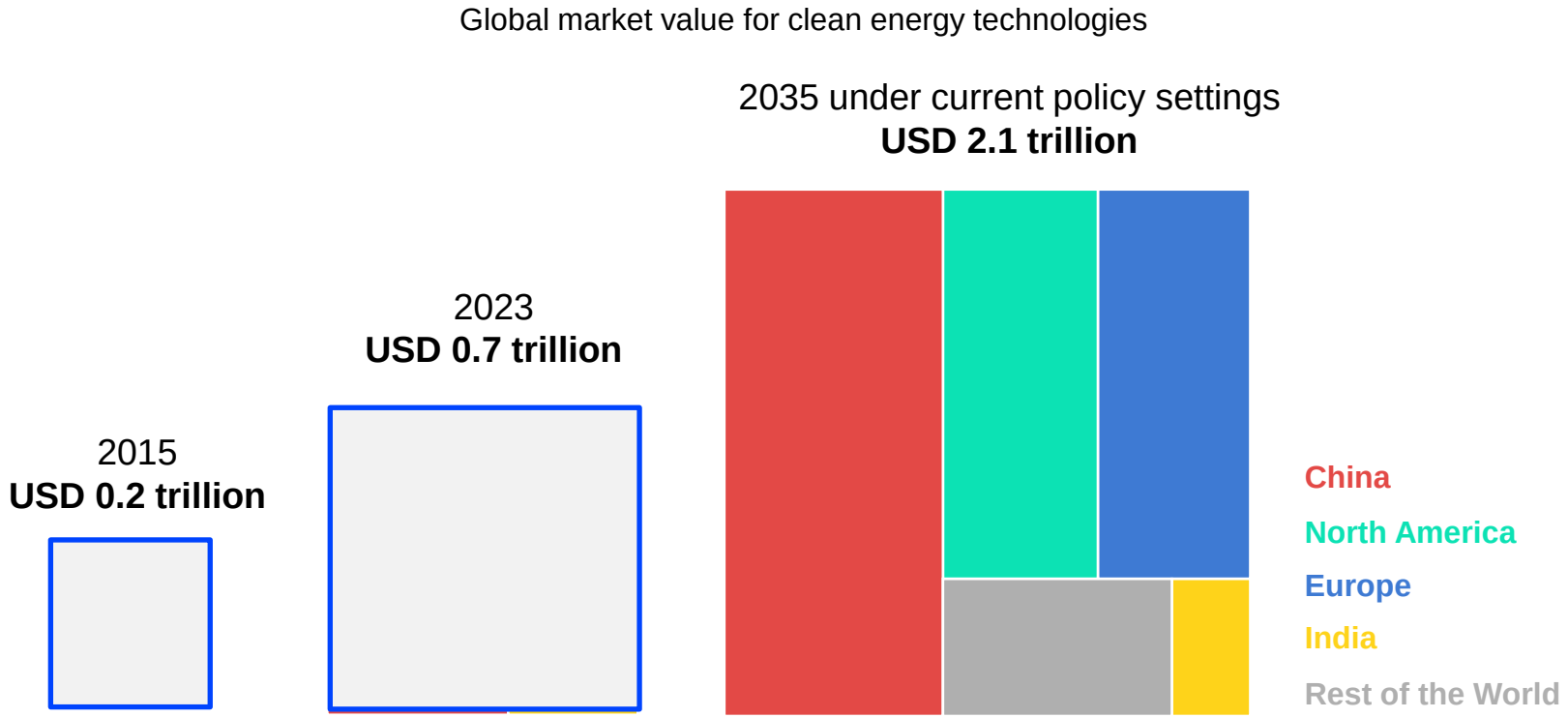
International Energy Agency

Energy Technology Perspectives 2024

Dr. Timur Gül, IEA Chief Energy Technology Officer

Clean & modern technologies are a sizeable economic opportunity

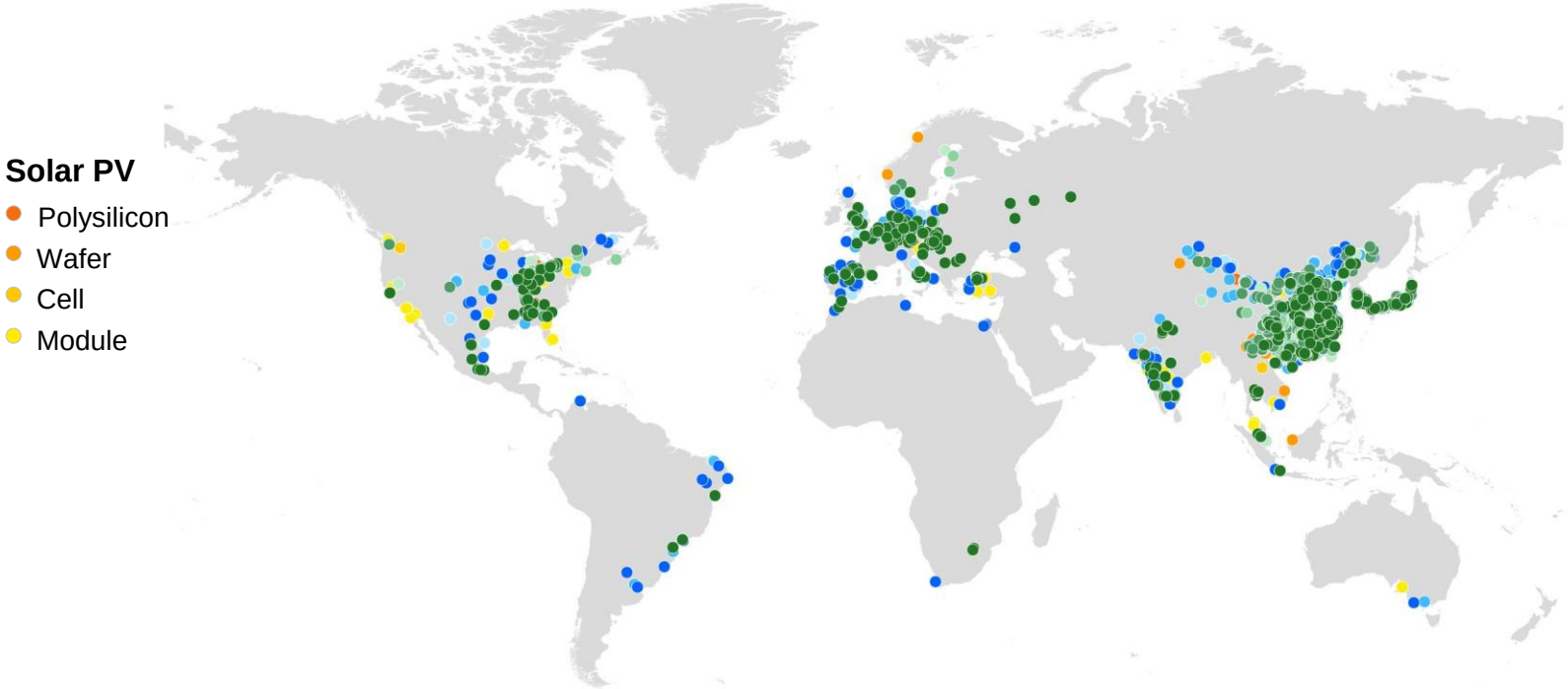


The market for clean technologies is set to triple to 2035 under current policy settings, close to value of the global crude oil market in recent years.

IEA 2024. All rights reserved.

Investment in clean technology manufacturing is booming

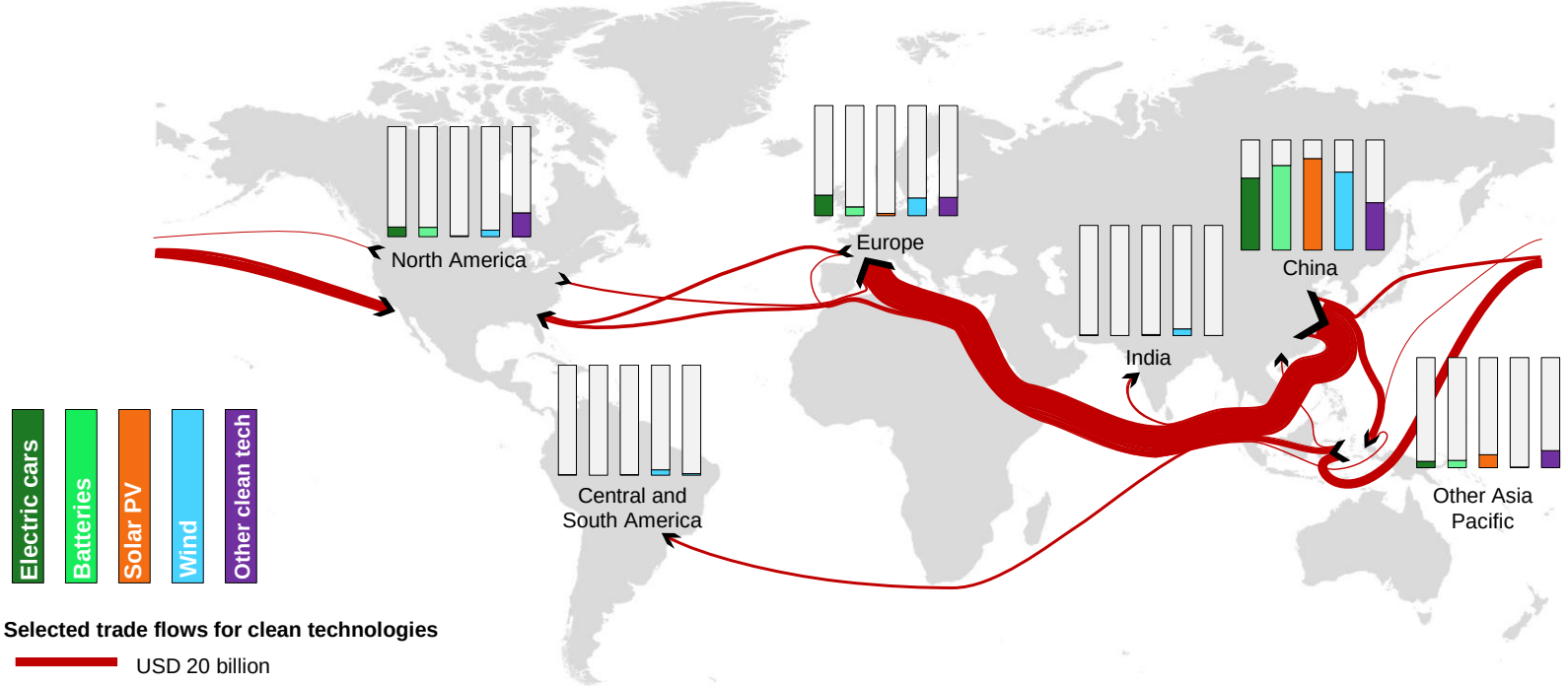
Clean technology manufacturing facilities in operation, 2023



IEA 2024. All rights reserved.

Investment in clean technology manufacturing is booming

Share of global clean technology manufacturing output by technology, 2023

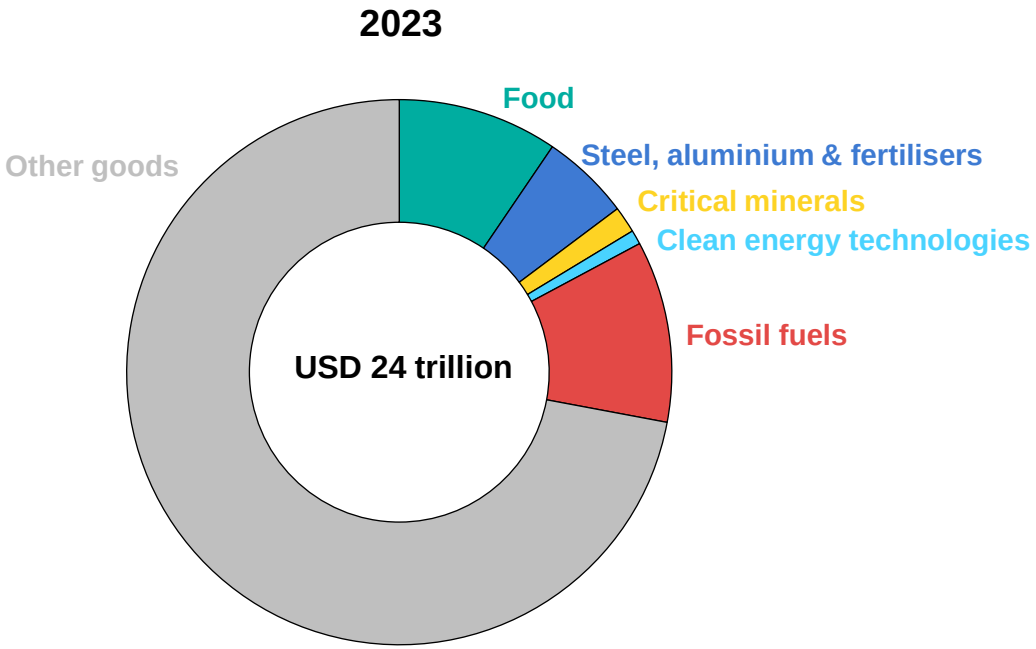


The manufacturing of clean technologies is highly concentrated geographically, with China accounting for around 70% of the global manufacturing output value for the six key clean technologies.

IEA 2024. All rights reserved.

International trade is essential to the global economy

International goods trade by value

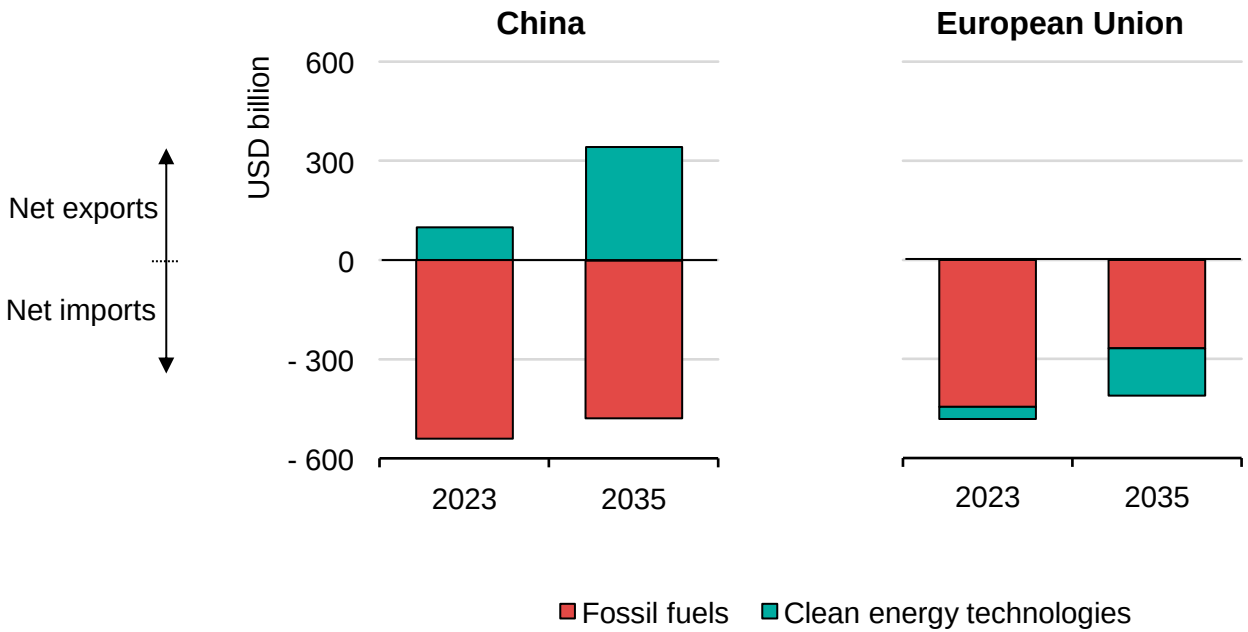


The value of clean energy technology trade is set to triple to 2035.
The pace of decline of the value of fossil fuel trade depends on the speed of the clean energy transition.

IEA 2024. All rights reserved.

China remains the world's clean technology powerhouse

Net trade of fossil fuels and clean energy technologies under current policy settings

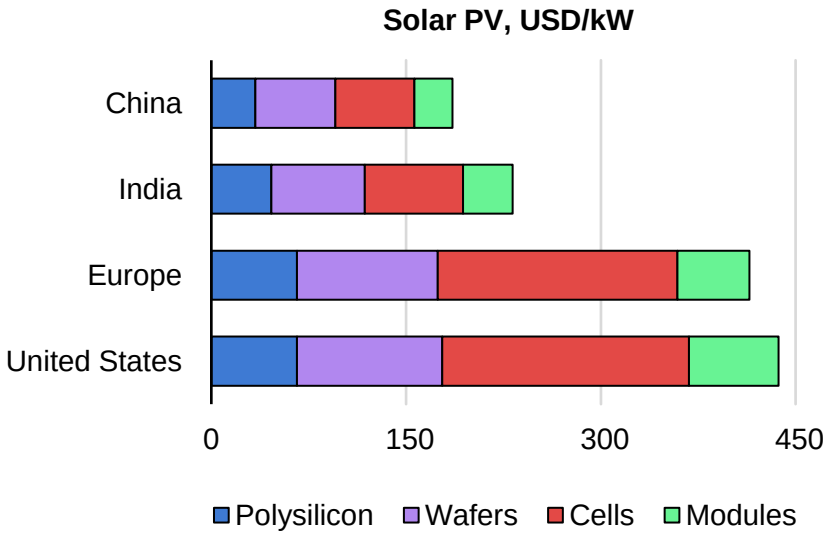


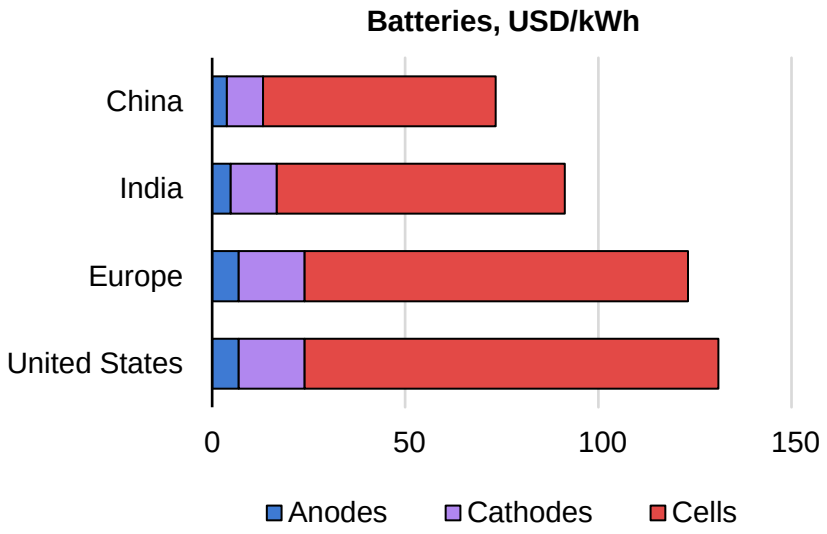
The value of China's clean tech exports in 2035 is roughly equivalent to the projected 2024 oil export revenue of Saudi Arabia & the United Arab Emirates combined. The EU's import bill shifts to clean tech, which is a boon to resilience.

IEA 2024. All rights reserved.

There is significant regional variation in capital costs…

Clean technology manufacturing facility capital costs



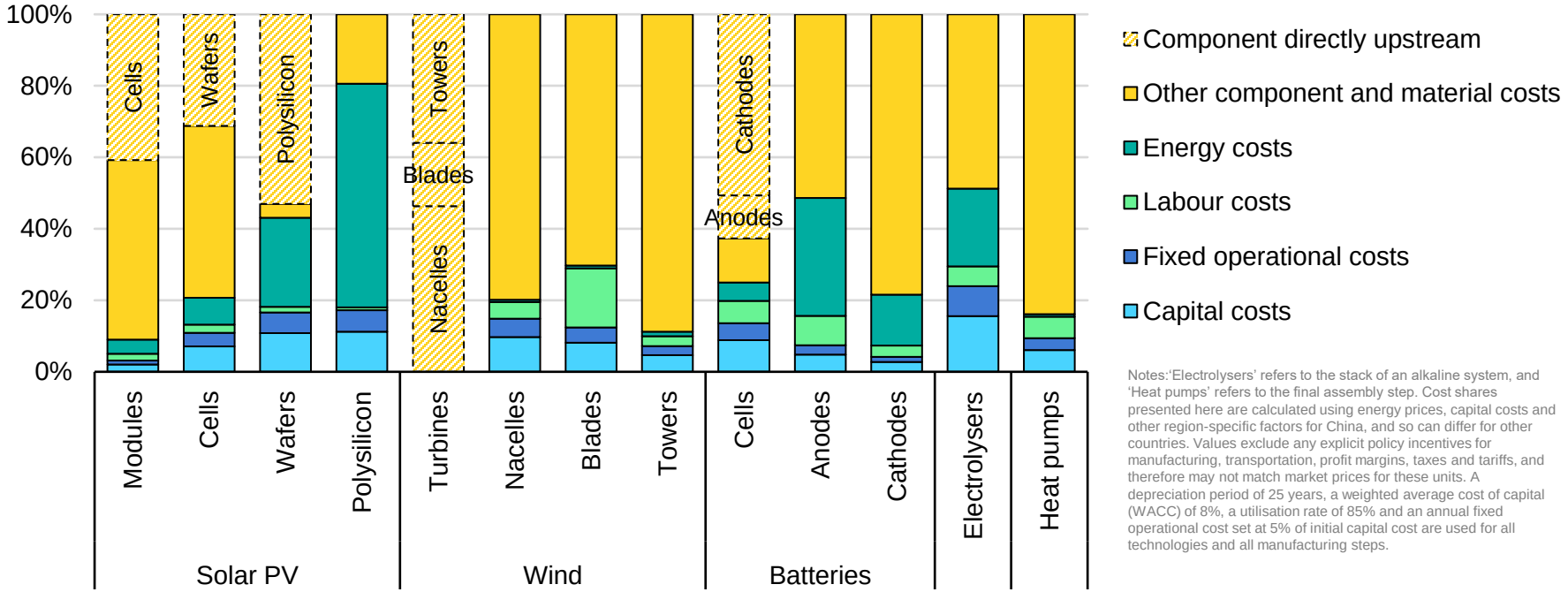


An analysis of cost data for 750 projects shows significant variation in average capital costs by region – a recent announcement for a large integrated solar PV facility suggests even lower costs (USD 140/kW) are possible in China

IEA 2024. All rights reserved.

…but other factors influence total manufacturing cost

Factors contributing to manufacturing cost for key clean technologies in China



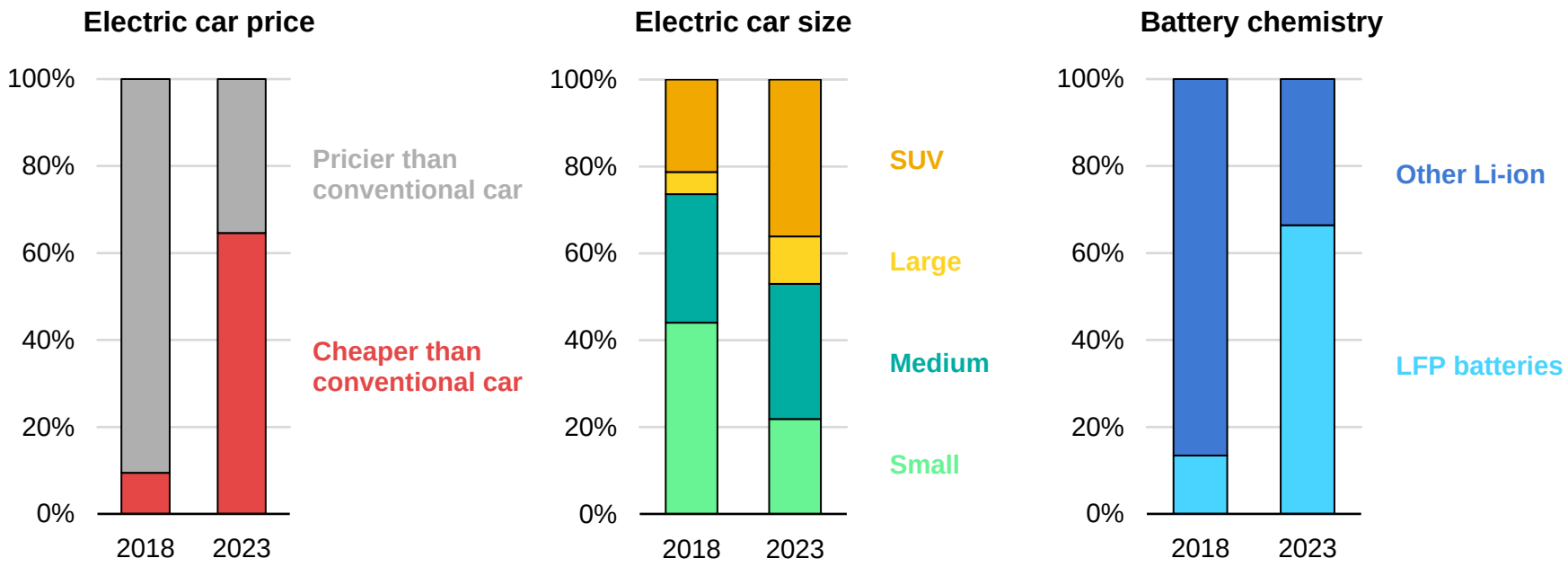
Notes:'Electrolysers' refers to the stack of an alkaline system, and 'Heat pumps' refers to the final assembly step. Cost shares presented here are calculated using energy prices, capital costs and other region-specific factors for China, and so can differ for other countries. Values exclude any explicit policy incentives for manufacturing, transportation, profit margins, taxes and tariffs, and therefore may not match market prices for these units. A depreciation period of 25 years, a weighted average cost of capital (WACC) of 8%, a utilisation rate of 85% and an annual fixed operational cost set at 5% of initial capital cost are used for all technologies and all manufacturing steps.

Capital costs contribute significantly to the regional variation in clean technology manufacturing cost, but account for only modest proportions of the total – materials and energy account for much larger shares

IEA 2024. All rights reserved.

In China, electric cars are getting larger… and cheaper

Share of battery electric car sales in China

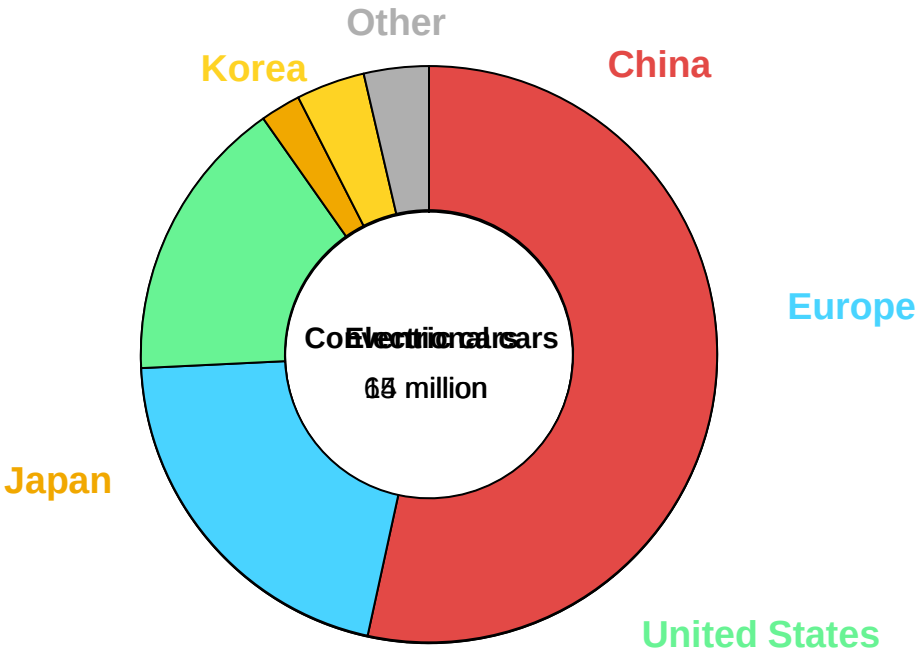


In 2023, over 60% of electric cars sold in China were cheaper than their average ICE equivalent.
Strong competition in the growing market of electric SUVs and cheaper battery chemistries are bringing prices down.

IEA 2024. All rights reserved.

A new electric car industry is emerging

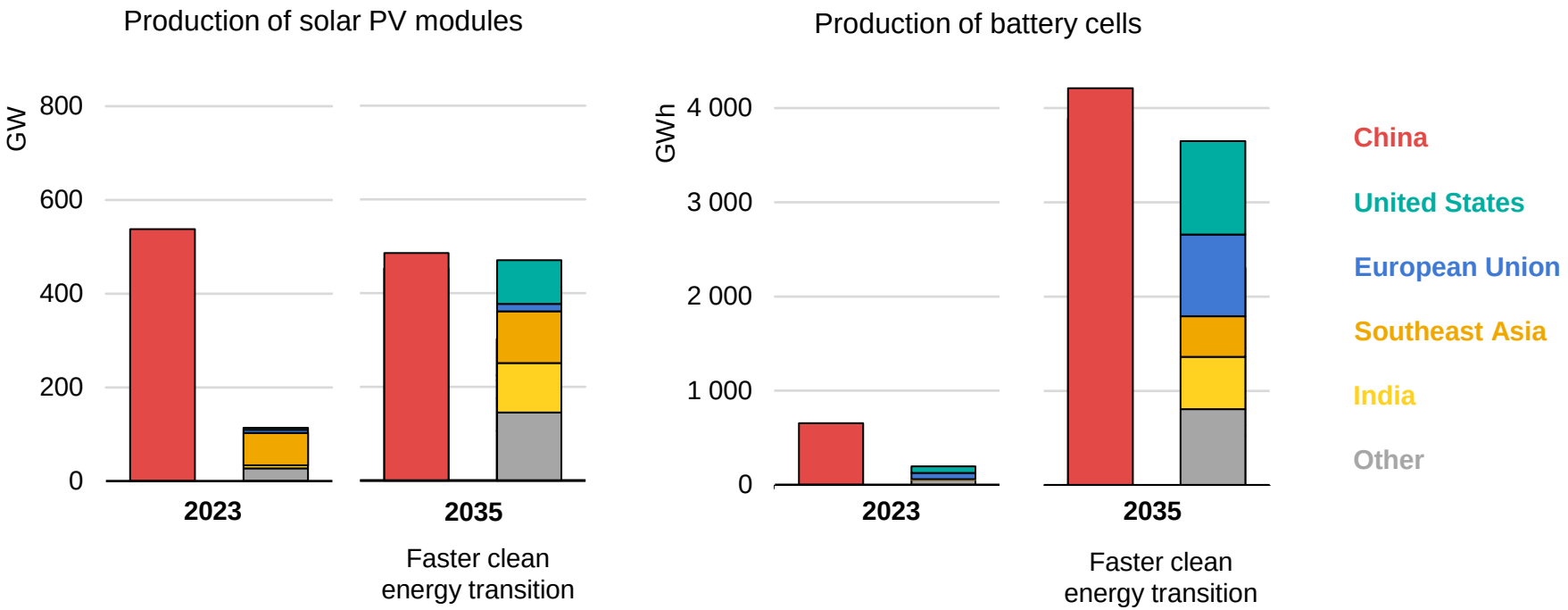
Share of global car markets by automaker headquarters, 2023



Chinese companies provide more than half of global electric car sales, compared with just 10% for conventional cars.

IEA 2024. All rights reserved.

Industrial policy & competitiveness shape the outlook for trade

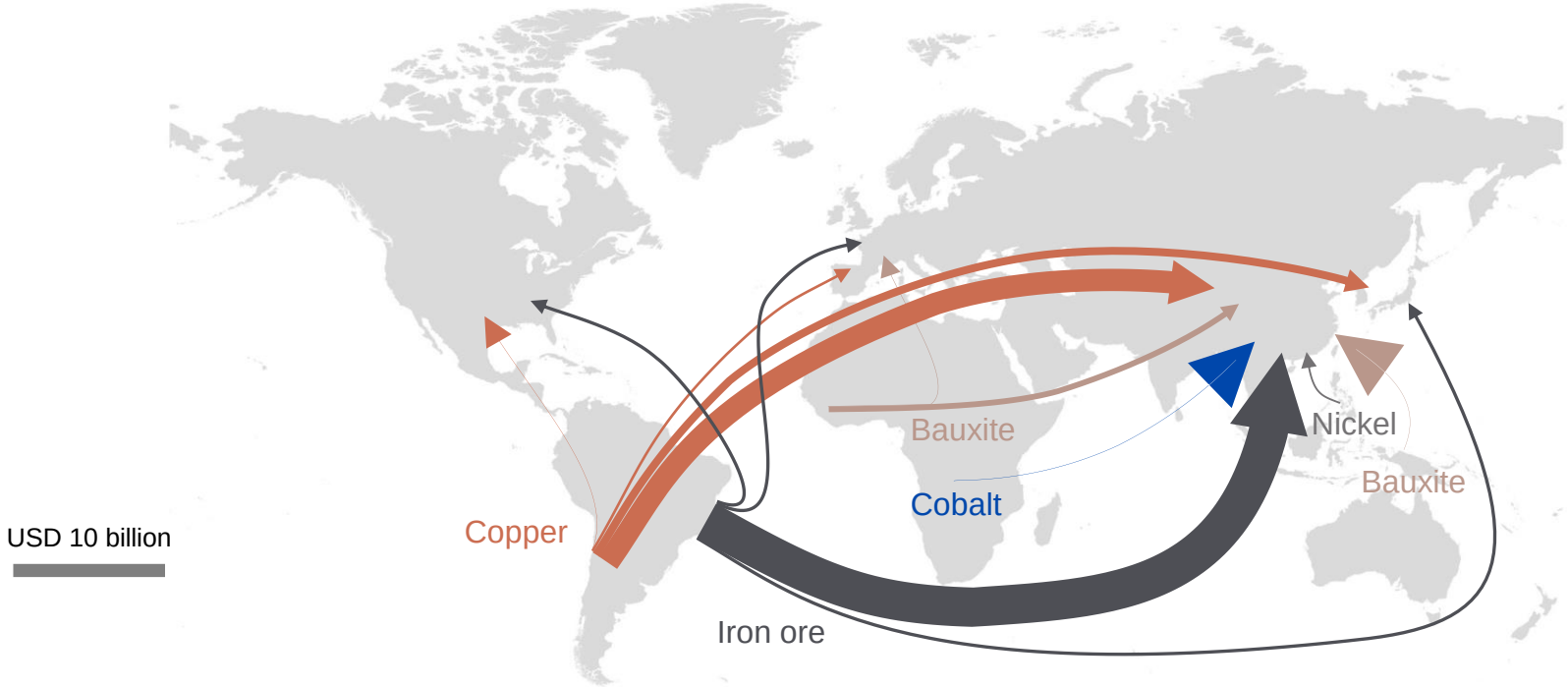


Industrial strategies can help boost the competitiveness of clean technology manufacturing.
The policies established by countries around the world will affect the outlook for manufacturing & trade.

IEA 2024. All rights reserved.

The door of the new energy economy is still open to emerging markets

Trade flows of raw materials from emerging markets and developing economies, 2023



A fair and just transition requires enabling more regions to reap the economic benefits from growing supply chains for clean and modern energy technologies.

IEA 2024. All rights reserved.

The door of the new energy economy is still open to emerging markets

Key manufacturing opportunities in the High Potential Case

- ✓ Skills of the workforce
- ✓ Good energy infrastructure
- ✓ Large lithium & iron ore reserves
- ✓ High fertiliser demand

Wind blade manufacturing increases x4 by 2035

Third largest battery manufacturer by 2050

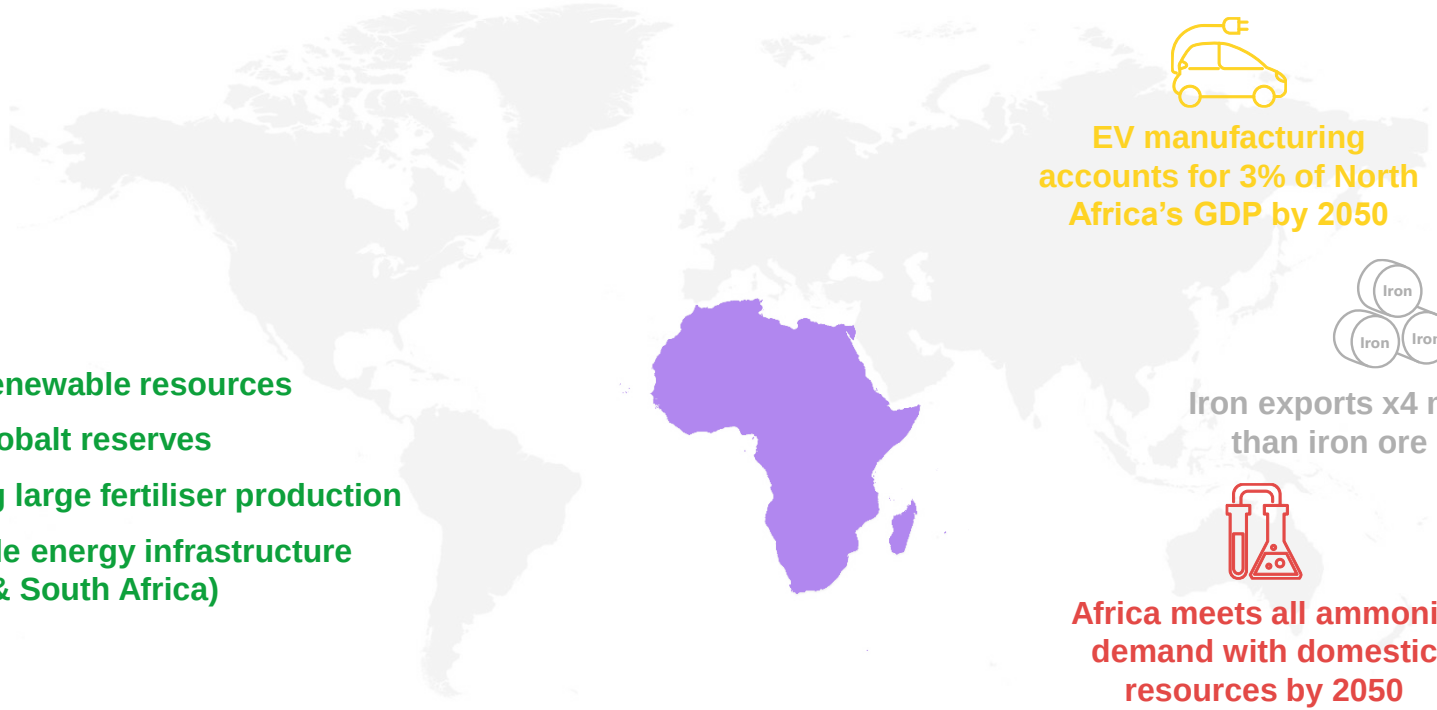
Second largest exporter of near-zero emissions ammonia by 2050

A fair and just transition requires enabling more regions to reap the economic benefits from growing supply chains for clean and modern energy technologies.

IEA 2024. All rights reserved.

The door of the new energy economy is still open to emerging markets

Key manufacturing opportunities in the High Potential Case



- ✓ Good renewable resources
- ✓ Large cobalt reserves
- ✓ Existing large fertiliser production
- ✓ Available energy infrastructure (North & South Africa)

EV manufacturing accounts for 3% of North Africa's GDP by 2050

Iron exports x4 more value than iron ore exports

Africa meets all ammonia demand with domestic resources by 2050

A fair and just transition requires enabling more regions to reap the economic benefits from growing supply chains for clean and modern energy technologies.

IEA 2024. All rights reserved.

The door of the new energy economy is still open to emerging markets

Key manufacturing opportunities in the High Potential Case

Over 10% of global polysilicon production by 2050

EV exports approach 3 million by 2035

- ✓ **Good business environment**
- ✓ **Strong high-tech manufacturing sector**
- ✓ **Existing solar PV and ICE manufacturing**
- ✓ **Large nickel reserves**

A fair and just transition requires enabling more regions to reap the economic benefits from growing supply chains for clean and modern energy technologies.

IEA 2024. All rights reserved.

IEA 2024. All rights reserved.