to help inform decision making.

## 1. Forecast Long-term Supply and Demand

*“the IEA establish an internal task force and undertake the analysis and verification in collaboration with the IEA’s Working Party on Critical Minerals”*

## 2. Develop Resources and Supply Chains Responsibly

## 3. Recycle More and Share Capabilities

## 4. Save with Innovations

## 5. Prepare for Supply Disruptions

*“the IEA’s consideration of “Voluntary Critical Mineral Security Program” to prepare for short-term supply disruptions of critical minerals”*

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