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**Griffith Business School,
Sydney**

**Accessing Climate Finance
Short Course:
Pakistan cohort**

Energy System Transition

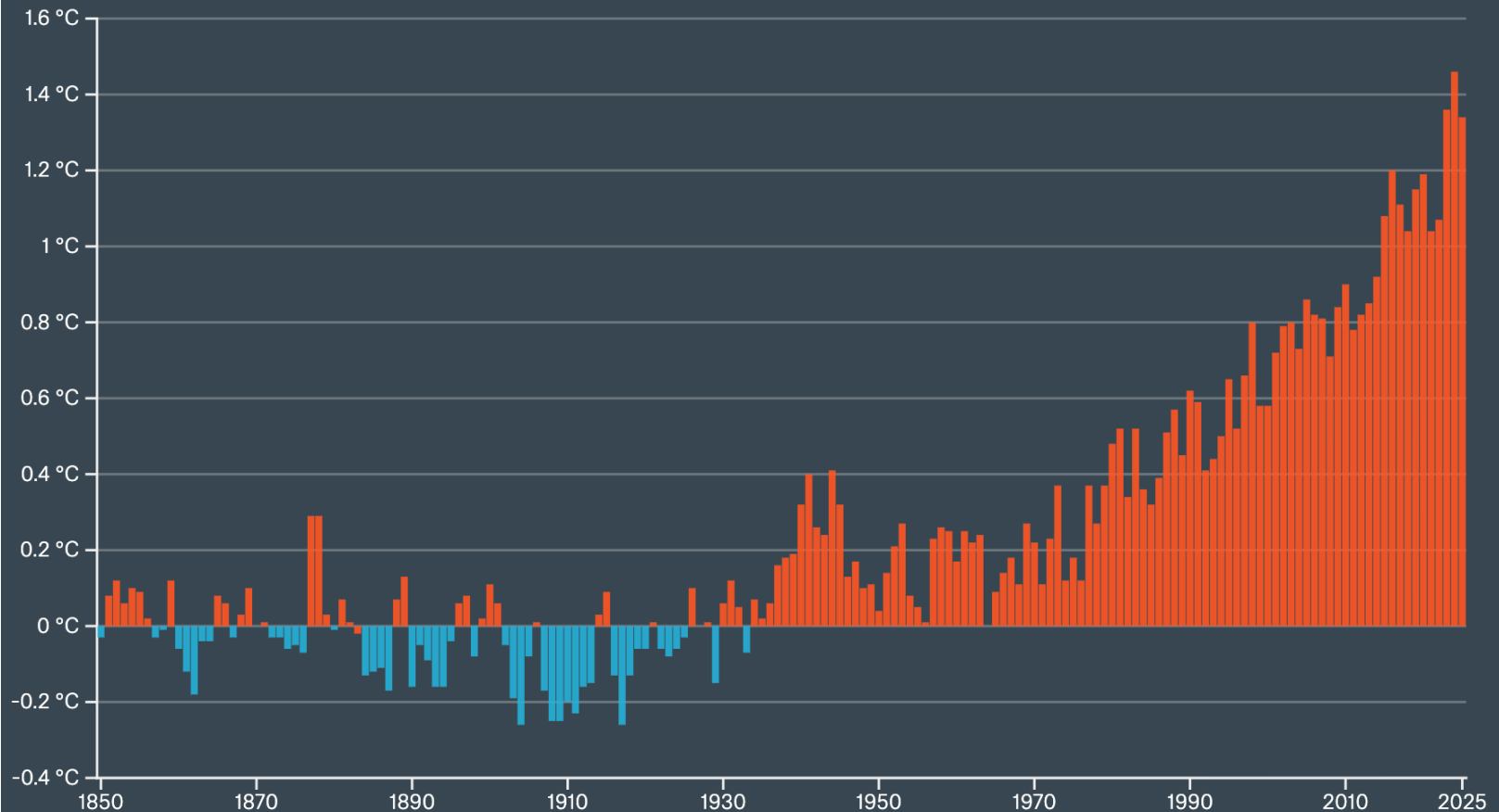
21 May 2026

CEF accepts the climate science

CEF is a public interest thinktank with no government or corporate funding

The last 12 years were the warmest on record

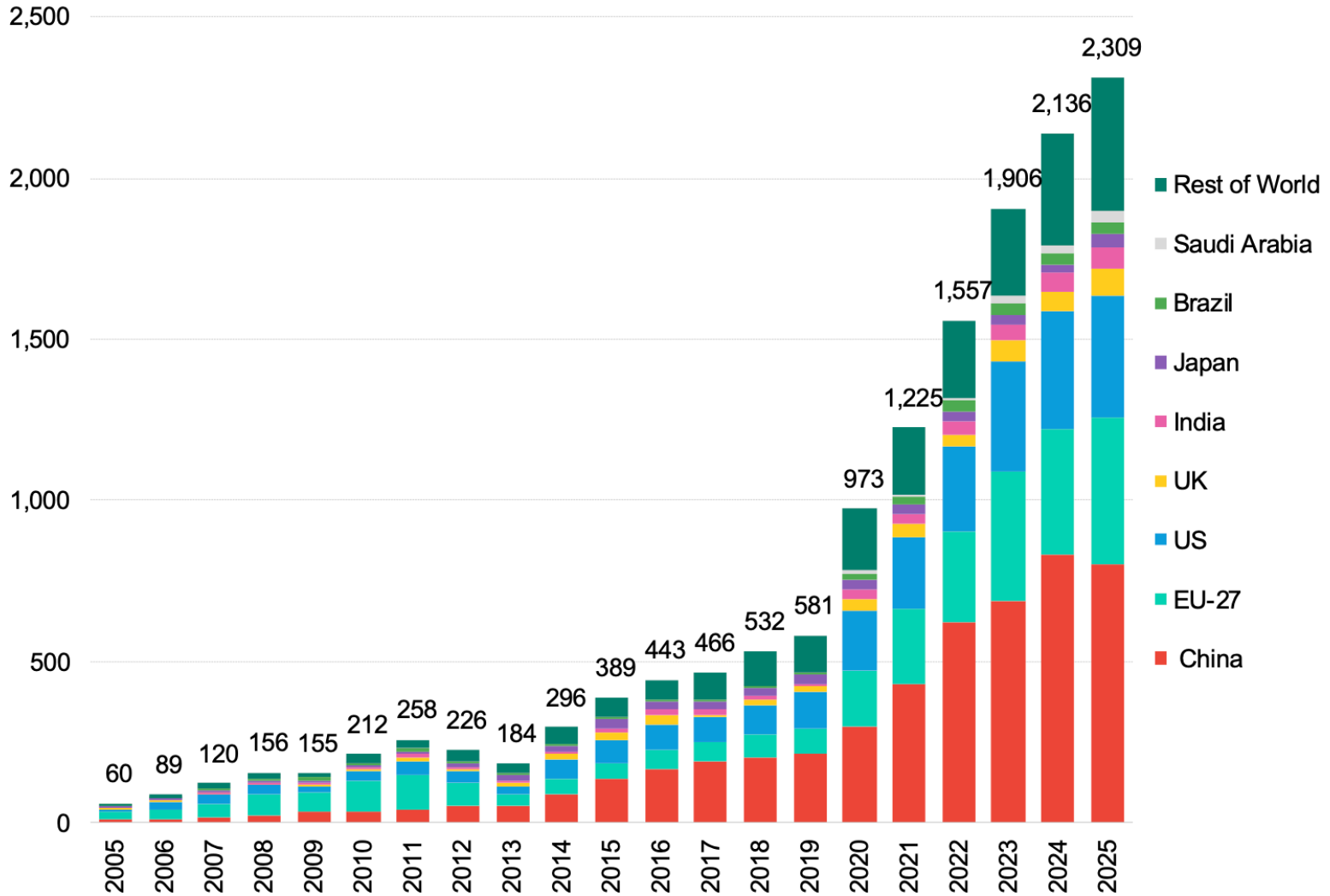
Global temperature anomalies compared to the 1850-1900 average



Source: Munich Re calculation, based on [NOAA data](#) (as at January 2026).

Renewables, EV & Grid outspend Fossil Fuels >2:1

\$ billion **Global Energy Transition Investment, by Country, US\$bn: 2025 +8% yoy**



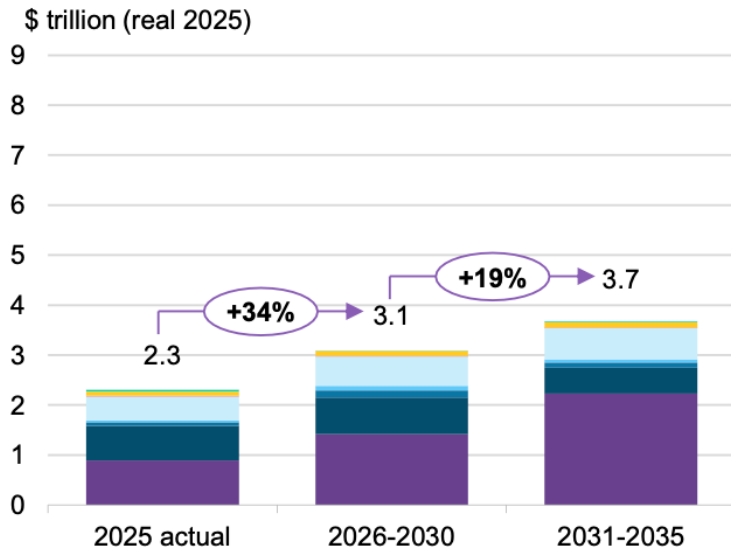
Source: BloombergNEF, Energy Transition Investment Trends, January 2026

Annual Investment in Energy Transition needs to treble

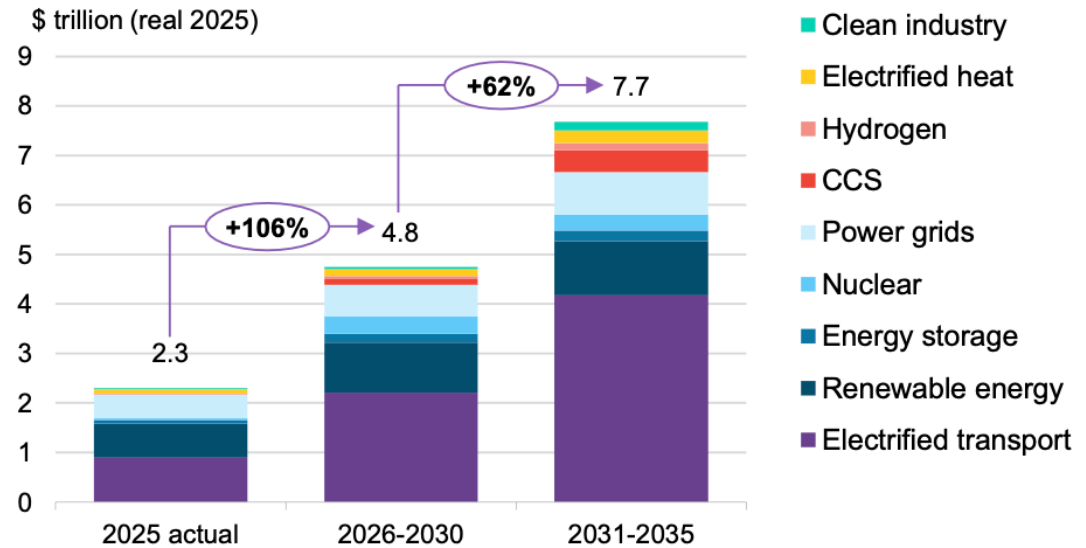
Global Energy Transition Investment, by Technology, US\$ Trillion pa

Energy transition investment, 2025 actuals versus required annualized levels in NEO scenarios

Economic Transition Scenario



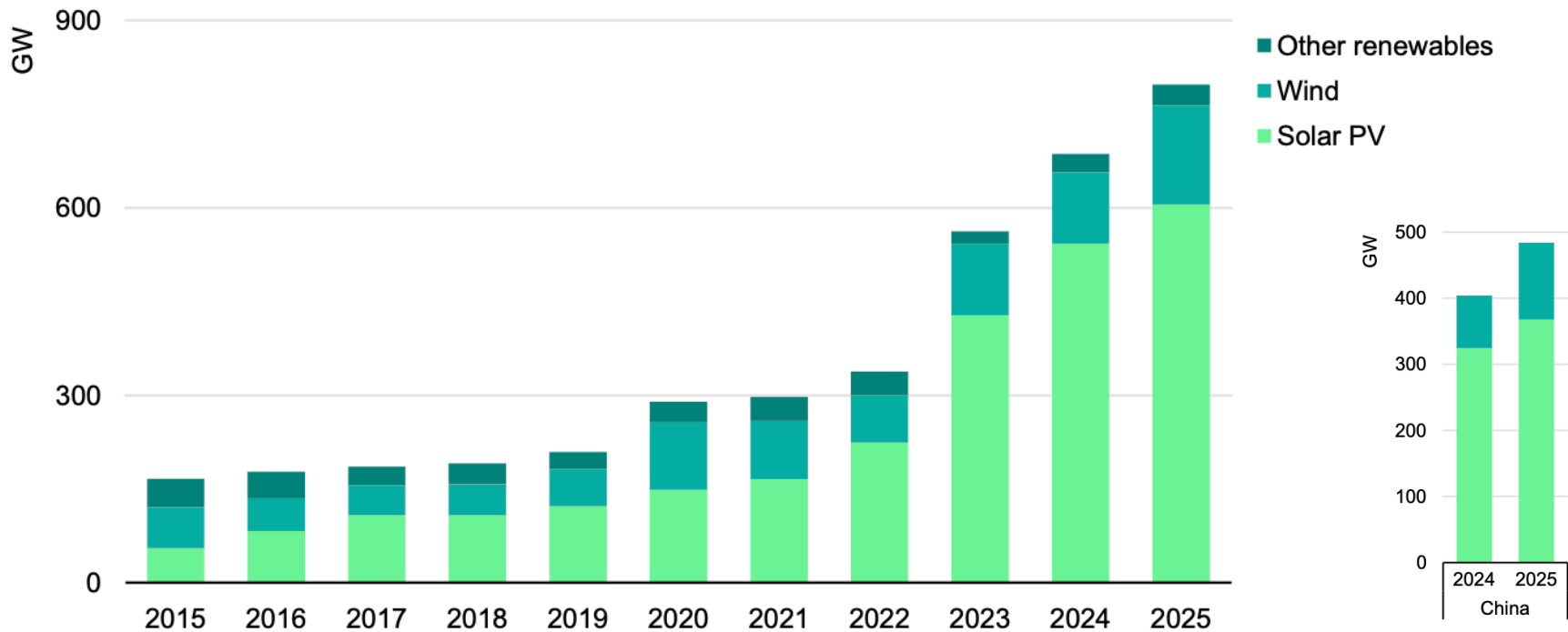
Net Zero Scenario



- Clean industry
- Electrified heat
- Hydrogen
- CCS
- Power grids
- Nuclear
- Energy storage
- Renewable energy
- Electrified transport

Global Renewable Infrastructure Capacity is Expanding, Rapidly

Total renewable capacity additions by technology, 2015-2025

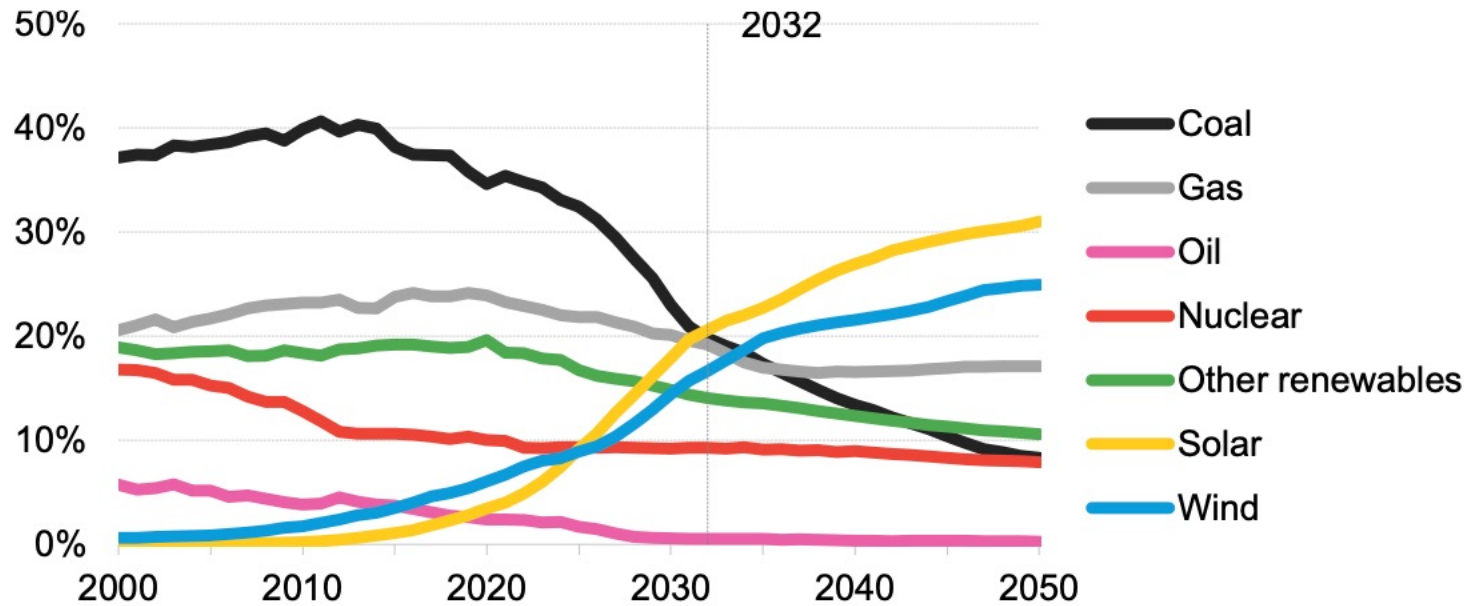


Global Renewable Infrastructure Capacity is Expanding, Rapidly

Share of global electricity generation by technology/fuel

BloombergNEF

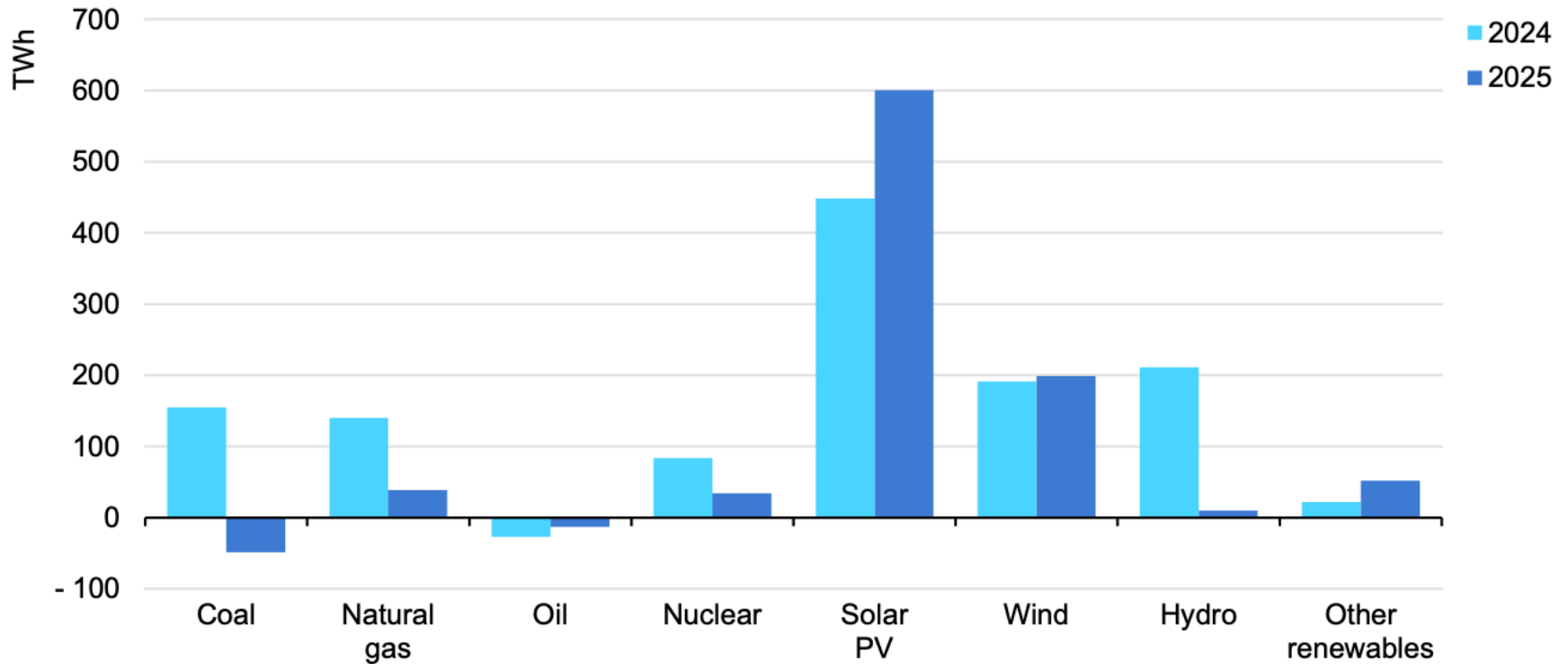
Share of total generation



Source: BloombergNEF. Note: "Other renewables" includes all other non-combustible renewable energy, including hydro, bioenergy, geothermal and solar thermal.

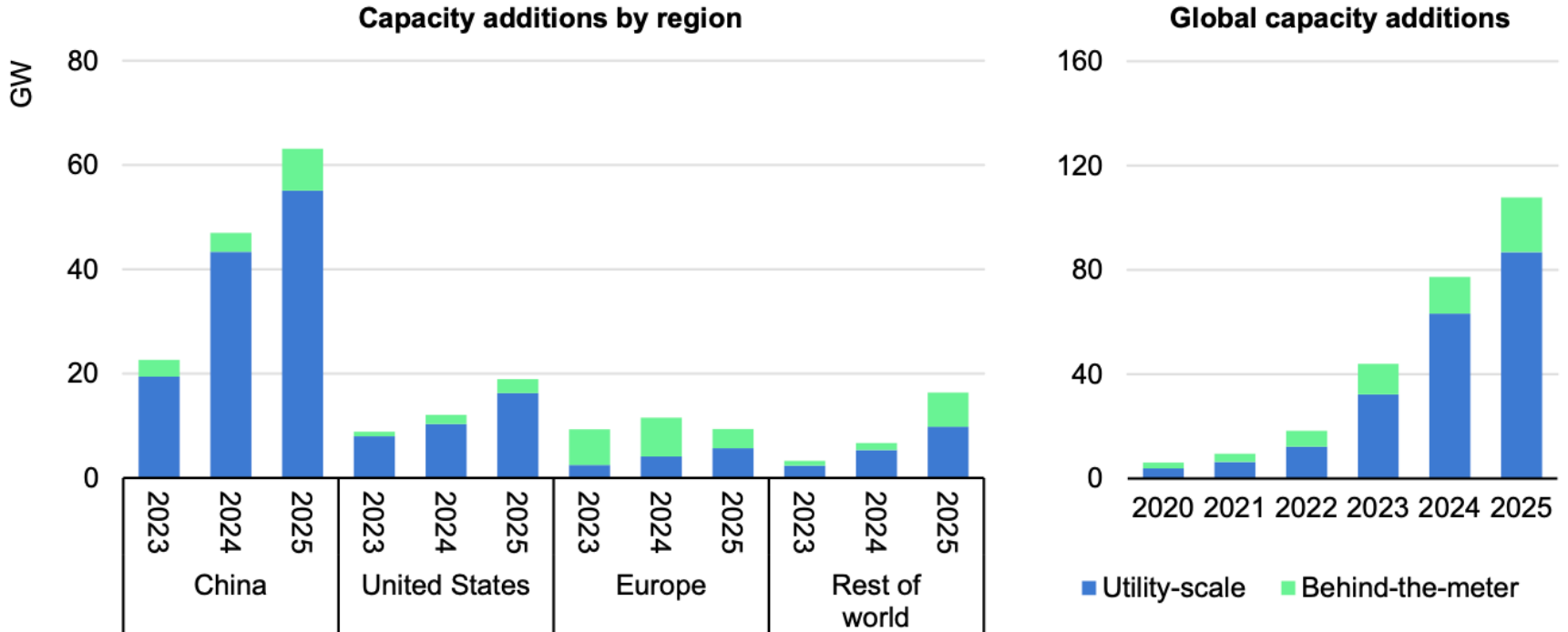
Global Renewable Infrastructure Capacity is Expanding, Rapidly

Annual change in global electricity generation by source, 2024-2025



Global Battery Storage Infrastructure Capacity is Expanding, Rapidly

Battery storage capacity additions in selected regions, 2023-2025, and global capacity additions, 2000-2025



Note: 2025 values are based on [Benchmark \(2026\)](#) data.

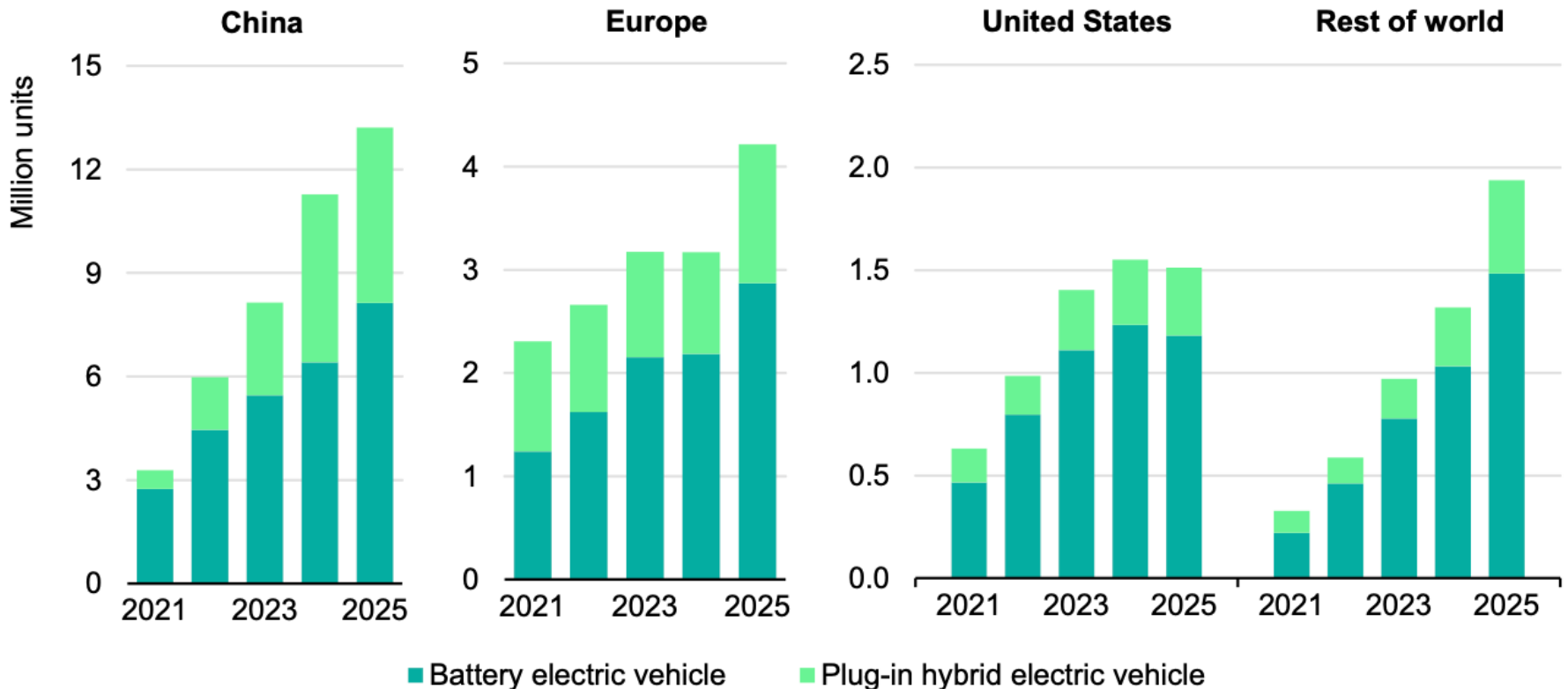


In year-to-date (YTD) to April 2026, [Benchmark Mineral Intelligence \(BMI\)](#) reports that global BESS installations have increased **29% yoy**.

The World is Pivoting to EVs, led by China

This makes V2G increasingly important as the US attacks more nations and pushes up the price of oil, driving EV adoption

Electric car sales in selected markets, 2021-2025



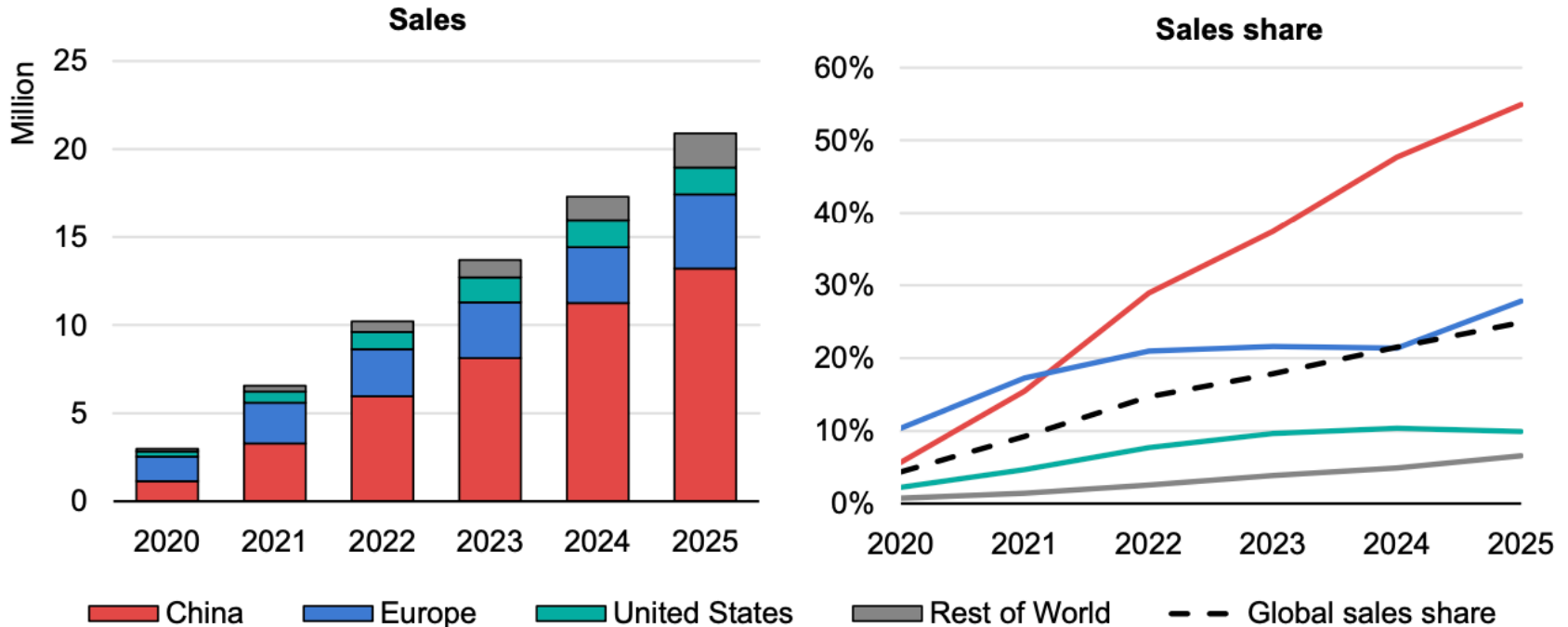
Note the different Y-axis scales, the IEA doesn't want to embarrass the US as they lose global leadership.



The World is Pivoting to EVs, led by China

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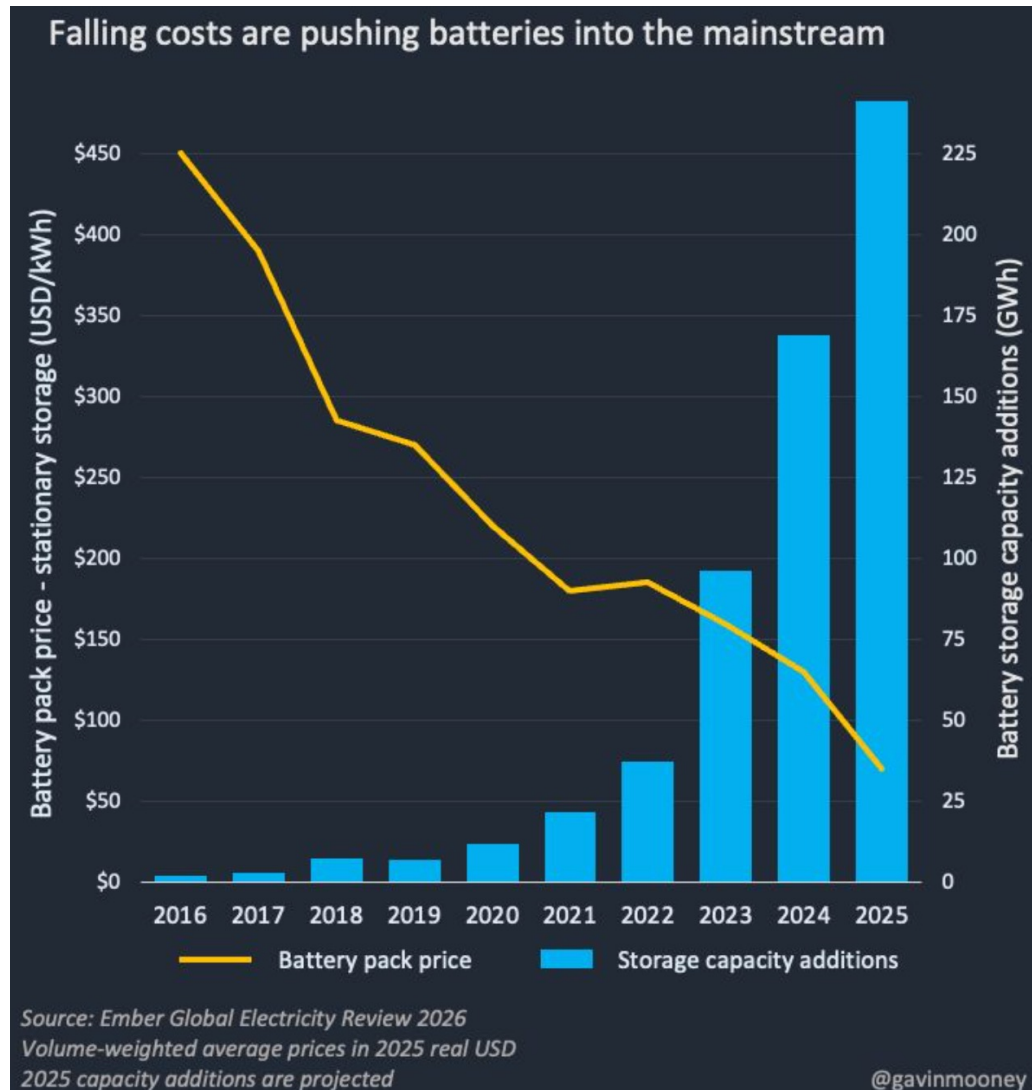
Figure 1.1 Electric car sales globally and sales share for selected regions, 2020-2025



Note: Electric cars include battery electric and plug-in hybrid electric cars.



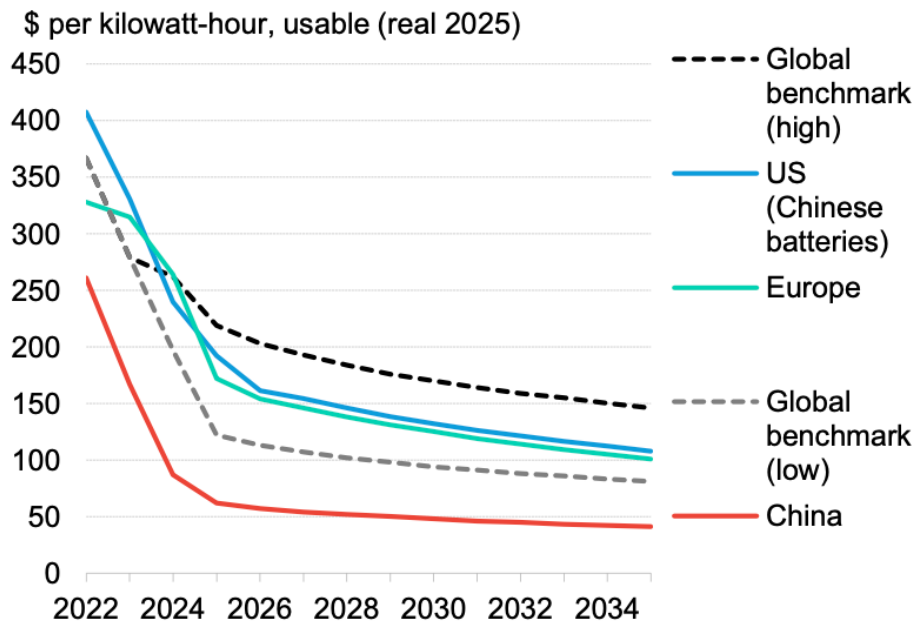
Batteries are the biggest energy system disruption in 2026



Batteries are the biggest energy system disruption in 2026

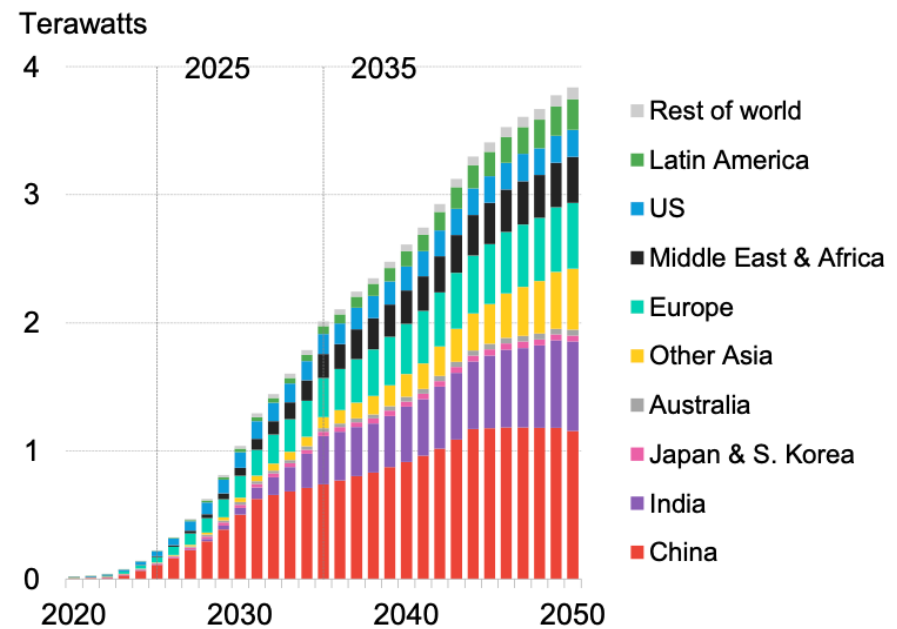
Battery technology continues to improve, and deflation is ongoing

Figure 7: Forecast capex for a 4-hour turnkey energy storage system using LFP batteries, by region



Source: BloombergNEF. Note: "LFP" stands for lithium iron phosphate battery. Pricing based on usable capacity.

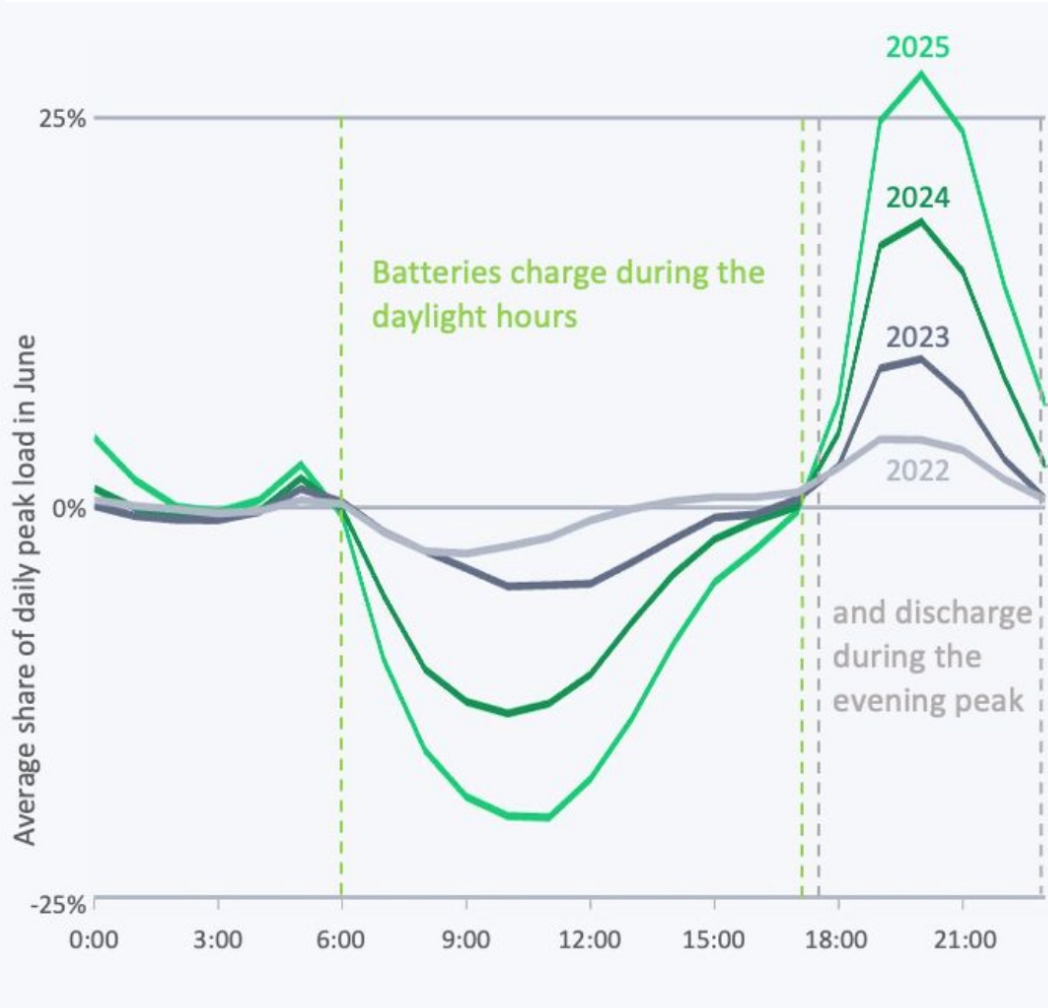
Figure 8: Battery stationary storage cumulative installed capacity, Economic Transition Scenario



Source: BloombergNEF. Note: Includes residential and utility-scale batteries.

Batteries are the biggest energy system disruption in 2026

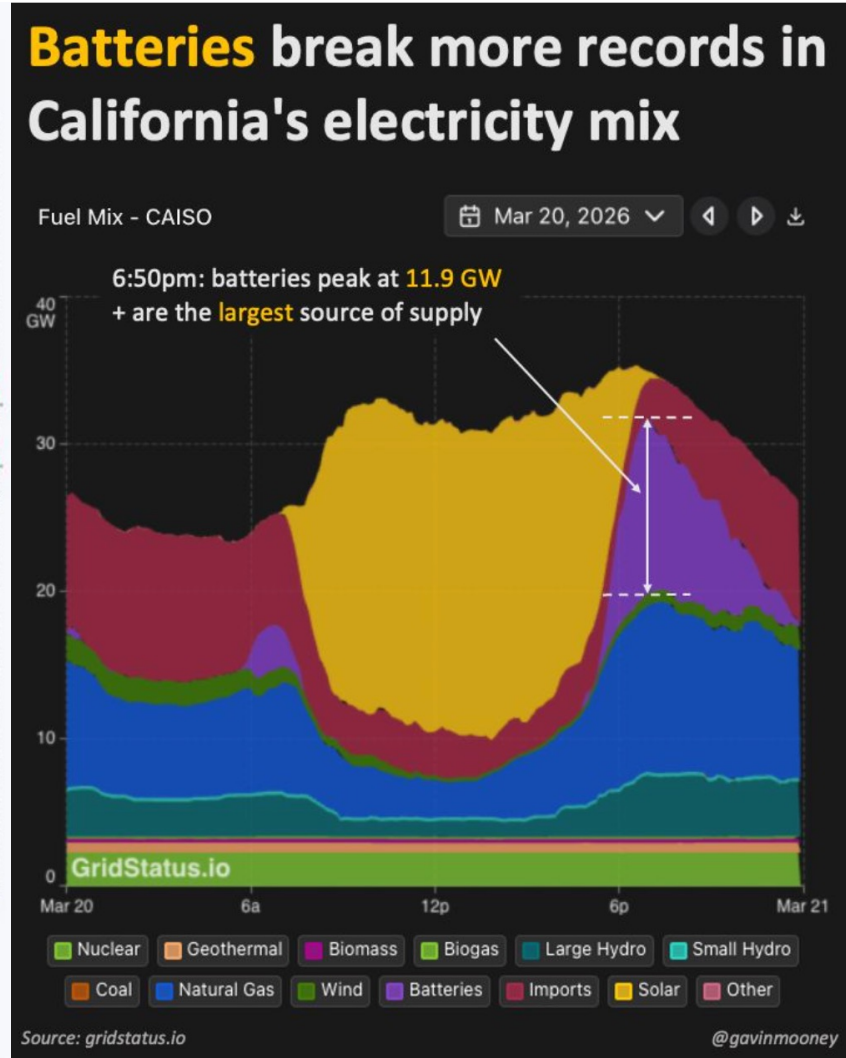
Solar + BESS + V2G => Accelerated Energy System Transformation: California



Original chart: Ember
Data source: GridStatus

EMBER

@gavinmooney

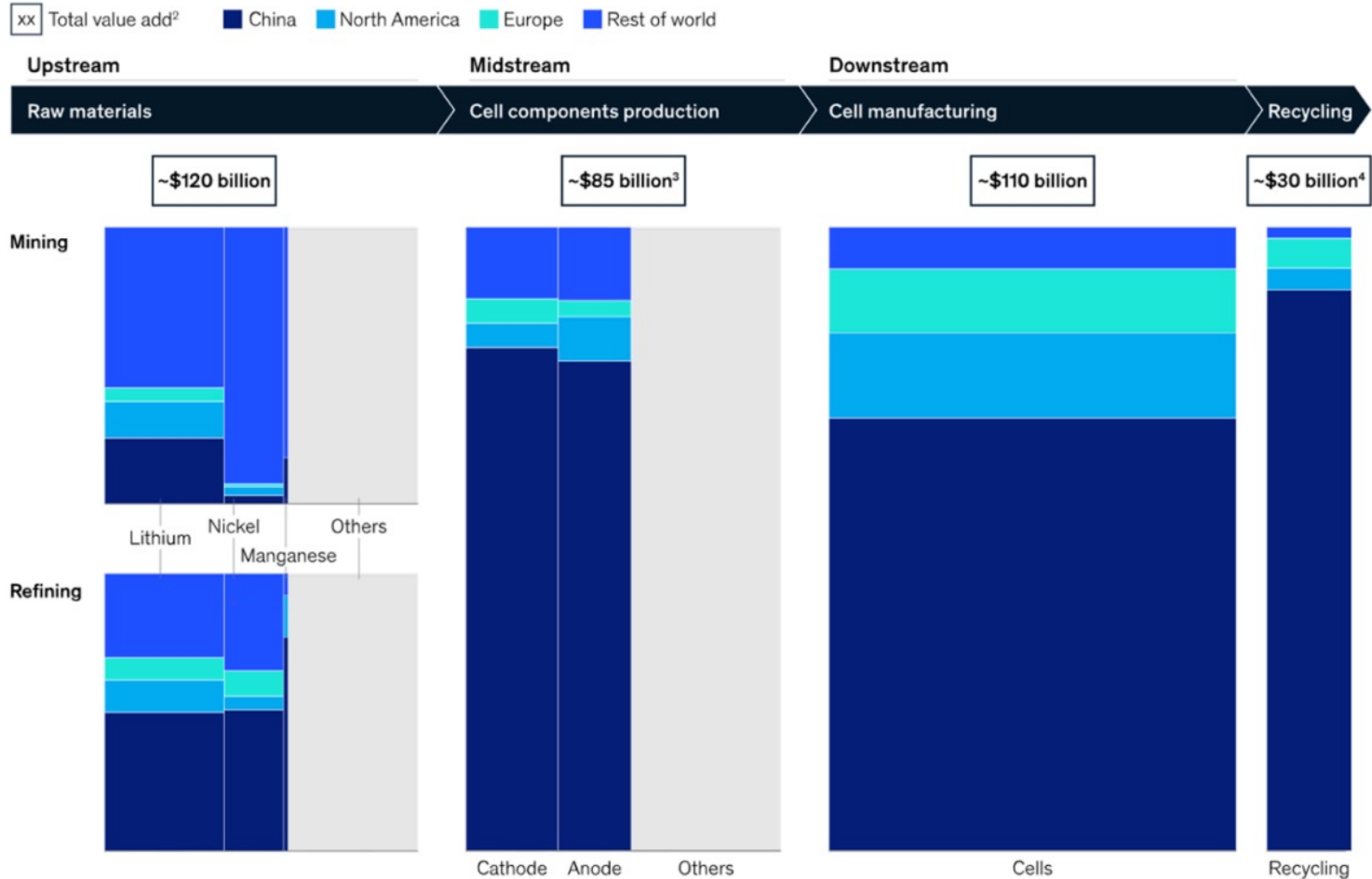


Source: Gavin Mooney, Kaluza via LinkedIn

Chinese Share of the Global Battery Supply Chain

Figure 2.25: China Dominates Battery Materials Manufacturing Capacity: Cathode Active Material (CAM) Demand and Supply (t, 2025)

Share of core steps along lithium-ion (Li-ion) value chain by project location, 2035 (estimated),¹ %



Source: McKinsey, [Battery 2035: Building new advantages](#), 1 January 2026

CEF's Report Advocating for Carbon Pricing

Climate Energy Finance

05 June 2025



A Price on Carbon: Building Towards an Asian CBAM

A focus on the harmonisation and integration of carbon pricing mechanisms in Asia-Pacific for the steel, aluminium and cement value chains.

Authors:

Matt Pollard, Net Zero Transformation Analyst, CEF

Tim Buckley, Director, CEF

The Safeguard Mechanism was reformed in 2023. It will be reviewed by the DCCEEW in late 2026.

Australia's #1 trade partner, China will expand its national ETS by 50% by 2027.

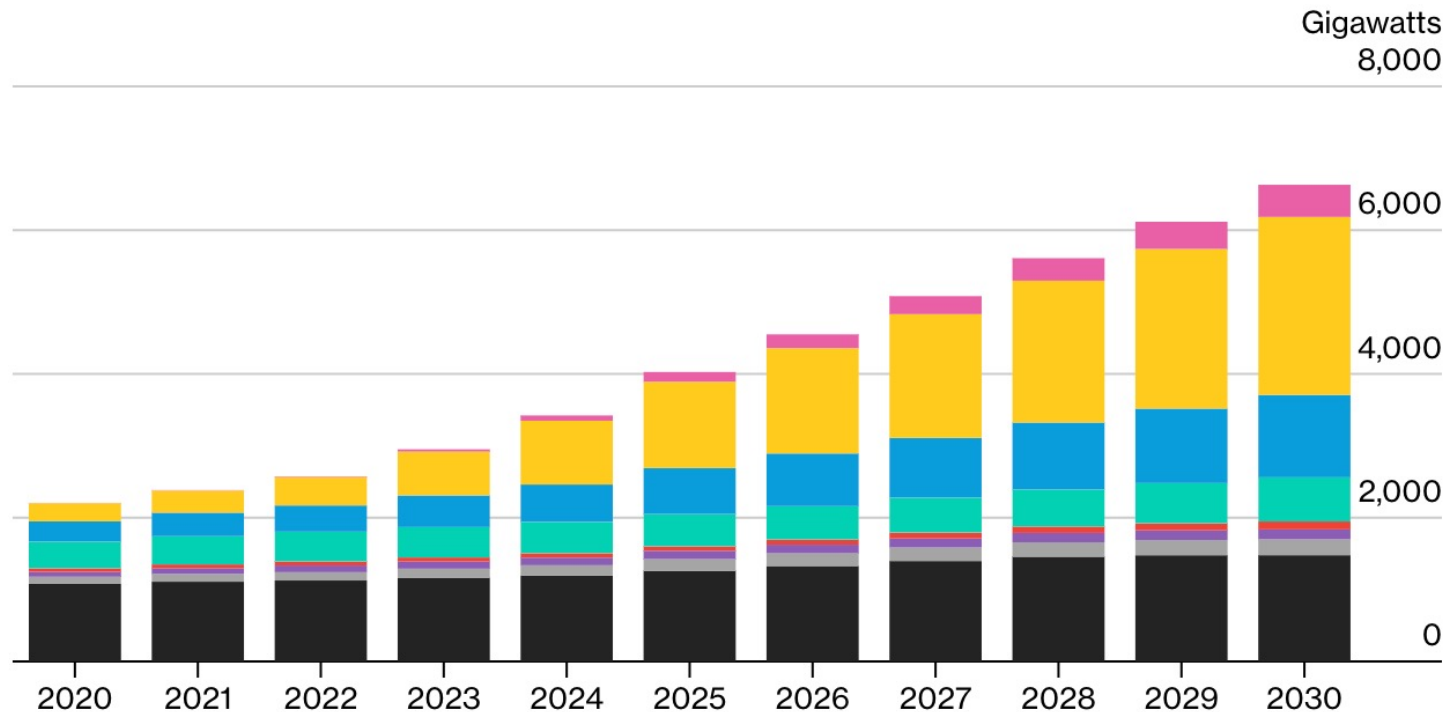
Australia needs to leverage the EU / UK ETS & CBAM into Asia to provide finance the price signal required.

China is Moving in Decarbonisation, Rapidly

China's Power Capacity Mix Diversifies as Wind and Solar Deployment Scales

China's cumulative installed capacity by technology

■ Coal ■ Gas ■ Other thermal ■ Nuclear ■ Hydro ■ Wind ■ Solar
■ Energy Storage



Note: Other thermal includes biomass and power generation from waste heat and pressure. Values are shown in alternating current.

Source: BloombergNEF, China Electricity Council, National Energy Administration.

CEF Chinese FDI reports: Rising Tide and Raw Power

Climate Energy Finance

08 December 2025



Rising Tide:

China's Outbound Cleantech Capital Surge Drives Global Collaboration Toward Net Zero

Authors:

Caroline Wang, China Analyst, CEF

Contributing editor:

Dr AM Jonson, Editorial director CEF

Climate Energy Finance

19 March 2026



Raw Power:

China locks-in global dominance of critical minerals and metals with \$120bn outbound investment surge

China's 'going global' strategy to secure value chains in zero-emissions industries is also boosting its partner economies, with lessons for Australia.

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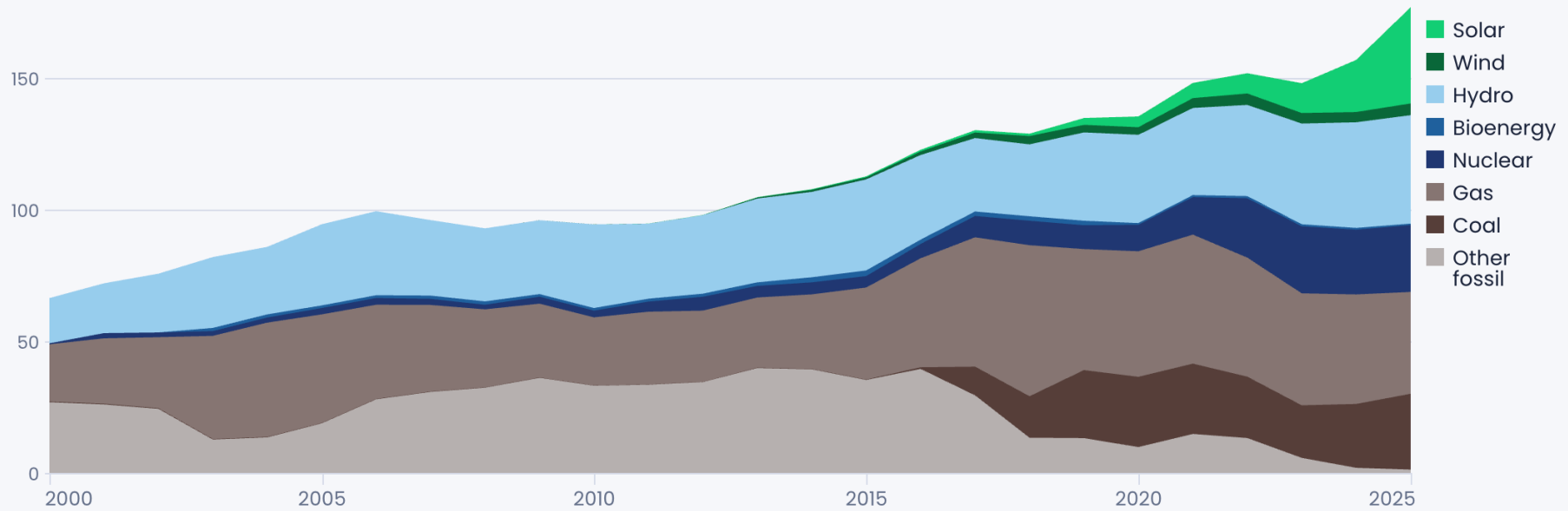
Contributing editor:

Dr AM Jonson, Editorial director CEF

Pakistan Electricity Generation, TWh, CY2000 to CY2025

Electricity generation in Pakistan

Terawatt-hours



Data: Ember Electricity Data Explorer, ember-energy.org

EMBER

EMBER electricity data

https://ember-energy.org/data/electricity-data-explorer/?entity=Pakistan&temporal_res=yearly

Pakistan Electricity Generation, TWh, CY2020 vs CY2025

Pakistan's solar achievements are world leading, 55% CAGR over the last five years, such that solar will over gas in CY2026 and hydro in CY2027 to be #1

	CY2020 TWh	CY2020 share	CY2025 TWh	CY2025 share	Growth CAGR
Solar	4.1	3.0%	36.6	20.7%	55%
Wind	2.9	2.1%	4.5	2.5%	9%
Hydro	33.6	24.8%	41.2	23.3%	4%
Nuclear	10.1	7.4%	25.4	14.3%	20%
Bio	0.6	0.4%	0.6	0.3%	0%
Gas	47.8	35.3%	38.7	21.9%	-4%
Coal	26.7	19.7%	28.8	16.3%	2%
Other fossil	9.8	7.2%	1.3	0.7%	-33%
Total	135.6	100.0%	177.1	100.0%	5.5%

EMBER electricity data, CEF calculations

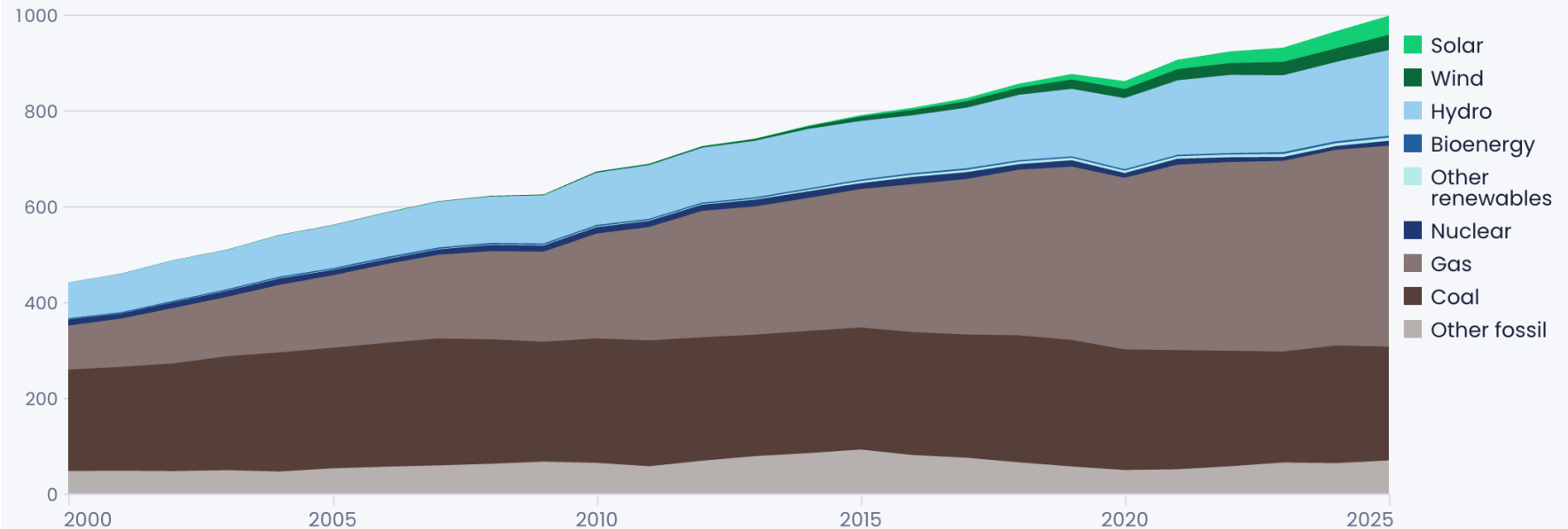
https://ember-energy.org/data/electricity-data-explorer/?entity=Pakistan&temporal_res=yearly

African Electricity Generation, TWh, CY2000 to CY2025

**Africa is set in 2026/27 to replicate what Pakistan has achieved over CY2023/25
Thanks to China, and Germany before China!**

Electricity generation in Africa

Terawatt-hours



Data: Ember Electricity Data Explorer, ember-energy.org

EMBER

EMBER electricity data

https://ember-energy.org/data/electricity-data-explorer/?entity=Africa&temporal_res=yearly

China leads the world in cleantech R&D, manufacturing, domestic deployments, OFDI and in exports.

China exported a record \$21.9bn in solar, batteries and EVs in March 2026

Value of key exports (billion USD)



Source: Ember analysis of GACC monthly bulletin

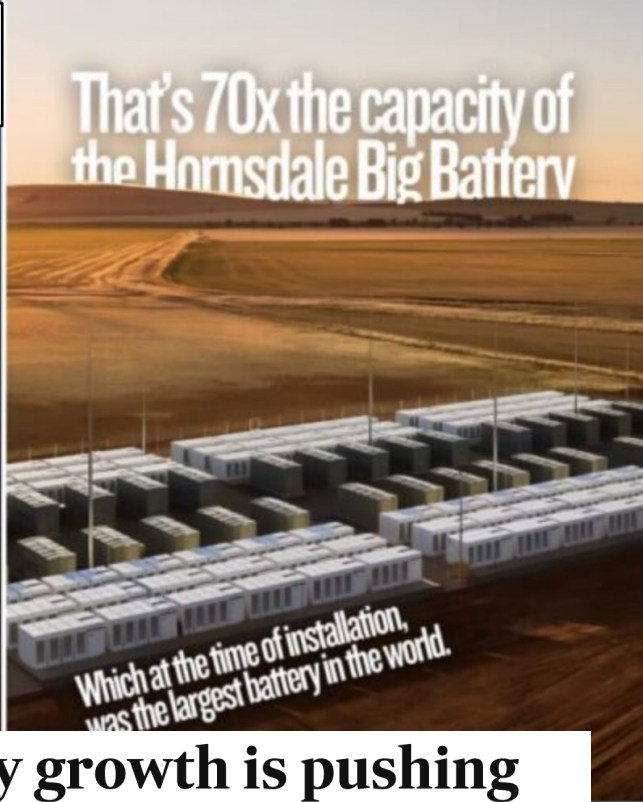
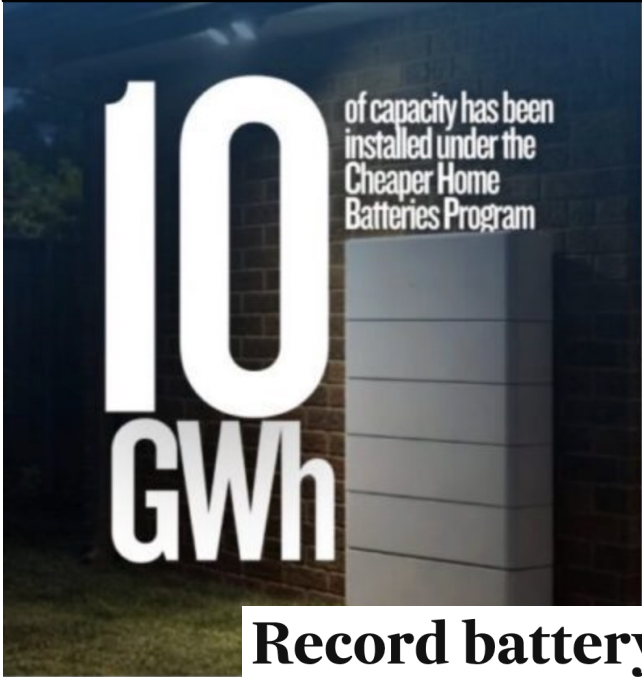
"New Three" total is the sum of lithium ion battery, solar, and electric vehicles exports.

EMBER

The \$7.2bn Home Battery Scheme is a roaring Success

Solar + BESS + V2G => Accelerated Energy System Transformation: California

>360,000 home battery installs in just 10 months.



Record battery growth is pushing power prices down

2
2

Ryan Cropp *Energy and climate reporter*



Apr 30, 2026 - 12.01am

FINANCIAL REVIEW