

# POWER SHIFT: Staggering rise of renewables positions China to end new coal power before 2030

6<sup>th</sup> June 2024

**CEF & BofA**

Presenter:

Tim Buckley (Founder and Director, CEF) [tim@climateenergyfinance.org](mailto:tim@climateenergyfinance.org)

Xuyang Dong (China Energy Policy Analyst, CEF) [xuyang@climateenergyfinance.org](mailto:xuyang@climateenergyfinance.org)



# Overview of the Global Energy Market

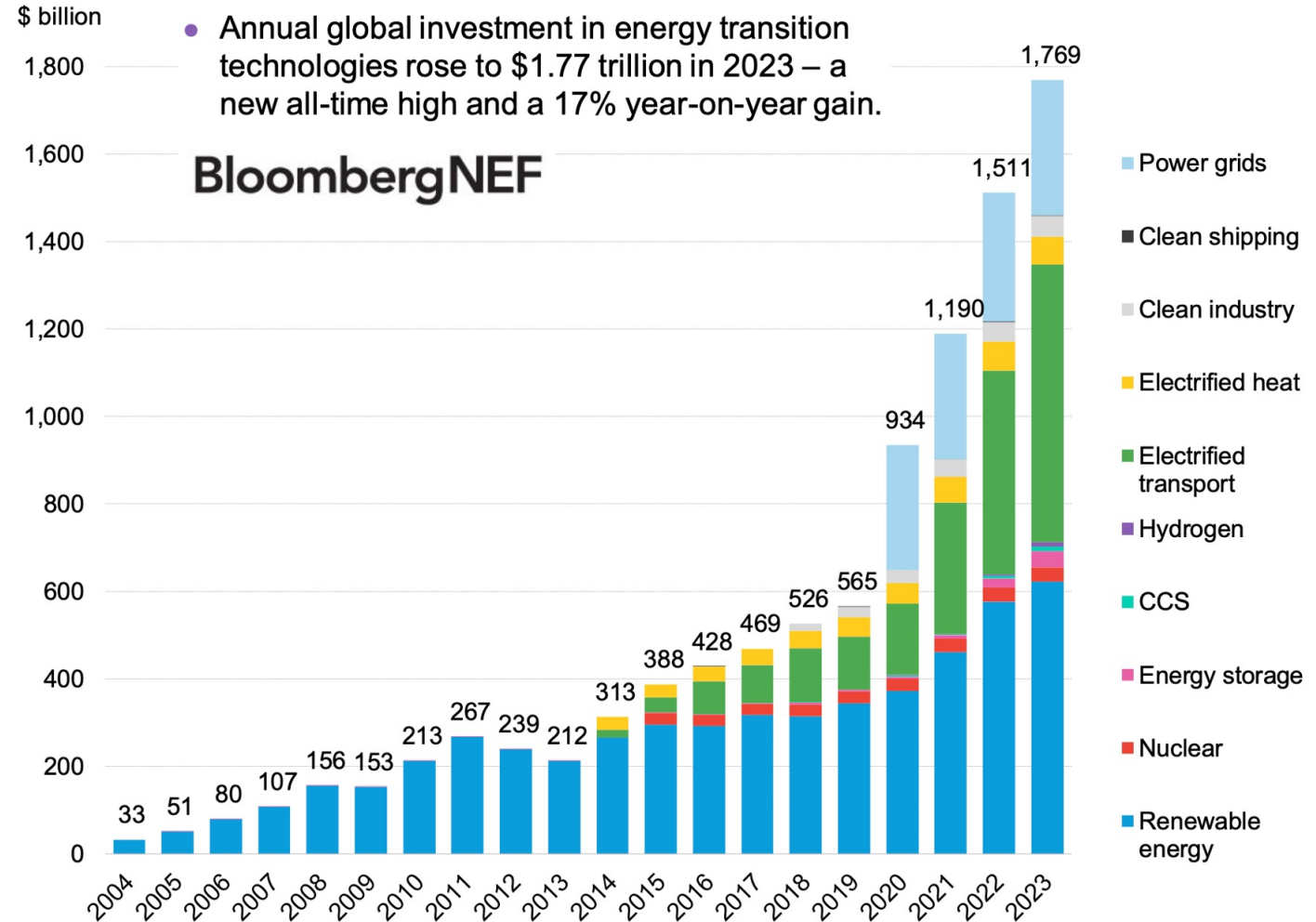




# 1. The Global Energy Transition

- Increases across almost all categories push anticipated spending in 2023 up to a record US\$1.77 trillion, +17% yoy.

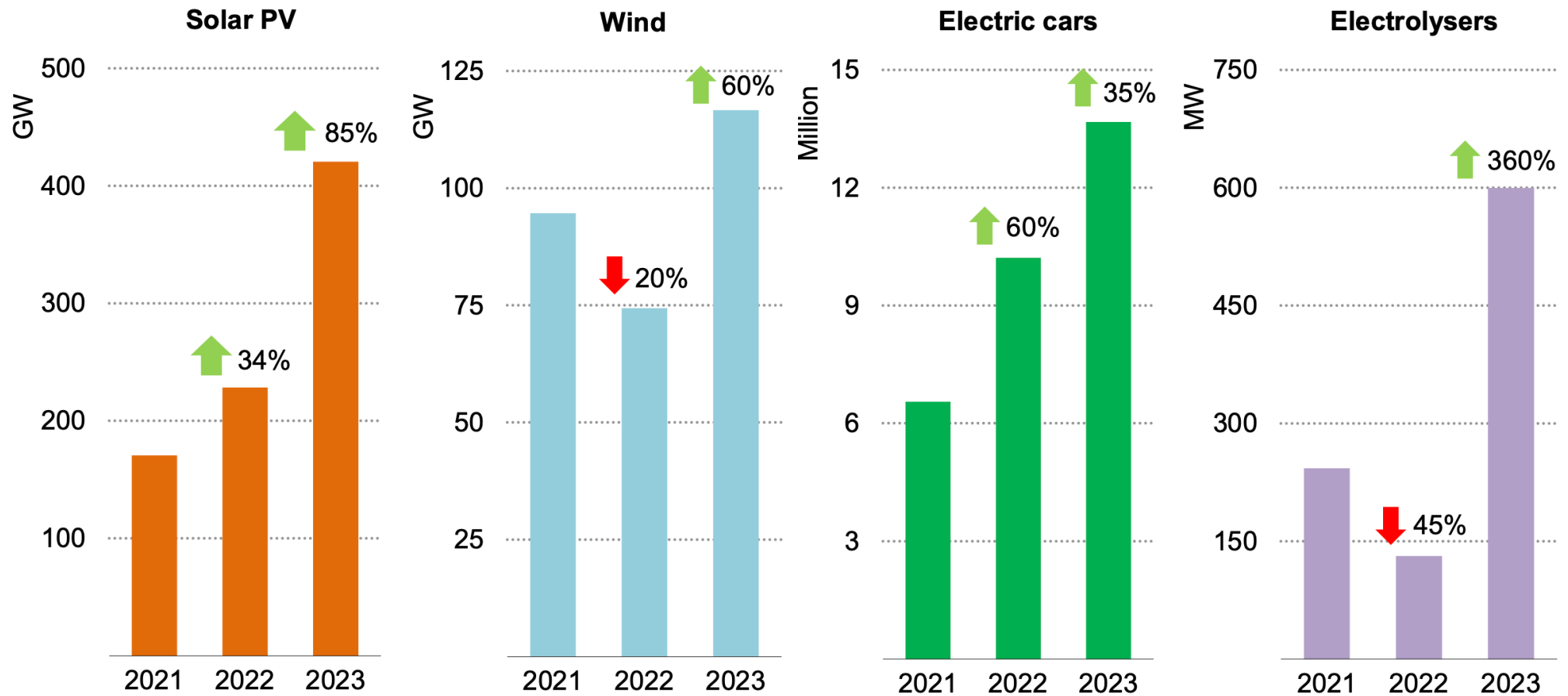
## Global investment in energy transition, by sector



# 1. The Global Energy Transition

## Global Investment to 2023

Annual capacity additions for selected clean energy technologies

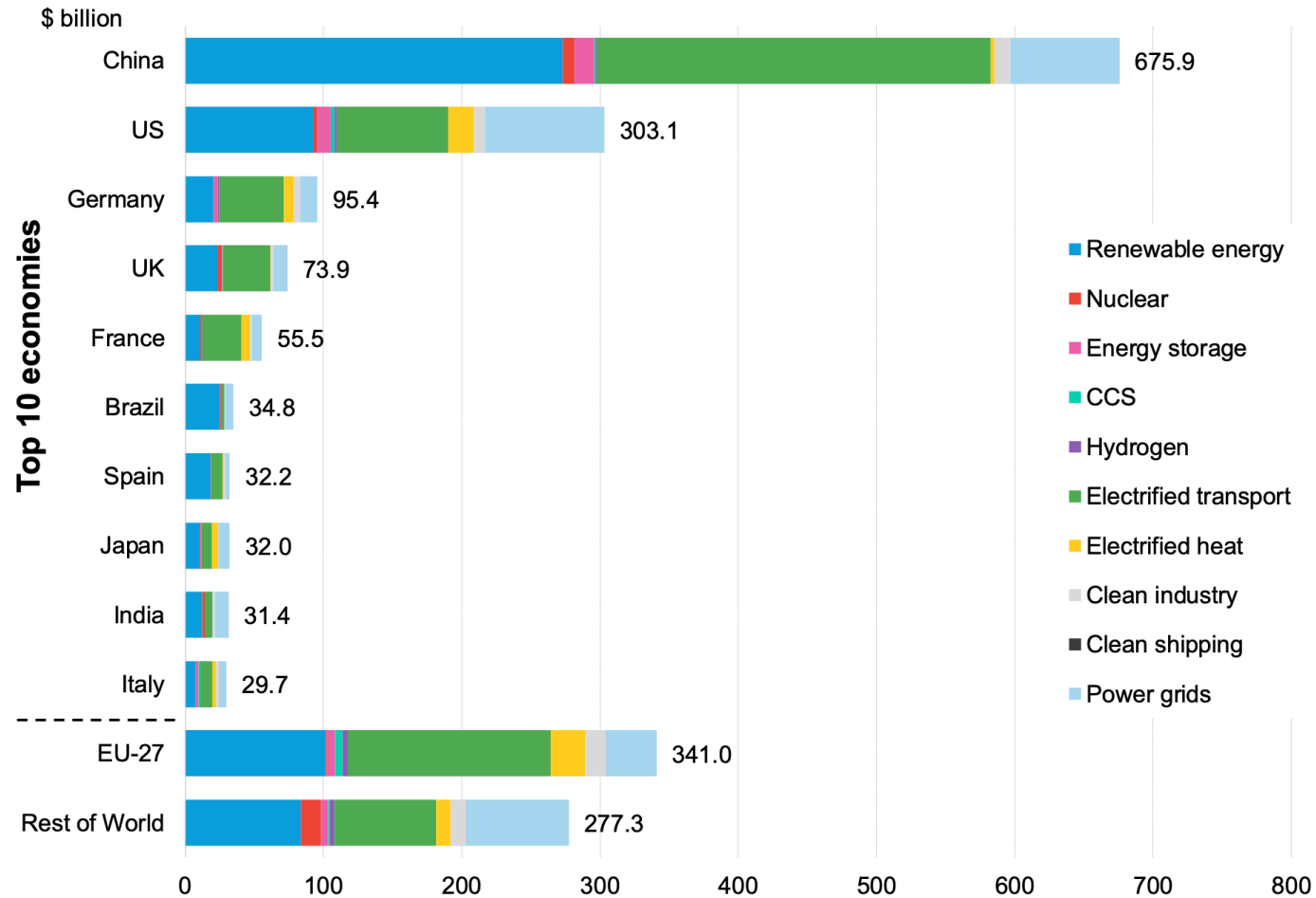


IEA. CC BY 4.0.

Sources: IEA (2024), [Clean Energy Market Monitor – March 2024](#), and IEA (2024), [Global EV Outlook 2024](#).

## 2. China Leads the World in Cleantech Investing

Top 10 economies for 2023 energy transition investment, plus the EU-27 and rest of the world

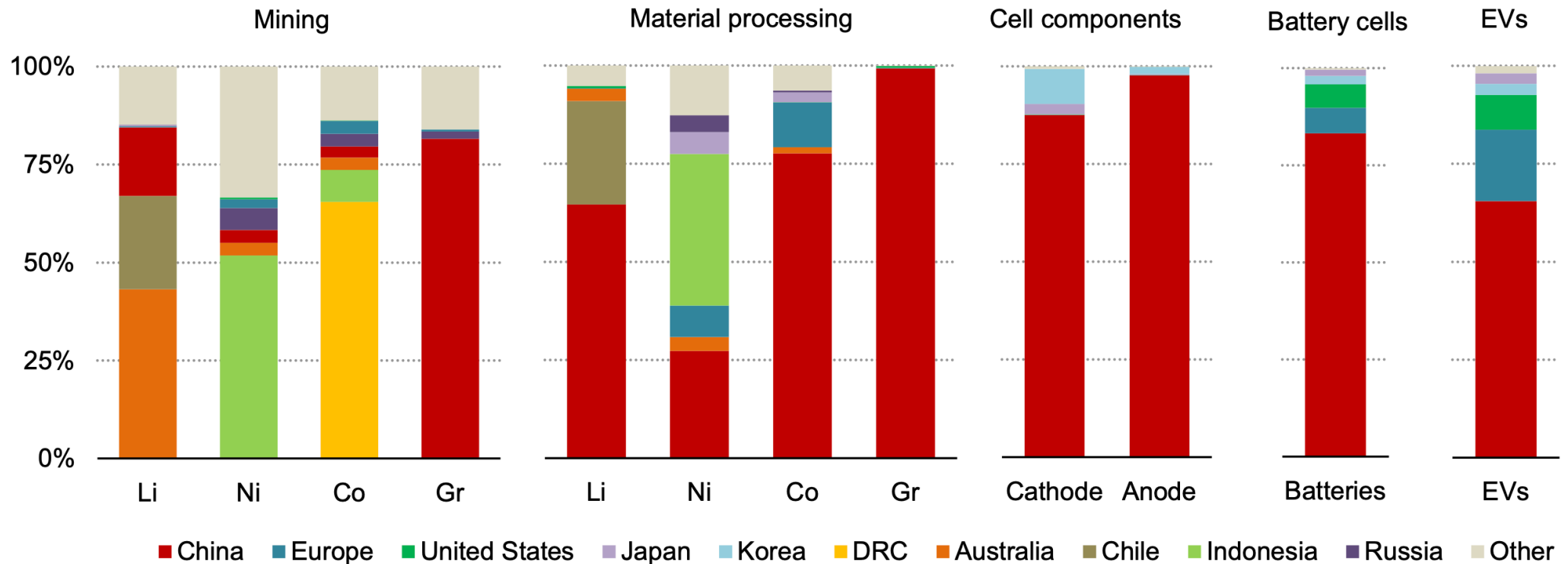


Source: BloombergNEF 30 Jan 2024

## 2. China Dominates Battery Manufacturing

China dominates the entire global battery-EV supply chain

Geographical distribution of the global EV battery supply chain, 2023

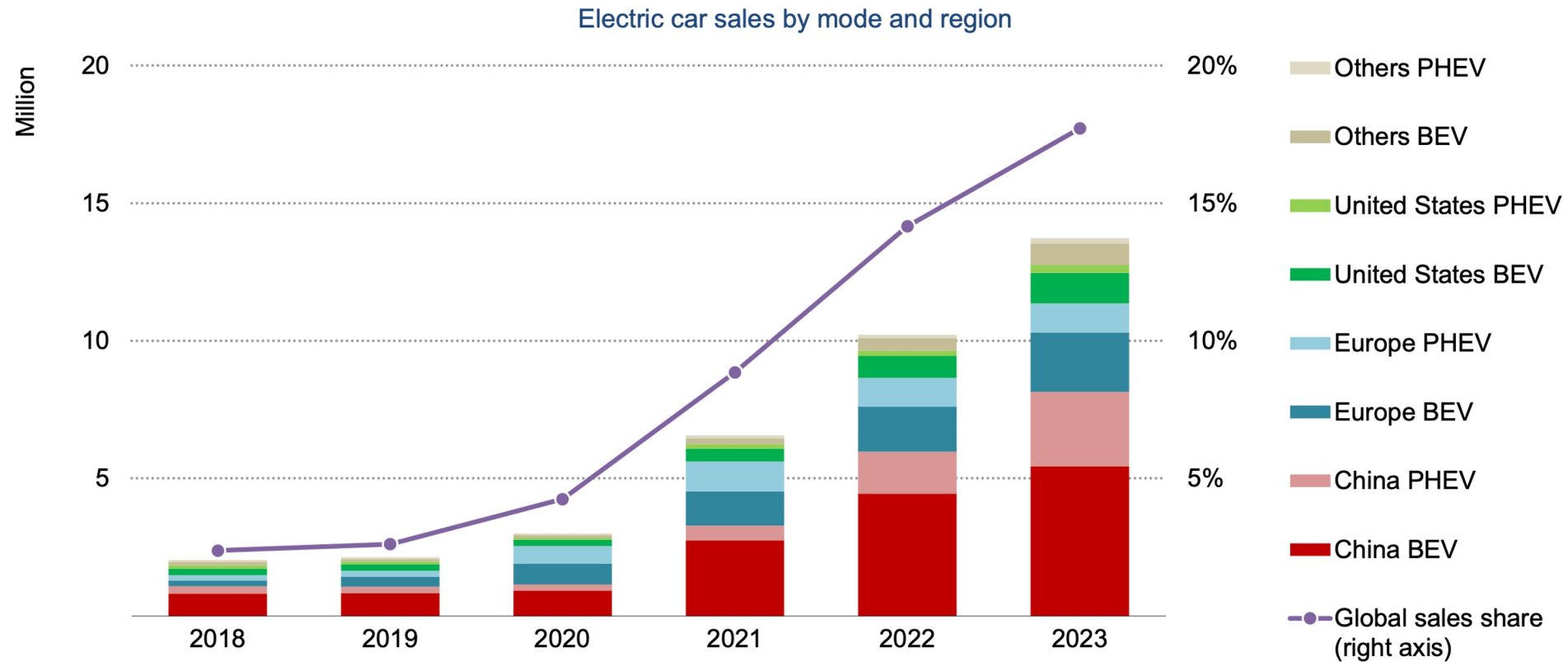




## 2. China Leads the World in EVs

Passenger NEVs in China totalled 709,000 units in March 2024, +29.5% yoy, penetration reaches record 41.6%

### The growth story continued in 2023 for EVs



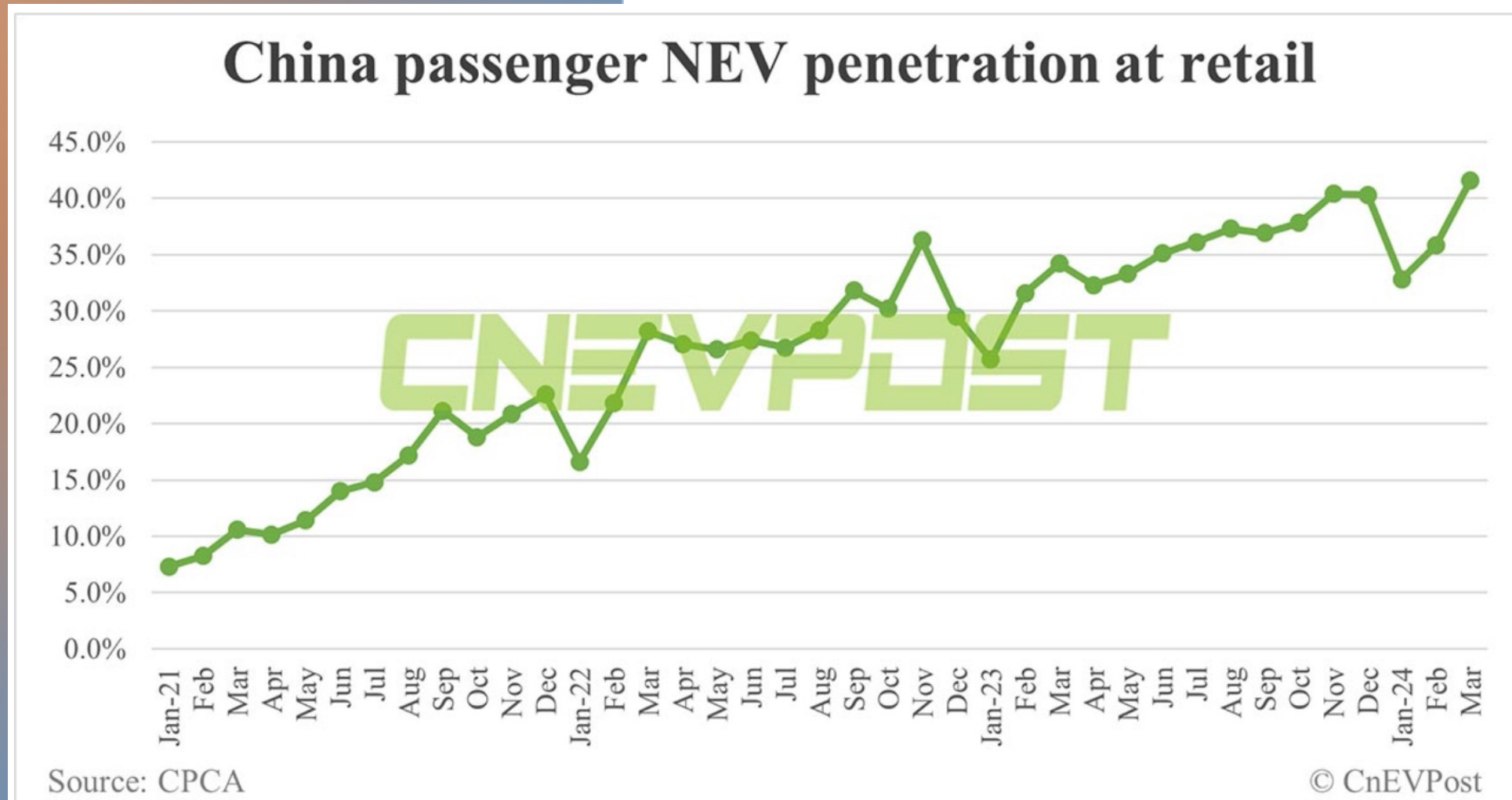
IEA. CC BY 4.0.

Note: BEV = Battery electric vehicle; PHEV = Plug-in hybrid electric vehicle.

Source: IEA (2024), [Global EV Outlook 2024](#).

## 2. China's Rising New Energy Vehicle Penetration

Passenger NEVs in China totalled 709,000 units in March 2024, +29.5% yoy, penetration reaches record 41.6%

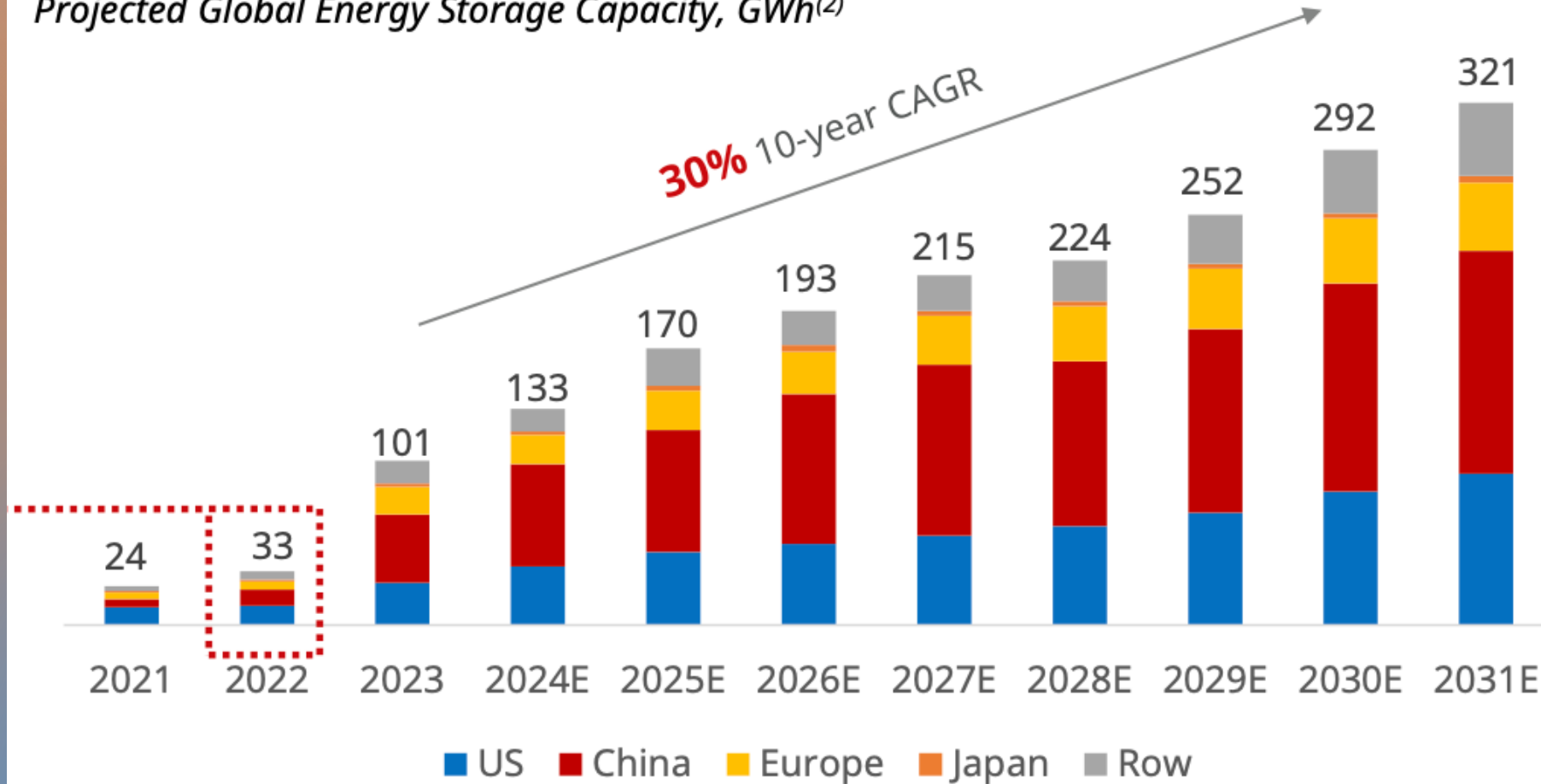




### 3. Global BESS installations are set to boom

Passenger NEVs in China totalled 709,000 units in March 2024, +29.5% yoy, penetration reaches record 41.6%

*Projected Global Energy Storage Capacity, GWh<sup>(2)</sup>*



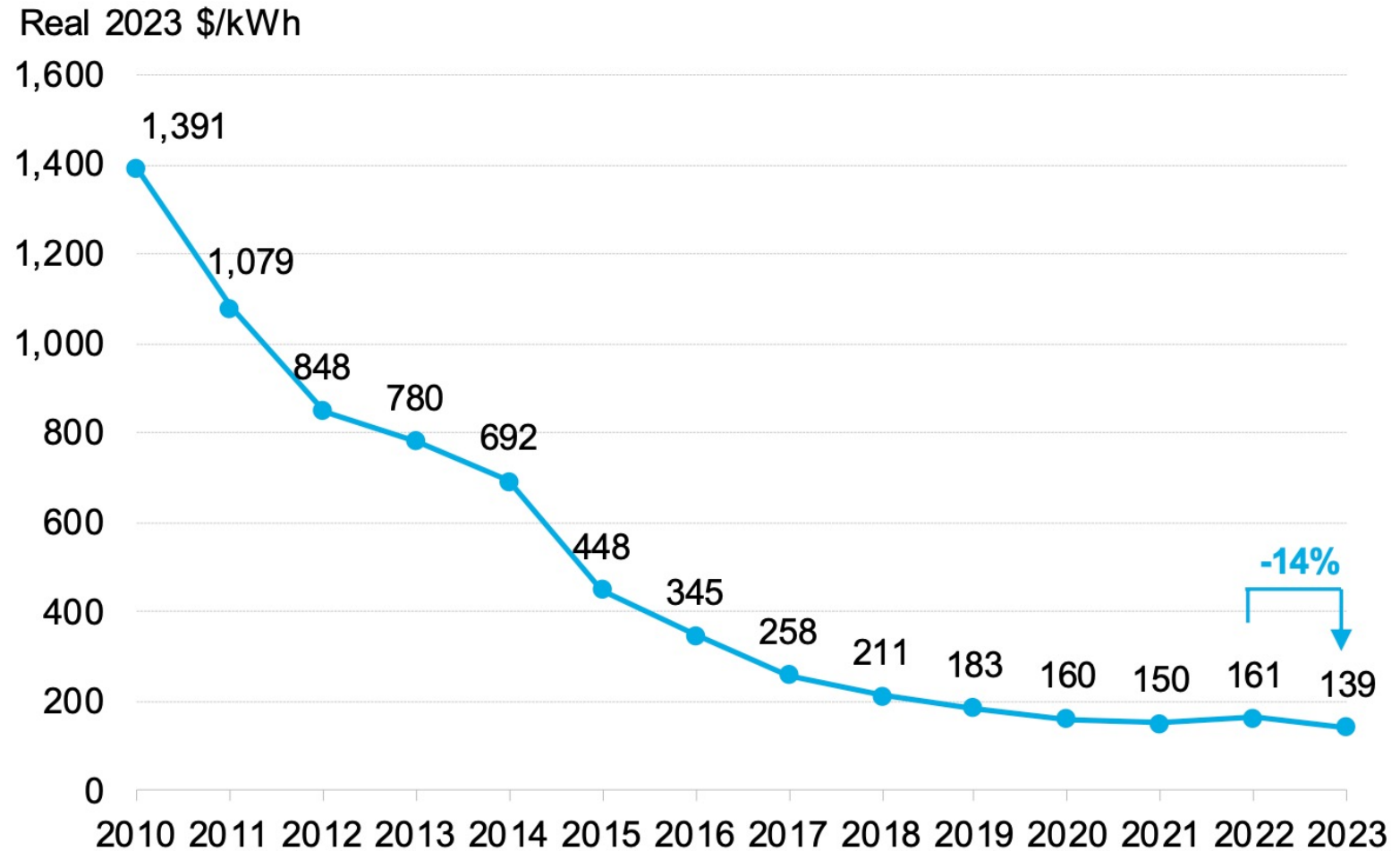
Source: Canadian Solar Investor Presentation March 2024, Woodmac <https://investors.canadiansolar.com/static-files/9d391145-cd5f-42c9-a6ab-67cd02c2f065>

### 3. BESS Deflation

March 2024 saw reports China's CATL will slash the cost of its batteries by up to 50% in 2024, as a price war kicks off with the second largest maker in China, BYD, partly driven by the >80% collapse in lithium and >40% decline in nickel prices.

The Conversation, A battery price war is kicking off that could make EV cheaper, 20 March 2024

#### Volume-weighted average lithium-ion battery pack price

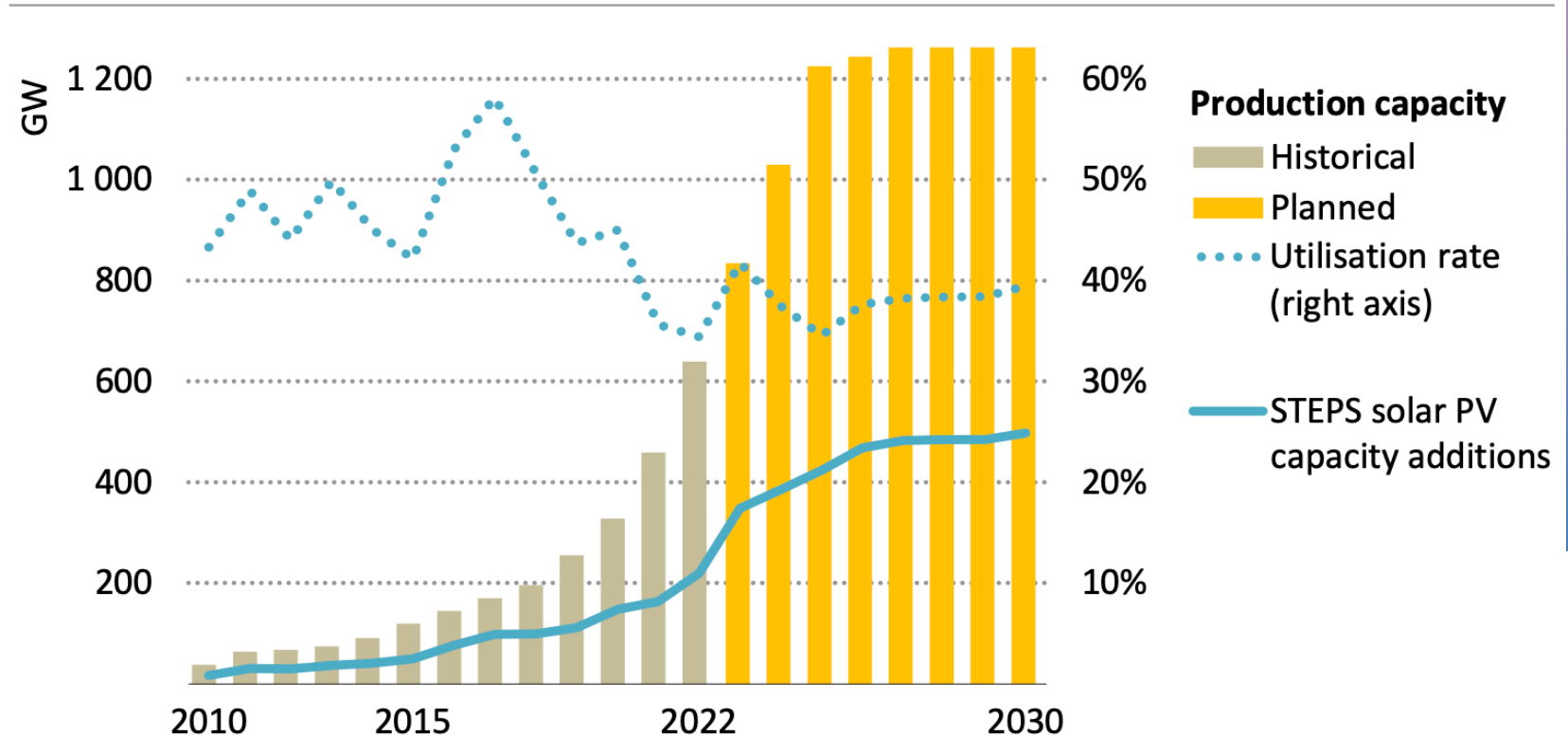


Source: BloombergNEF. Note: Historical figures have been adjusted to real 2023 dollars.

## 4. China Dominates Solar

Solar Growth is Accelerating, Globally.  
BNEF forecasts 585GW<sub>dc</sub> in 2024, +32% yoy.

**Figure 1.10** ▶ Global solar module manufacturing and solar PV capacity additions in the STEPS, 2010-2030



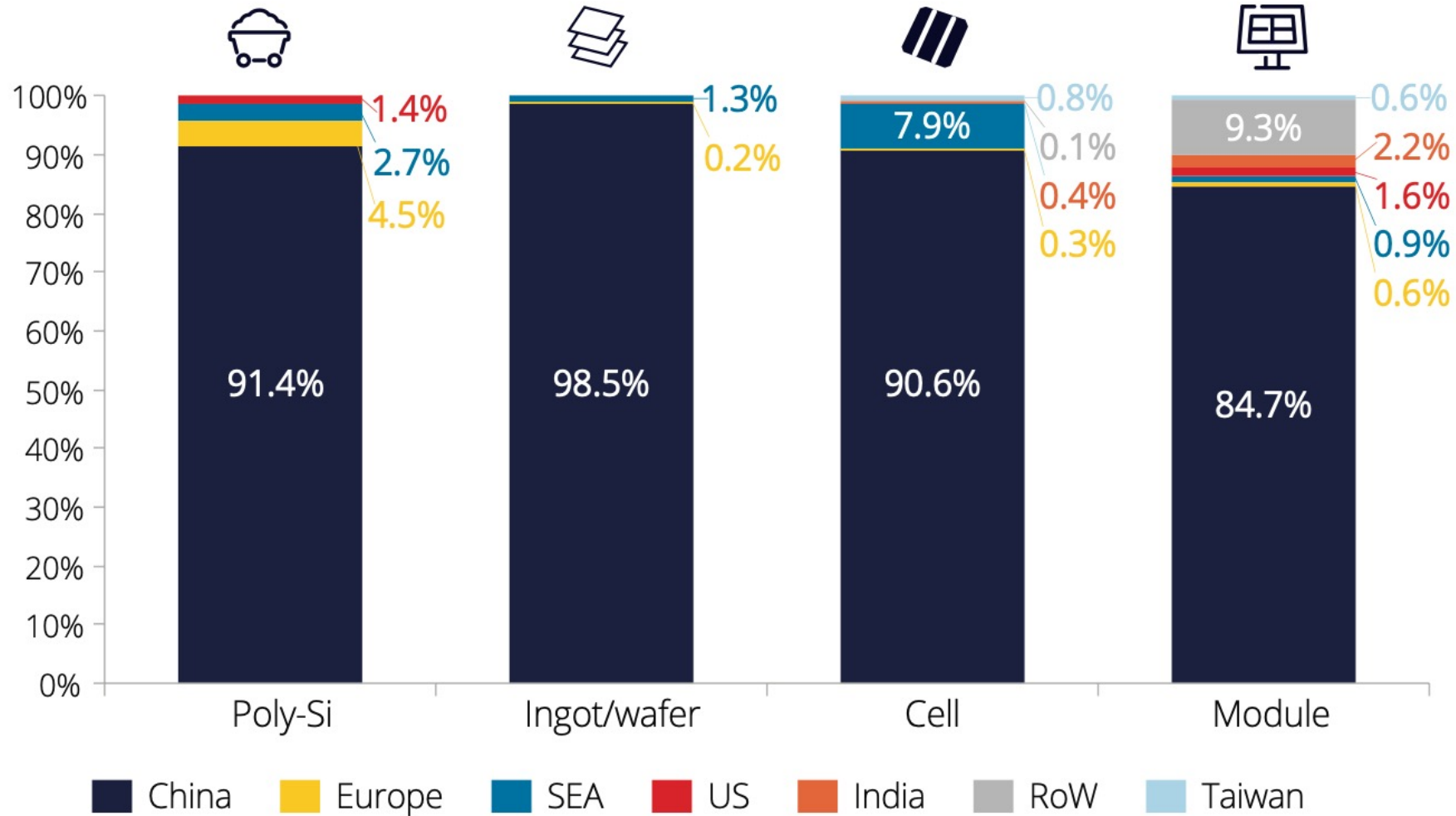
IEA. CC BY 4.0.

*Planned expansion of solar manufacturing outpaces solar PV capacity additions to 2030; its low utilisation rate presents a huge opportunity to accelerate clean energy transitions*



## 4. China's Solar Manufacturing Dominance

Market share in 2023 global PV manufacturing production<sup>4</sup>



Key Findings of the Report –  
POWER SHIFT: Staggering rise of renewables  
positions China to end new coal power before 2030

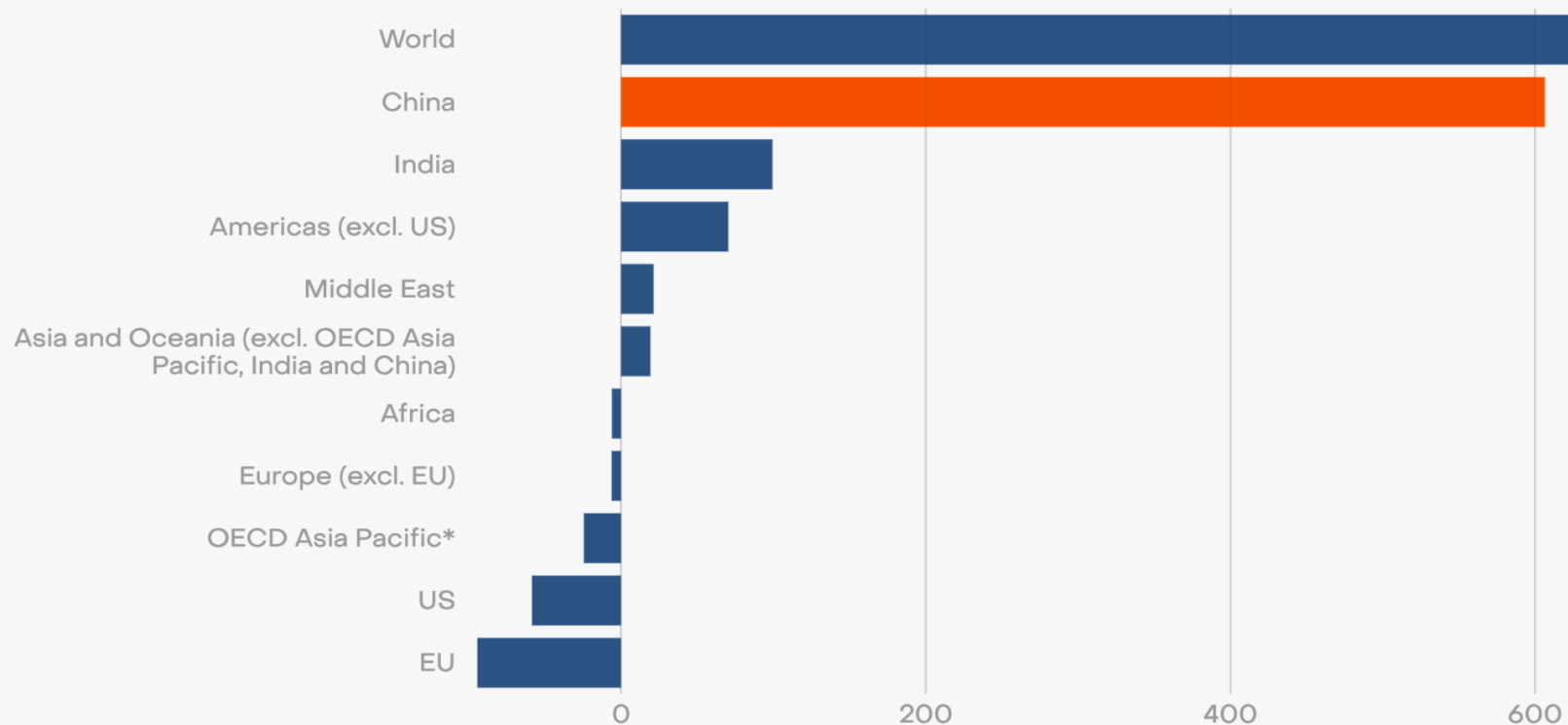


## 5. China Drives Global Electricity Markets

Year on year change, TWh, 2023

**China was the main driver of global electricity demand growth, while the EU and US saw sharp falls**

Change in electricity demand in 2023 (TWh)



Source: Annual electricity data, Ember  
\*South Korea, Japan, Australia and New Zealand

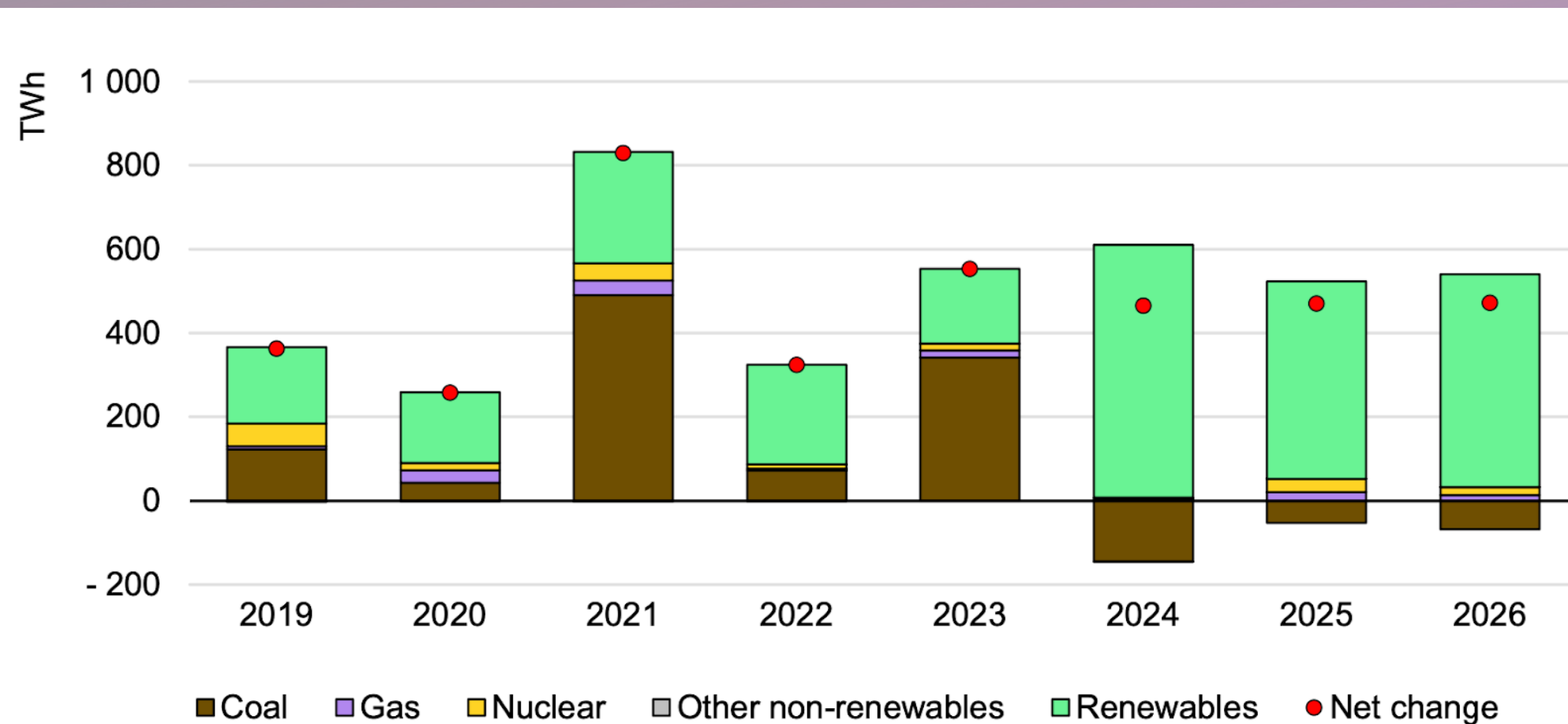
**EMBER**

Source: Ember 2024 <https://ember-climate.org/insights/research/global-electricity-review-2024/>



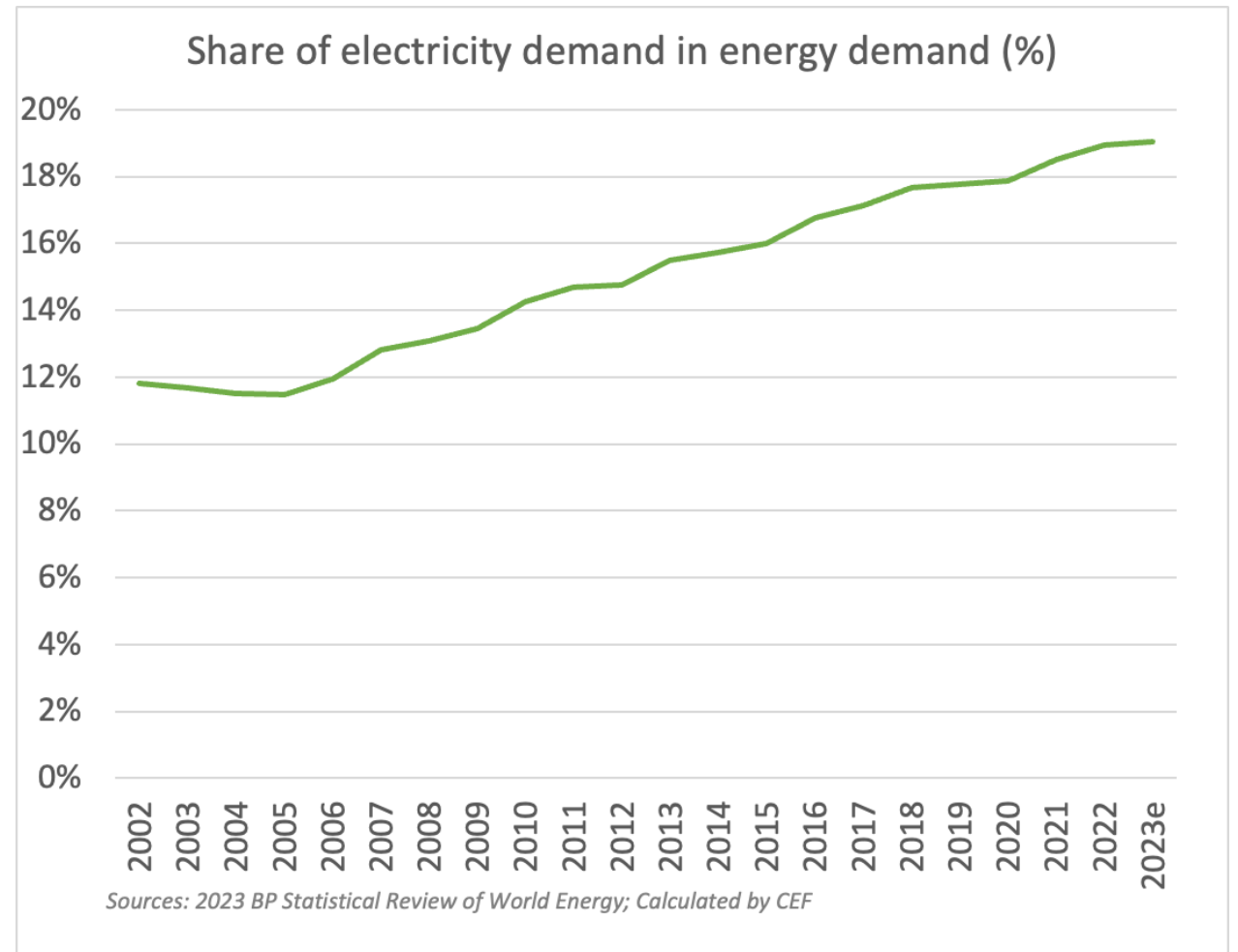
# 5. China's Electricity Generation Mix

Year on year change, TWh, 2019-2026



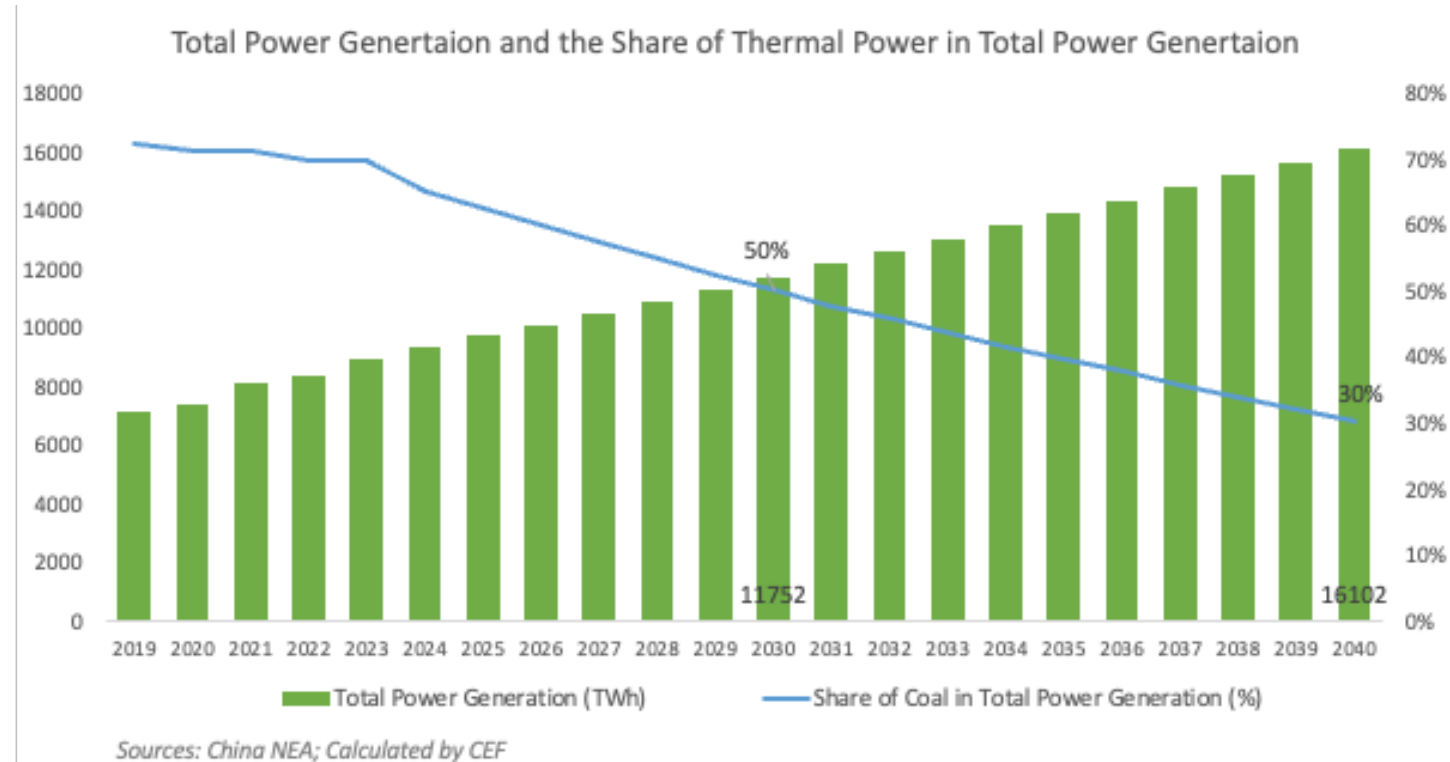
## China's coal power generation could peak well before 2030, then plateau and decline

- Electricity demand keeps increasing due to economic growth.
- Share of electricity demand in energy demand keeps growing due to the multi-decade-long electrification of everything strategy.
- The share of electricity in total energy demand has increased from 12% in 2002, to 19% in 2023, and CEF is expecting this share to reach over 25% by 2040.



## China's coal power generation could peak well before 2030, then plateau and decline

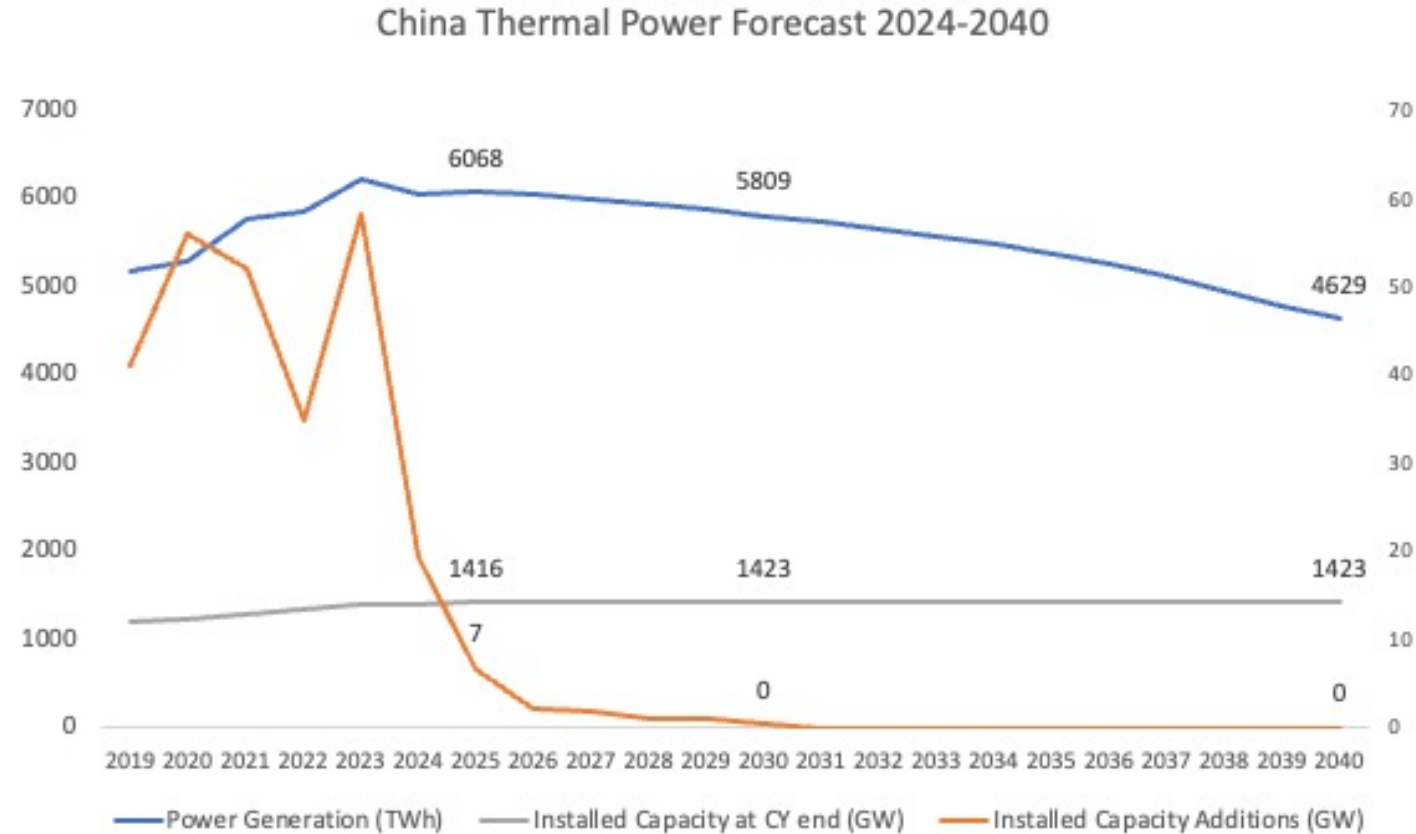
- Renewable expansion >> declining coal-use in power generation.
- As a result, fossil-fuels and imported crude oil imports should decline in the upcoming decade.





## China's coal power generation could peak well before 2030, then plateau and decline

- CEF forecasts that China will see coal power generation peak well before 2030, then plateau and decline.



Sources: China NEA; Calculated by CEF

China will likely reach its 14th Five Year Plan (FYP) 2030 target of 1,200 gigawatts (GW) of installed solar and wind capacity six years early.

- By the end of CY2023, China's total installed wind + solar capacity reached 1050GW.
- During the first 4 months of 2024, China newly added solar + wind capacity of 77GW, 19GW per month.
- By the end of April 2024, China total installed wind + solar capacity reached 1129GW.
- If this pace sustains or accelerates in the rest of the year, China will achieve its 1,200GW of installed wind and solar capacity by 2030 target this year, 6 years ahead of time.

Figure 2. National Installed Capacity as of Dec 2023

		Dec-23	Share of Capacity	Change (yoy %)	Dec-22
Thermal Power	GW	1,390	47.6%	4.3%	1,332
Hydro Power	GW	422	14.4%	1.9%	414
Nuclear Power	GW	57	1.9%	2.5%	56
Wind Power	GW	441	15.1%	20.8%	365
Solar Power	GW	609	20.9%	55.2%	393
<b>Total of Installed Capacity</b>	<b>GW</b>	<b>2,920</b>		<b>13.9%</b>	<b>2,564</b>
Variable Renewables Capacity	GW	1,051	36.0%	38.6%	758
Zero Emissions Capacity	GW	1,529	52.4%	24.2%	1,232

Source: NBS, CEF Estimates

New Capacity Installed in China in Jan-April 2024

		Jan-April 2024	Share of new adds (%)	Change (yoy %)	Apr-23	Share of new adds (%)
Thermal Power	GW	9.2	10%	-28%	2.8	14%
Hydropower	GW	2.7	3%	-24%	0.9	5%
Nuclear Power	GW	-	0%	-100%	0.0	0%
Wind Power	GW	16.8	19%	19%	1.3	7%
Solar Power	GW	60.1	68%	24%	14.4	74%
<b>Total capacity added</b>	<b>GW</b>	<b>88.8</b>	<b>100%</b>	<b>11%</b>	<b>19.4</b>	<b>100%</b>
Renewable Energy adds	GW	79.7	90%	21%	16.6	86%
Zero Emissions Capacity Adds	GW	79.7	90%	18%	16.6	86%

National Installed Capacity as of April 2024

		Apr-24	Share of Capacity	Change (yoy %)	Apr-23
Thermal Power	GW	1,398	46%	4.0%	1,345
Hydro Power	GW	425	14%	2.1%	416
Nuclear Power	GW	57	2%	0.3%	57
Wind Power	GW	458	15%	20.6%	380
Solar Power	GW	671	22%	52.4%	441
<b>Total of Installed Capacity</b>	<b>GW</b>	<b>3,010</b>	<b>100%</b>	<b>13.6%</b>	<b>2,649</b>
Renewable Energy Capacity	GW	1,555	52%	25.7%	1,236
Zero Emissions Capacity	GW	1,612	54%	23.6%	1,304

Source: NBS, CEF Estimates



Zero emissions generation is a lower share than capacity, given lower capacity utilization factors.

- VRE share of total generation to-date in 4MCY2024 is 19% (vs the reported 15%) when distributed energy resources are included.
- Zero emissions total generation is 33% 4MCY2024.
- The 23 May 2024 Notice of the State Council 2024-2025 Energy Conservation and Carbon Reduction Action Plan puts emission reductions, energy efficiency and zero emissions capacity expansions central to the governments plans.

[https://www.gov.cn/zhengce/content/202405/content\\_6954322.htm](https://www.gov.cn/zhengce/content/202405/content_6954322.htm)

China's Electricity Generation Mix in Jan-Apr 2024 (Adjusted for DER)

		Jan-Apr 2024	Share of Generation Jan-Apr	Change (y-o-y %)	Jan-Apr 2024 Adjusted	Share of Generation Jan-Apr Adjusted	Apr-24	Change (y-o-y %)
Hydropower	TWh	294	10%	8.4%	294	10%	84	22.1%
Thermal Power	TWh	2,062	70%	5.9%	2,062	67%	458	1.9%
Nuclear Power	TWh	141	5%	1.9%	141	5%	37	6.0%
Wind Power	TWh	325	11%	11.7%	335	11%	81	-2.6%
Solar Power	TWh	111	4%	31.7%	245	8%	31	36.0%
<b>Total Power Generation</b>	<b>TWh</b>	<b>2,933</b>	<b>100%</b>	<b>7.4%</b>	<b>3,076</b>	<b>100%</b>	<b>690</b>	<b>4.8%</b>
Variable Renewable Generation	TWh	437	15%	16.2%	580	19%	112	5.8%
Zero Emissions Power Generation	TWh	871	30%	11.0%	1,014	33%	607	11.1%

Source: NBS, CEF Estimates

China's reported generation excludes distributed solar & wind (<30MW); capacity includes this. So VRE share is understated (20% not 15%).

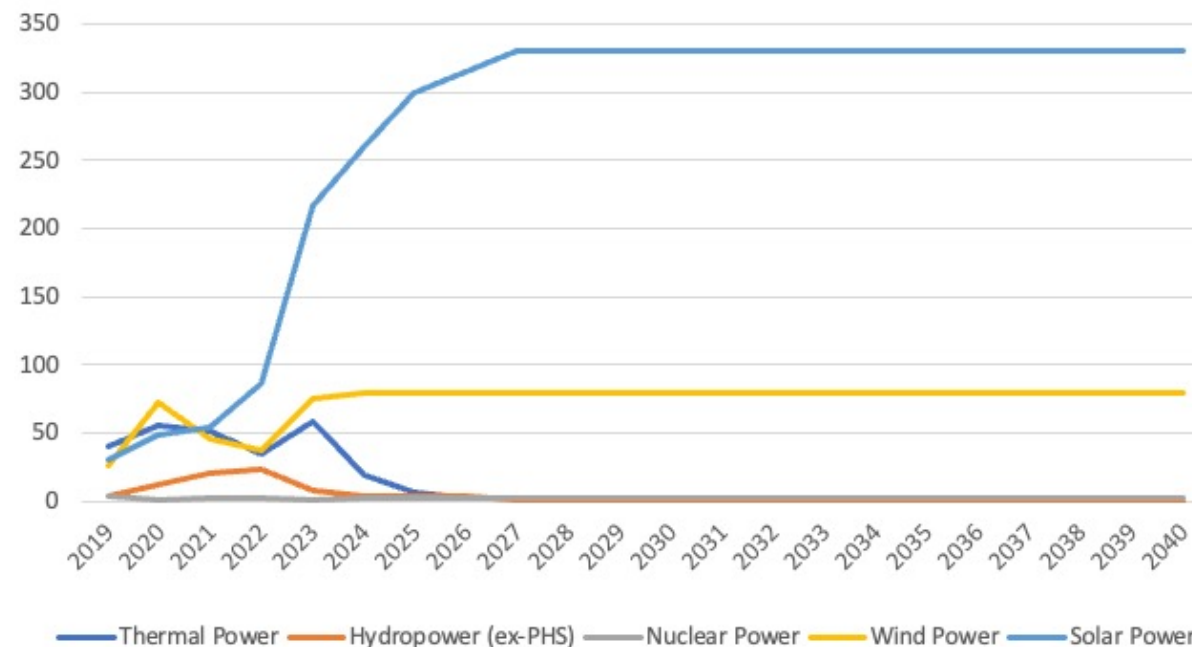


China could reach 'dual carbon' targets ahead of time- to peak carbon emissions by 2030 and reach carbon neutrality by 2060. IF:

CEF forecasts that through to 2040, China will

- Install 323GW p.a. of solar capacity.
- 80GW of wind p.a.
- 1GW of hydropower p.a.
- 3GW of nuclear p.a.
- Sustaining this rate of installation of >400GW p.a. of zero-emissions additions would see China achieve ahead of time its 'dual carbon' targets – to peak carbon emissions by 2030 and reach carbon neutrality by 2060.

**Figure 2.1.2 China's Installed Capacity Additions by Fuel Types Forecast till 2040 (GW)**



**Figure 1. New Capacity Installed in China in Jan-Dec 2023**

		Jan-Dec 2023	Share of new adds (%)	Change (yoy %)	Dec-23	Share of new adds (%)
Thermal Power	GW	57.9	16%	30%	11.5	12%
Hydropower	GW	8.0	2%	-66%	0.2	0%
Nuclear Power	GW	1.4	0%	-77%	0.2	0%
Wind Power	GW	75.9	21%	102%	28.5	31%
Solar Power	GW	216.9	60%	148%	51.9	56%
<b>Total capacity added</b>	<b>GW</b>	<b>360.1</b>	<b>100%</b>	<b>78%</b>	<b>92.2</b>	<b>100%</b>
Variable Renewable adds	GW	292.8	81%	99%	80.4	87%
Zero Emissions Capacity Adds	GW	302.2	84%	92%	80.7	88%

Source: NBS, CEF Estimates

# China's Electricity Market Outlook till 2040

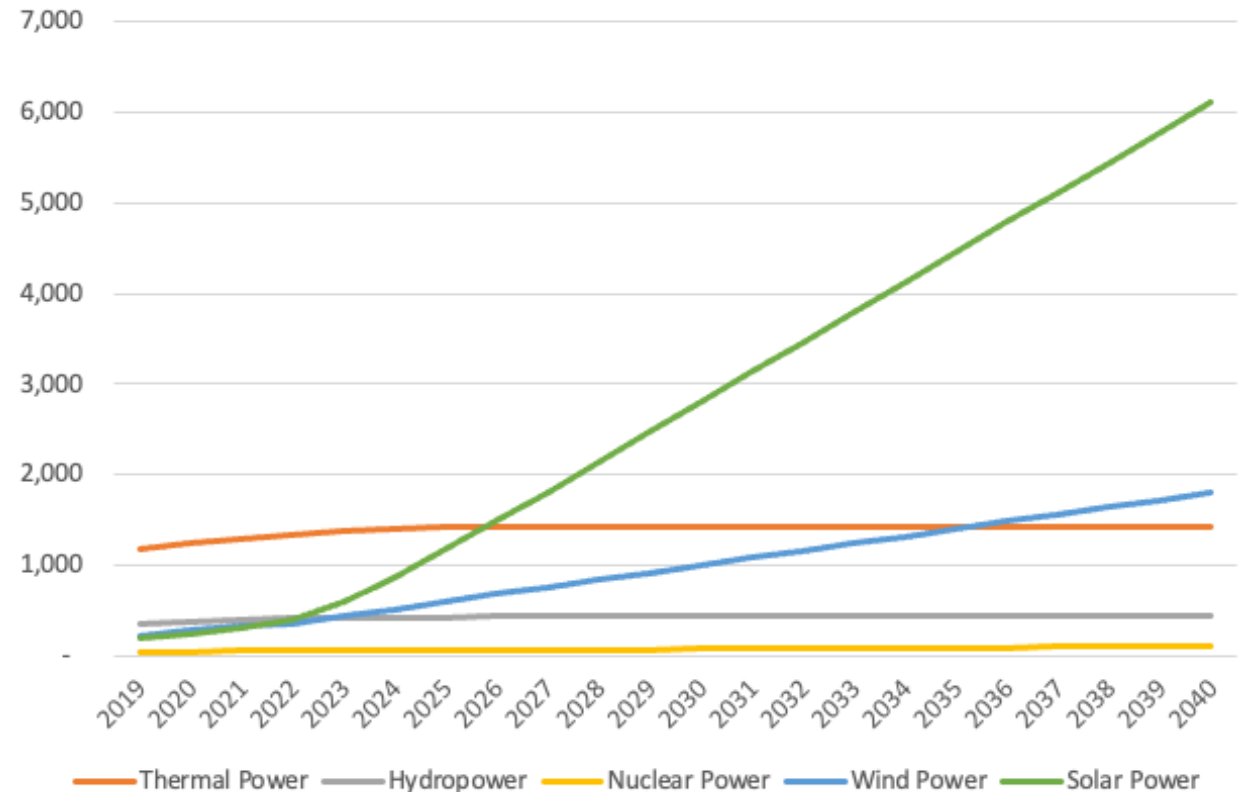


## 1. Total Installed Capacity – Solar as major growing renewable force

CEF forecasts:

- Installed solar capacity will surpass thermal power in 2026 for the first time, reaching 2,804GW in 2030, and 6,104GW in 2040.
- Installed wind capacity will surpass thermal power in 2036 for the first time, reaching 1,001GW in 2030, and 1,801GW in 2040.
- Installed hydropower capacity will increase to 438GW by 2030, and plateau at 438GW till 2040.
- Installed nuclear capacity will increase to 78GW in 2030, and 108GW in 2040.
- Installed thermal capacity will peak in 2030, reaching 1,423GW, and plateau at 1,423GW till 2040.

**Figure 2.1.1 China's Total Installed Capacity at CY End by Fuel Types Forecast till 2040 (GW)**



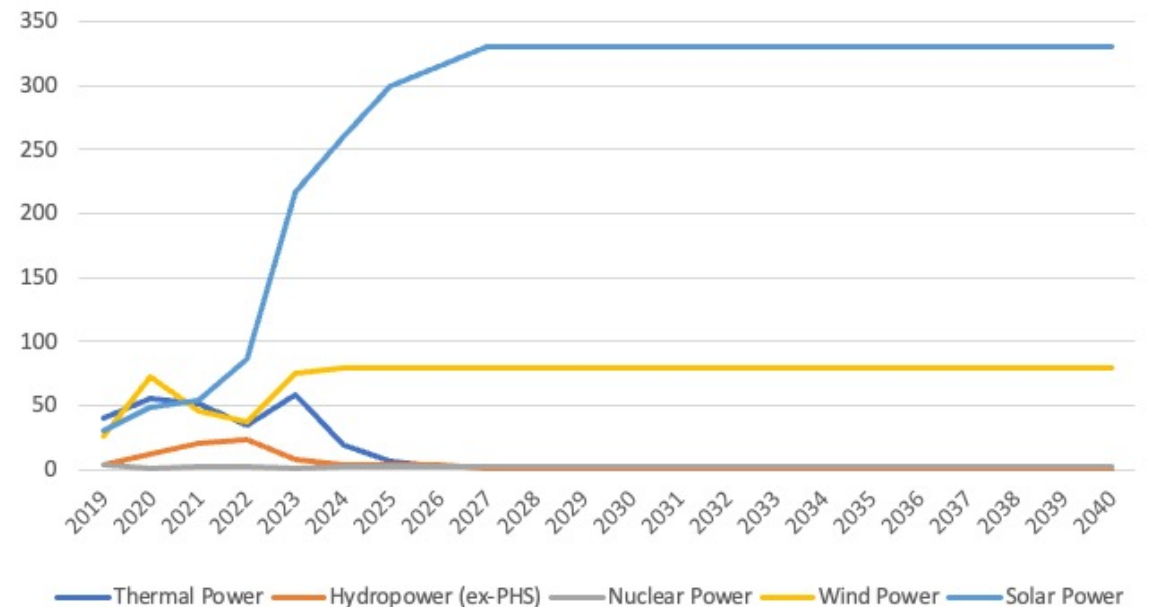


## 2. Installed Capacity Additions

CEF forecasts:

- Solar capacity addition will increase to 260GW by the end of CY2024, and 330GW by the end of 2027, and plateaus until 2040.
- Wind capacity addition will increase to 80GW by the end of 2024, and plateaus until 2040.
- Nuclear power capacity addition will increase to 3GW and remain at 3GW p.a until 2040.
- Hydropower capacity addition will decrease to 3.6GW by the end of 2024, and decrease to 0.5GW by the end of 2030, and no more new hydropower additions moving forward from 2030.
- Thermal power additions will drop to 19.4GW in 2024, and 0.5GW by the end of 2030, and no more thermal power additions from 2030 onwards.

**Figure 2.1.2 China's Installed Capacity Additions by Fuel Types Forecast till 2040 (GW)**



### 3. Generation

CEF forecasts:

- China's electricity demand will keep climbing to 11,672.9TWh in 2030, a 31% increase from 2023, and reach 15,855TWh by 2040, a 78% increase from 2023.
- Thermal power generation in 2030 will reach 5,806TWh, and plateaus thereafter.
- Solar power generation will surpass wind power generation in 2034, and increase to 1,790TWh in 2030, and 4,810TWh in 2040.
- Wind power generation will increase to 2,068TWh by 2030, then 4,186TWh by 2040.
- Hydropower generation will increase to 1,436TWh by 2030, then stay around 1,438TWh from 2031 to 2040.
- Nuclear power generation will continue to rise, reaching 569TWh by 2030, then 792TWh by 2040.

