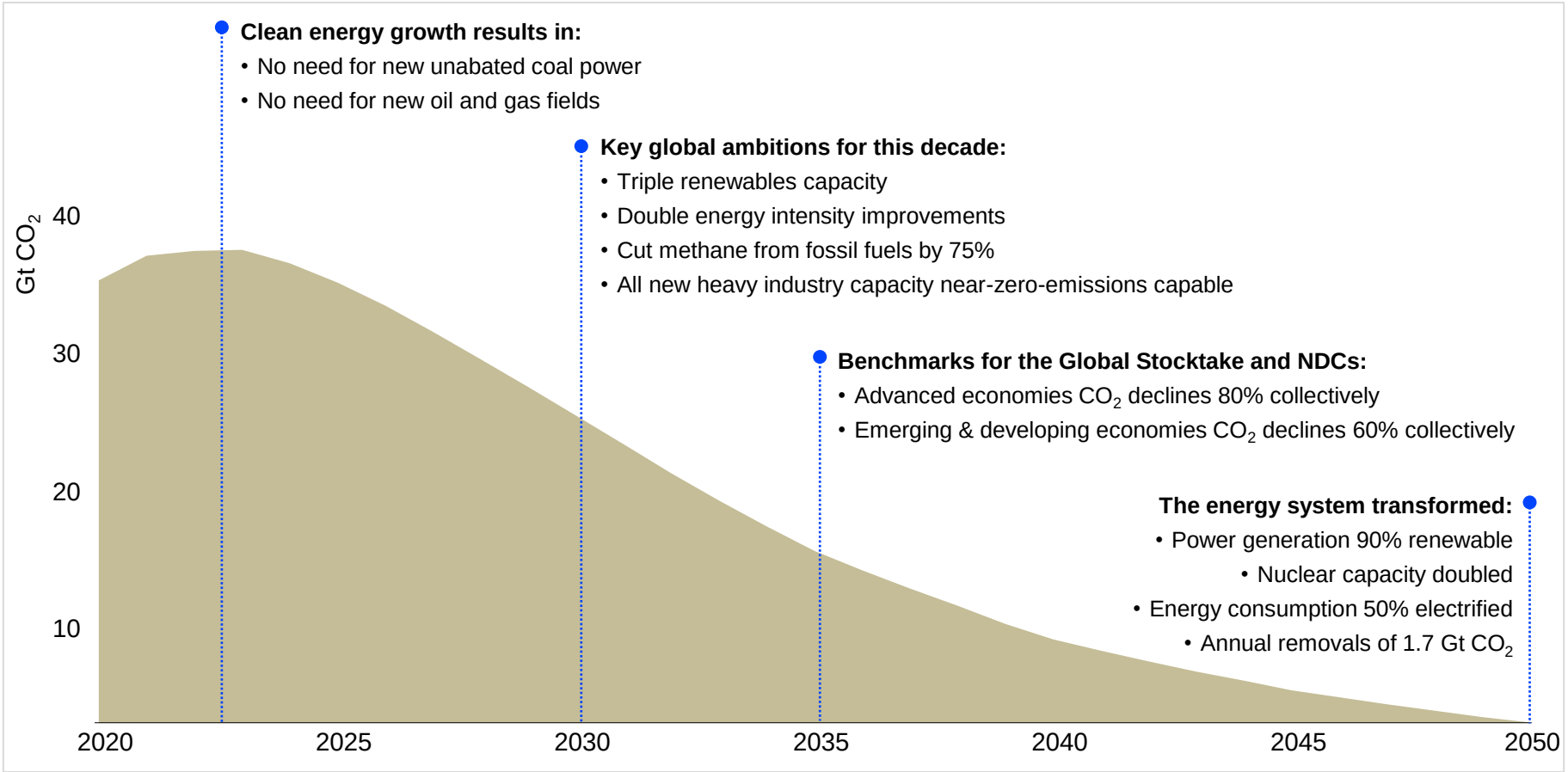
International Energy Agency

Materials Challenges in the Clean Energy Transition

Dr Peter Levi, Energy Technology Policy Division, International Energy Agency

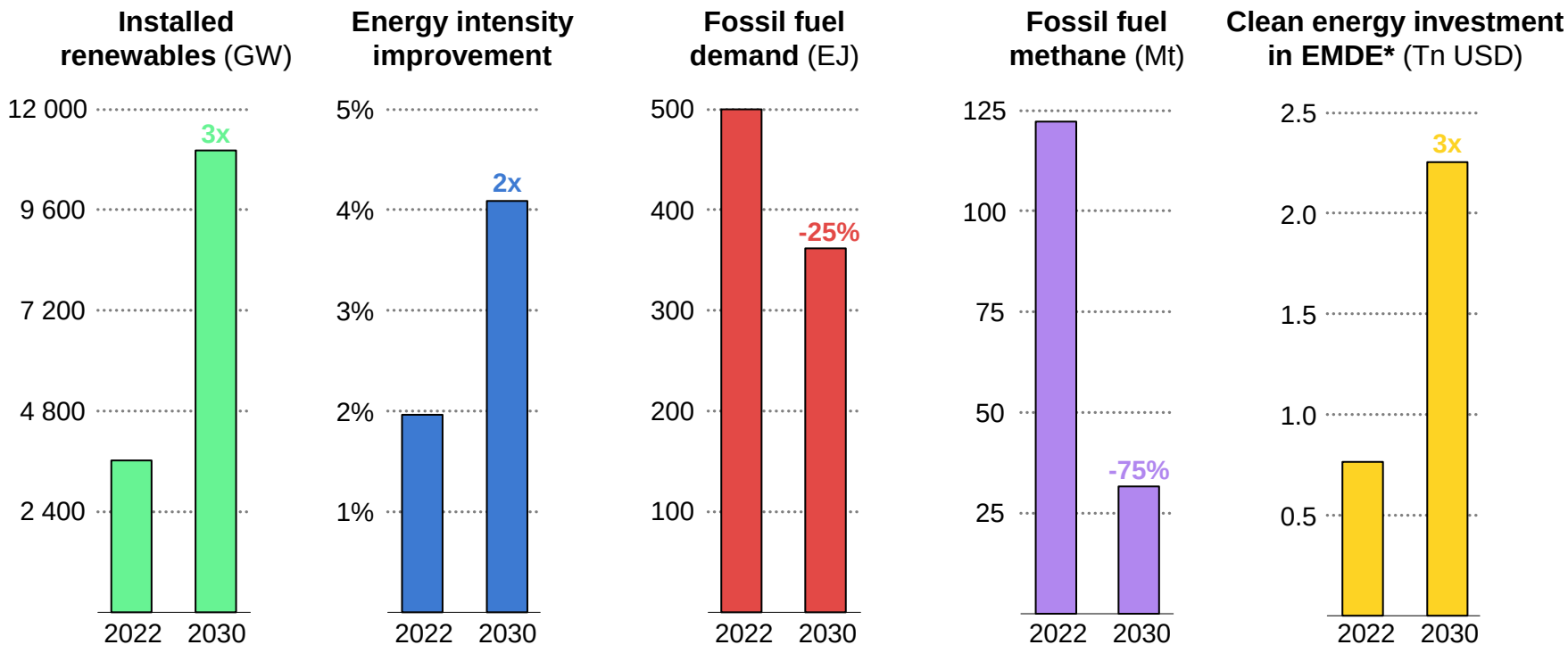
EC-JRC and IEA-EGRD Clean Energy Supply Chains Workshop, Petten, December 2023 (Online)

A global roadmap to net zero by 2050



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Five pillars to keep 1.5 °C alive

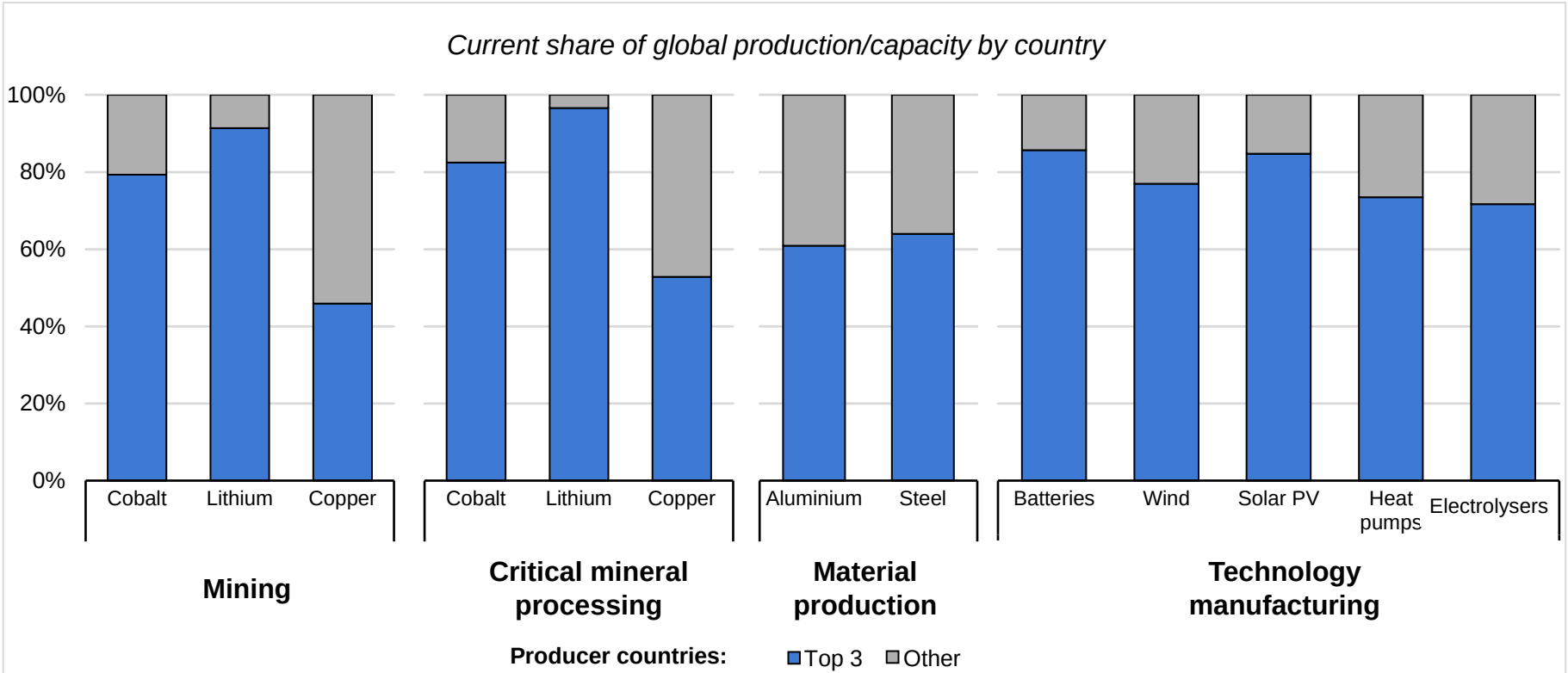


A comprehensive energy package for COP28 needs to drive the growth in clean energy, support emerging and developing economies in the transition, and recognise the need to reduce fossil fuel demand

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* EMDE = emerging market and developing economies

Clean technology supply chain concentration risks extend beyond mining

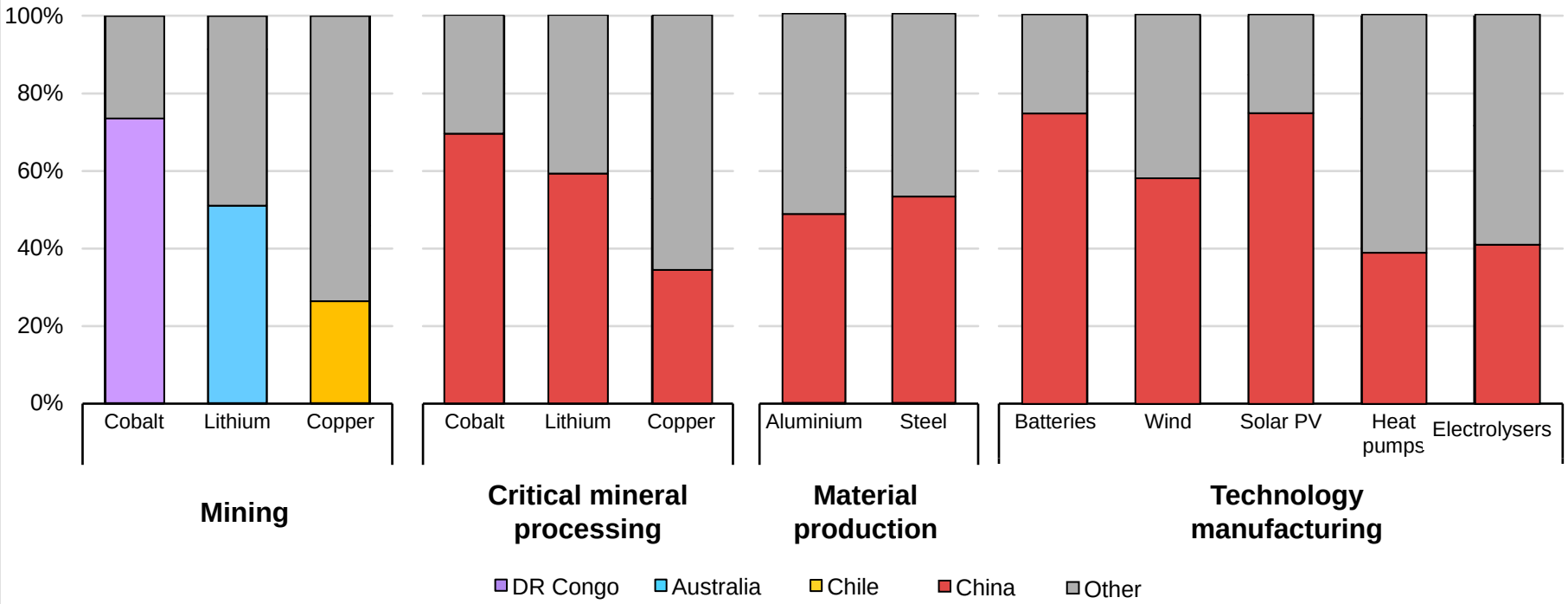


The top three countries together account for over 70% of global capacity for manufacturing key clean technologies. China is the single largest producer in all major clean technology supply chain steps except mining.

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Clean technology supply chain concentration risks extend beyond mining

Current share of global production/capacity by country

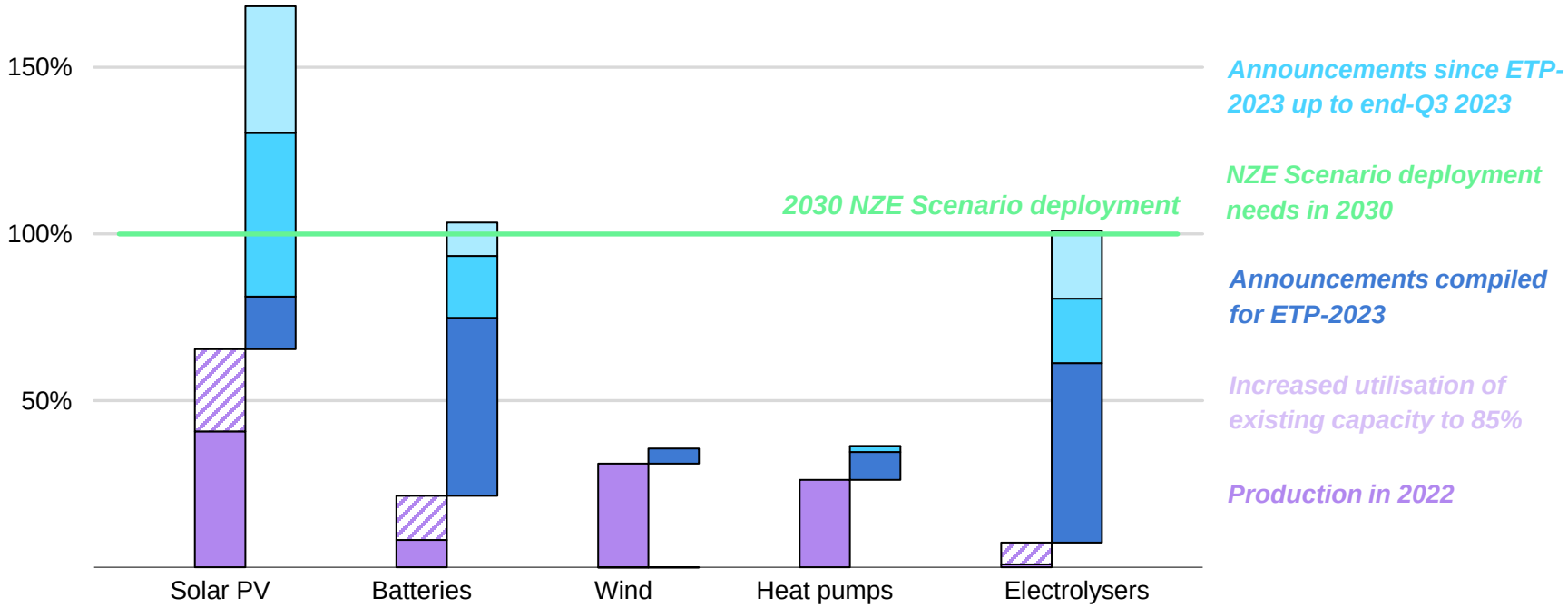


The top three countries together account for over 70% of global capacity for manufacturing key clean technologies. China is the single largest producer in all major clean technology supply chain steps except mining.

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Dynamic project pipelines – update analysis in November 2023

Projected throughput from existing and announced manufacturing capacity relative to NZE deployment needs in 2030

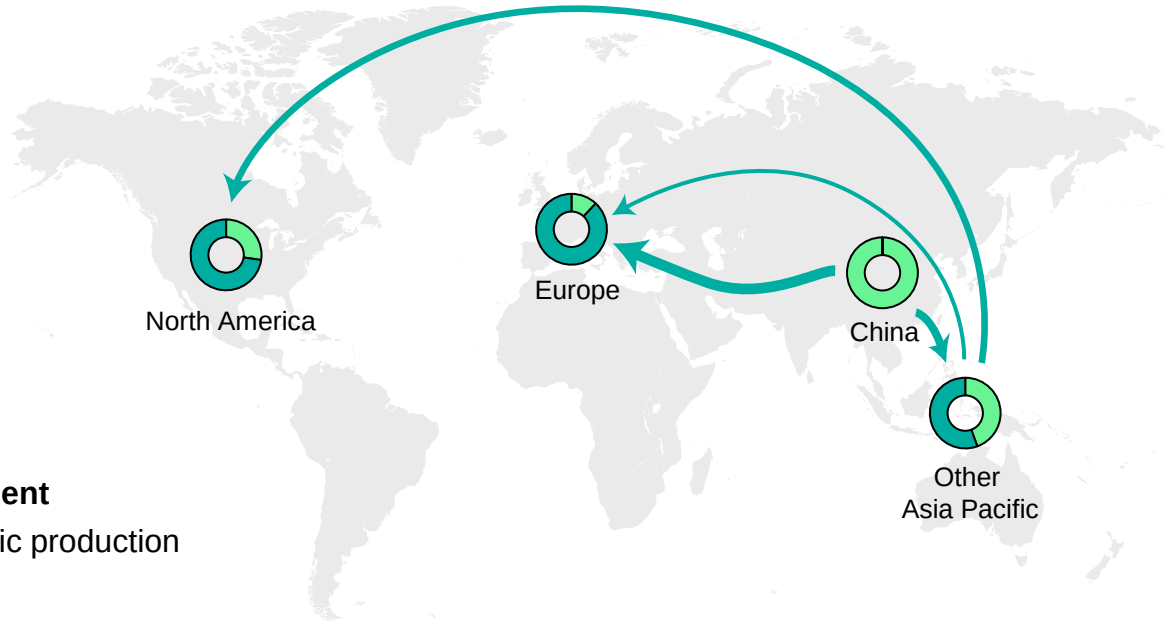


Nearly 90% of project announcements for solar PV modules and 30% for batteries took place since the analysis conducted for *ETP-2023*

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Clean technology supply chains benefit from international trade

Main net trade flows for selected clean technologies, 2021



Solar PV modules

Share of trade in global deployment:

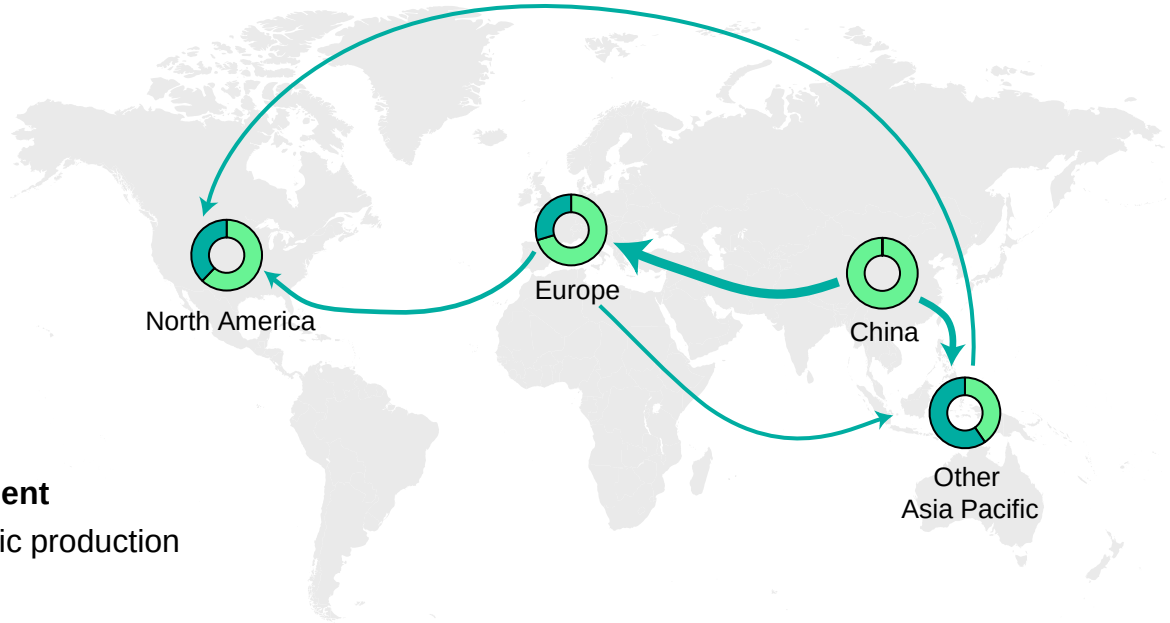
~60%

A large domestic market created by rapid clean technology deployment, combined with concerted industrial policy, have made China the dominant player in global clean technology manufacturing and trade.

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Clean technology supply chains benefit from international trade

Main net trade flows for selected clean technologies, 2021



Wind

Share of trade in global deployment:

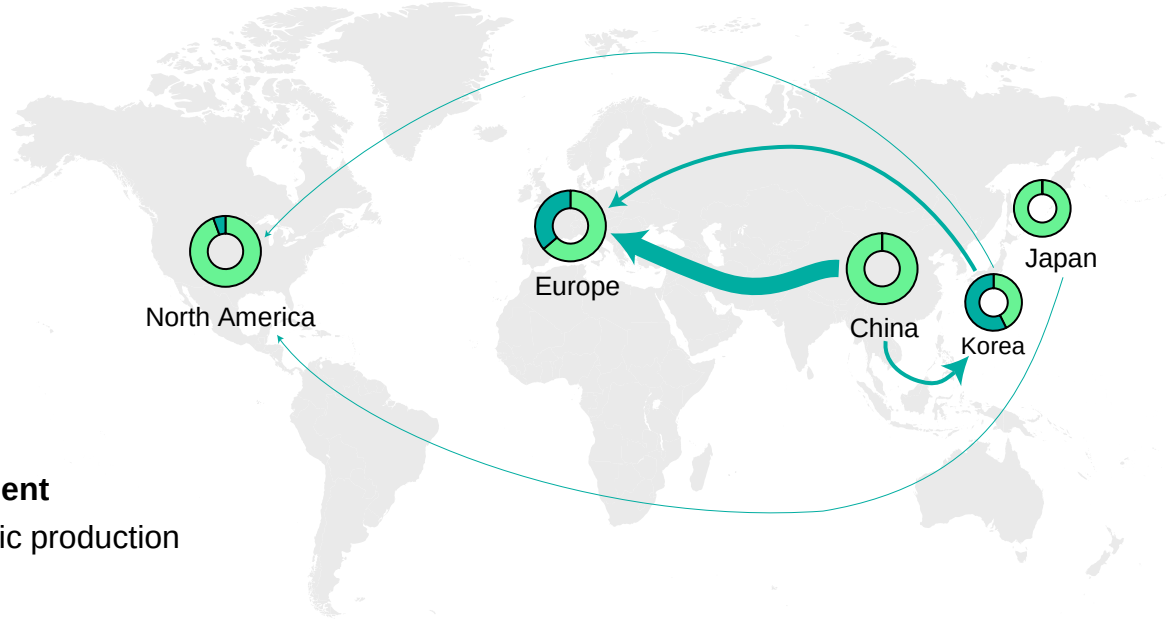
~20%

A large domestic market created by rapid clean technology deployment, combined with concerted industrial policy, have made China the dominant player in global clean technology manufacturing and trade.

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Clean technology supply chains benefit from international trade

Main net trade flows for selected clean technologies, 2021



EV batteries

Share of trade in global deployment:

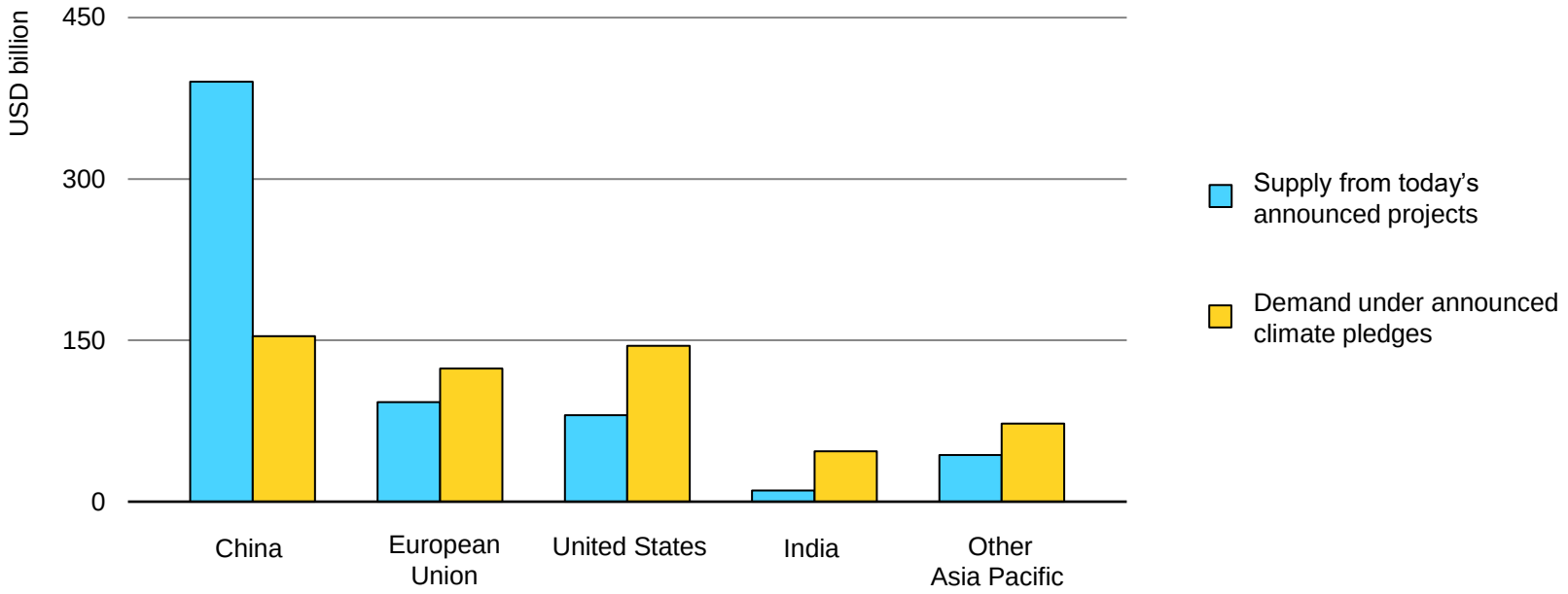
~10%

A large domestic market created by rapid clean technology deployment, combined with concerted industrial policy, have made China the dominant player in global clean technology manufacturing and trade.

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Markets for clean technologies constitute a major opportunity

Market sizes for supply from announced projects and demand under announced pledges for key clean technologies, 2030

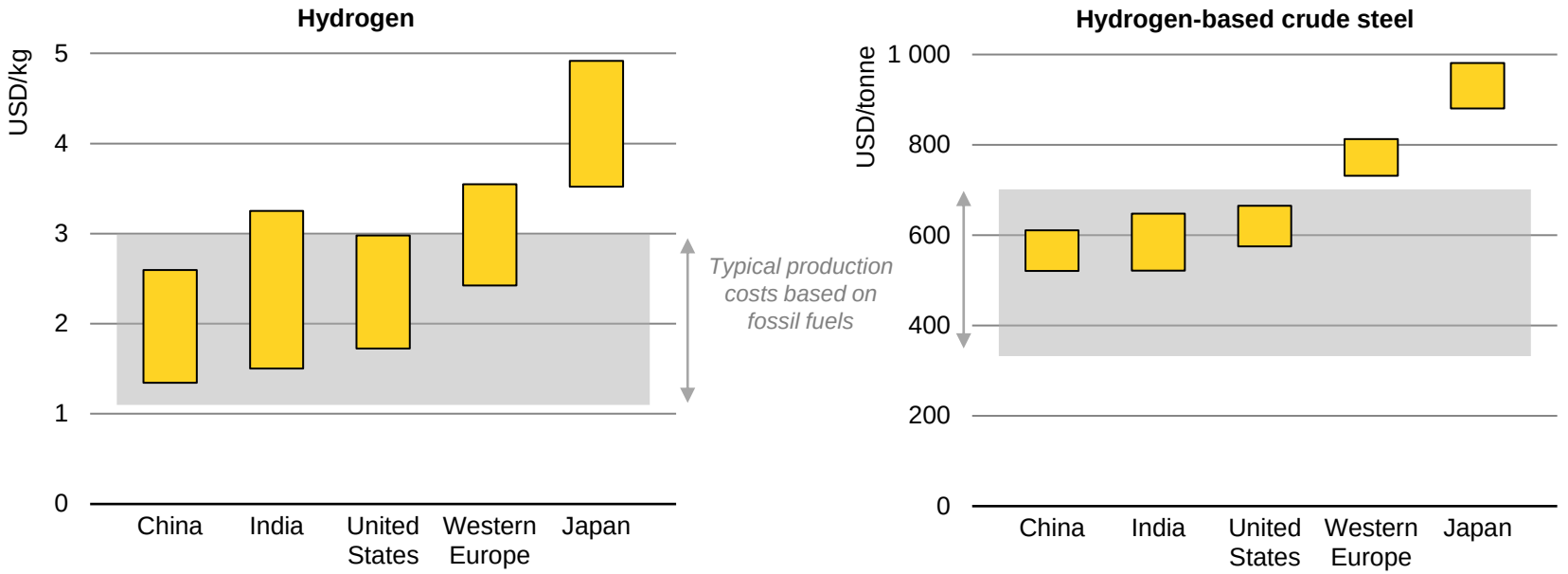


Committed projects in the United States and the European Union account for less than 20% of domestic expansion plans, leaving significant opportunity to increase production in fulfilling announced climate pledges.

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Competitiveness is a key consideration for industrial strategies

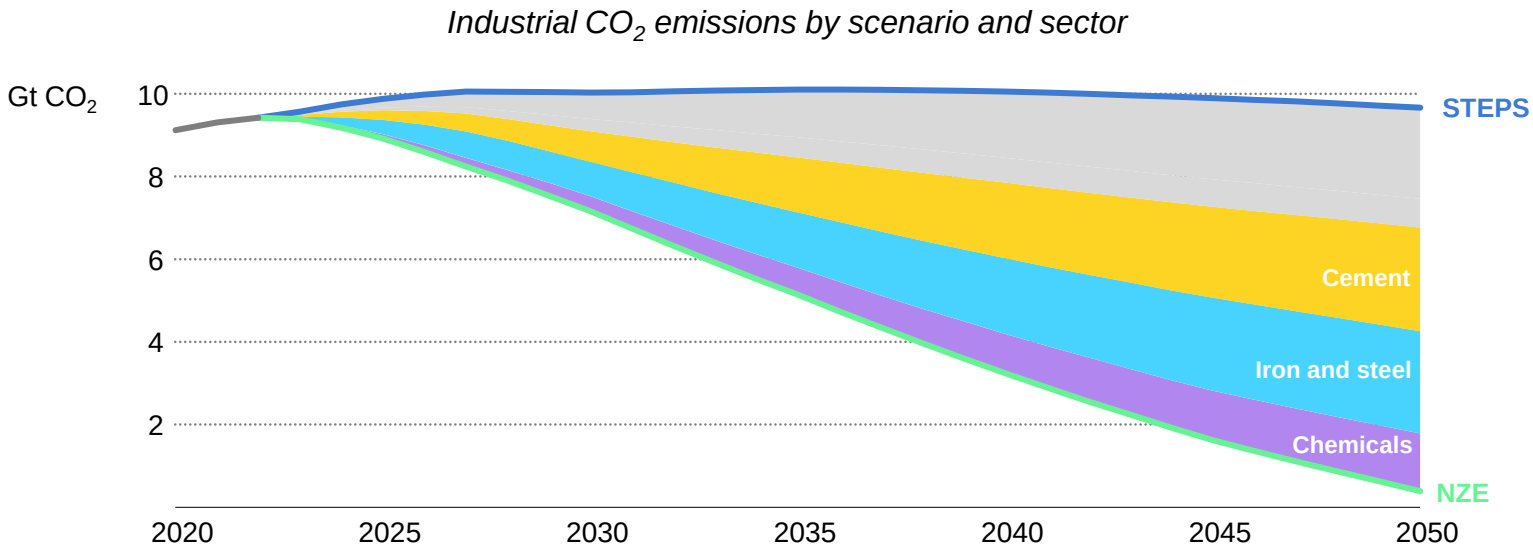
Production costs using electrolysis and variable renewables under announced climate pledges, 2030



Climate goals and innovation policy are driving new project announcements for energy intensive commodities, but persistent cost competitiveness gaps indicate the need for strategic partnerships and international collaboration.

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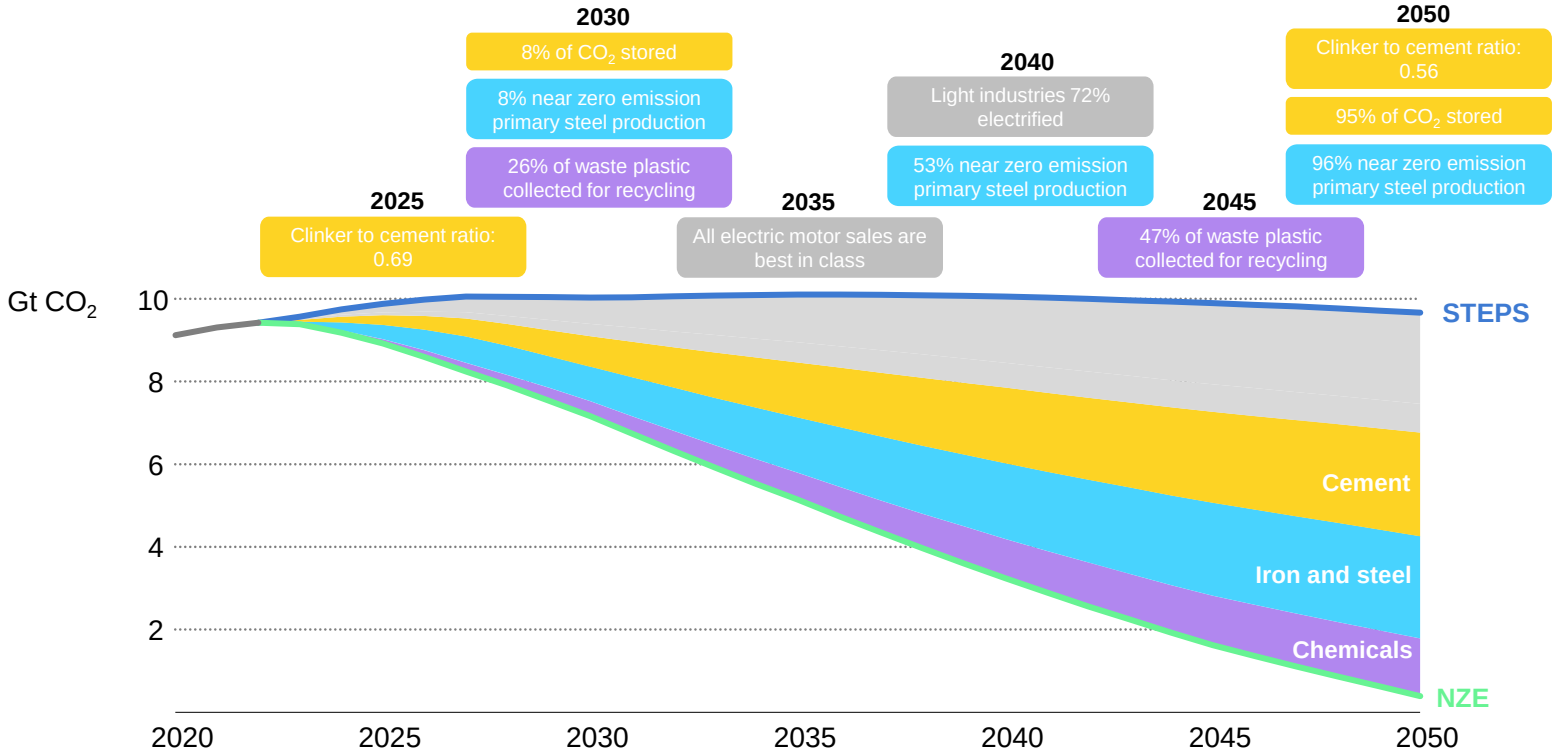
Net zero means tackling ‘hard to abate’ industrial emissions



Heavy industry sectors – cement, steel and chemicals – account for around 70% of industrial CO_2 emissions today, presenting a variety of technical challenges on the pathway to a net zero emissions energy system

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Net zero means tackling ‘hard to abate’ industrial emissions

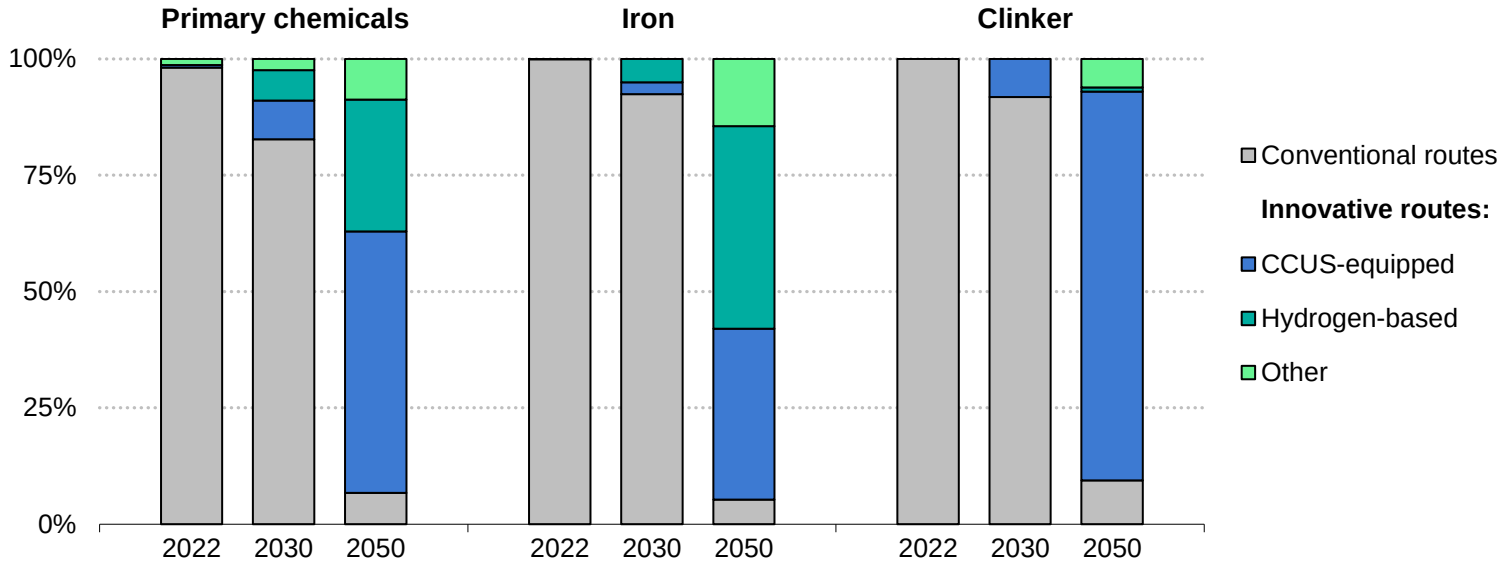


Heavy industry sectors – cement, steel and chemicals – account for around 70% of industrial CO_2 emissions today, presenting a variety of technical challenges on the pathway to a net zero emissions energy system

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Innovative technology deployment in heavy industries

Share of innovative near-zero emissions technology deployment in heavy industries in the NZE Scenario



Near-zero emissions routes dominate primary chemicals, iron and clinker production by 2050, with key roles for CCUS and hydrogen-based technologies

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Key takeaways

- The energy world is in the early phase of a new industrial age – the age of clean energy technology manufacturing; reaping the benefits requires an **all-of-government approach**.

- High geographical and market concentrations threaten **supply security;** the policies to deal with such threats differ by supply chain, and must build on competitive advantages and strengths.

- Boosting **supply chain resilience** and **sustainability** is crucial; market disruptions and input price fluctuations can have profound cost implications.

- Participating in the emerging new energy economy requires **industrial strategies** that build on a **mapping of domestic opportunities** and **identify strategic partnerships**.

- **Time is of the essence** for clean energy technology supply chains; governments hold the key to accelerating deployment and tapping into economic opportunities.

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