# Power Up

## How Clean Energy Is Putting Fossil Fuel Demand in Doubt

FOSSIL TO CLEAN

WE MEAN BUSINESS COALITION

Energy Transitions Commission

EMBER

E3G

# Content

# Foreword

## The unprecedented pace of renewable electricity deployment and electrification is crushing one forecast after another. Renewables and batteries are cheaper and faster to deploy than fossil assets.

## The age of clean electrification has arrived, with significant implications for the fossil system. And while demand for fossil fuels remain, cracks are showing....

Despite the exponential growth of clean energy, and all the benefits that come with it, the fossil fuel industry is still banking on long-term growth of demand for oil, gas and coal. But should it be?

This analysis — created by We Mean Business Coalition, Energy Transitions Commission, Ember and E3G — dives into these numbers and more to assess whether future demand justifies new fossil supply. By analyzing climate commitments, clean energy and fossil fuel trends and investments, this report shows how clean energy already is displacing oil, gas and coal demand.

In many places, the transition from fossil fuels to clean energy is already happening. In Europe and North America, renewables are replacing gas and coal for power generation. In China, the government is making its country a powerhouse in electrification. And in Latin America, Asia and Africa, communities are rapidly embracing and deploying solar power.

# Foreword

Such a transition is driven by the fact that a clean energy system — underpinned by abundant and homegrown renewables, energy efficiency and clean electrification — creates opportunities for countries to boost their economy, reduce pollution and avoid trillions of dollars in fossil fuel imports.

Plus, businesses overwhelmingly want policymakers to transition to a renewables-based electricity system: More than 270 companies representing over $1.6 trillion in annual revenue have signed We Mean Business Coalition's letter calling for governments to phase out fossil fuels.

But these businesses still need clear signals from policymakers — from infrastructure improvements to realigned incentives — that show that governments will do their part in the energy transition. When policy is predictable and provides a clear direction, businesses can invest with confidence.

Fossil fuel demand is not going to disappear overnight. But these findings send a clear message to policymakers, investors, fossil fuel producers and corporate energy consumers that clean energy is gaining momentum and that sustained investment in fossil fuels brings significant risks.

All told, investors and policymakers with long-term perspective are right to question the economic, competitive and security implications of the energy system dominated by fossil fuels. By accelerating a well-managed and just transition away from fossil fuels, we can build clean energy systems that work better for everyone.

# Executive summary

# Clean energy is gaining momentum around the world — displacing fossil fuels and driving energy security, competitiveness and efficiency across business and nations

### The transition to a clean energy economy is well underway and accelerating.

Ten years ago, investment in fossil fuel supply outstripped clean 1.2 to 1. Today, clean energy receives twice as much investment as fossil fuels, boosting GDP growth and adding millions of jobs. And renewable electricity is picking up speed, pushing the share of clean electricity above 40% of the global power mix in 2024. This momentum means that today's clean energy technologies have the potential to replace 75% of existing fossil fuel demand.

### Renewable electricity provides a cheaper, faster and more secure way to satisfy growing energy demand in most regions.

Renewables consistently beat projections due to their accessibility and cost. They're available to everyone, everywhere, providing home-grown energy security. And rapid cost declines has meant that most new wind and solar capacity has been added at lower cost than the cheapest fossil fuel alternatives the last several years.

### Solar and wind are big enough and cheap enough to transform the power sector.

Solar has grown faster than any energy source in history, and last year it added more than twice as much generation as any other source, driven partially by the increasing cost-competitiveness of batteries. Between 2023 and 2024, new solar and wind, alongside storage, displaced over 650 TWh of fossil fuel use — more than the total electricity demand of South Korea.

A resounding majority of businesses want policymakers to transition away from volatile fossil fuels toward a renewables-based electricity system.

A poll of over 1,400 executives across 15 countries found that over 90% of business executives identify access to renewable electricity as critical for taking decisions on new investments, with half indicating they would relocate their operations and supply chains if their governments don't transition to a renewables-based electricity system.

The global race to clean energy will be led by clean electrification, transforming all sectors of society.

Electric vehicle sales are breaking records, increasing from 4% to 22% of all cars sold in the last five years. Switching to heat pumps and EVs uses three to five times less energy than fossil-based alternatives. And as the role of clean electrification grows, it's likely to undercut the future of fossil capture and hydrogen.

As clean electrification accelerates, high-value export markets will be up for grabs.

China is seizing this opportunity, electrifying nine times faster than the rest of the world, producing and installing the majority of the world's clean tech, and becoming the first major electrostate. As a result, fossil fuel demand is eroding across the country. Given that much of the global supply chain for clean electrification is not yet built, there is enormous opportunity for other countries to anticipate and invest.

# Fossil fuel producers risk counting on future demand that may not materialize

The abundant potential of solar and wind in emerging and developing economies means fossil fuel producers shouldn't count on them as the next source of significant demand growth.

In Latin America, for example, the share of solar and wind in total generation rose from under 2% to over 16% over the last ten years. In Africa, solar and wind grew from 1% to 7%, and solar PV — the cheapest electricity source for much of the continent — is primed to take off.

Oil demand is under significant pressure as EVs scale, with no sector, including petrochemicals, capable of offsetting the lost oil demand from road transport.

EVs are currently replacing 1.3 million barrels of oil per day and set to replace 5 million barrels of oil per day by 2030. As a result, oil demand is expected to peak then decline this decade, and suppliers who produce high-cost oil will struggle to stay in business.

Gas demand growth has slowed, raising questions about the viability of new gas production and LNG export facilities.

Renewables are rapidly eroding demand for gas in power. As the wait time and cost of gas turbines increase, and the price of solar and batteries declines, gas for power becomes uncompetitive, especially in countries reliant on LNG. Meanwhile, electrified heat in industry and heat pumps in buildings can replace a significant amount gas demand. Overall, while gas demand may grow in some geographies, total demand is unlikely to keep pace with the surge in LNG capacity, risking overbuilt infrastructure and stranded LNG assets.

## The role of coal in power generation is diminishing — the question now is how fast will it fall?

In the last 10 years, planned coal capacity has declined 65%. The remaining planned capacity is concentrated in just 10 countries. In places where renewables are already meeting much of the demand and dominate new installations, new coal plants risk low utilization rates and early retirement.

## Realizing the full potential to displace fossil fuel demand will require policies and incentives that support building a clean energy economy.

Businesses across the globe are ready to scale clean technologies, modernize supply chains and lead in global markets. But they need clear policy signals. The findings in this analysis send a clear message to policymakers, investors, fossil fuel producers and corporate energy consumers that clean energy is gaining momentum and that sustained investment in fossil fuels brings significant risks.

**Sources:** World Energy Investment (IEA), World Energy Employment (IEA), Global Electricity Review (Ember), The Cleantech Revolution (RMI), On the horizon of the energy transition, a new economy is rising (ETC), Powering up: Business perspectives on shifting to renewable electricity (WMBC, E3G and Beyond Fossil Fuels), Global EV Outlook (IEA), Electricity Data Explorer (Ember), E3G analysis of Global Energy Monitor Global Coal Plant Tracker dataset.

# SECTION 1

## THE GROWTH OF CLEAN ENERGY HAS BEEN EXPONENTIAL

The shift from fossil fuels to clean energy is gaining momentum globally — driving energy security, competitiveness and efficiency across business and nations. Today's technologies can displace three-quarters of existing fossil fuel demand.

Solar and wind, accompanied by cost-competitive batteries, are already big enough and cheap enough to lead a deep transformation of the power sector away from fossil fuels.

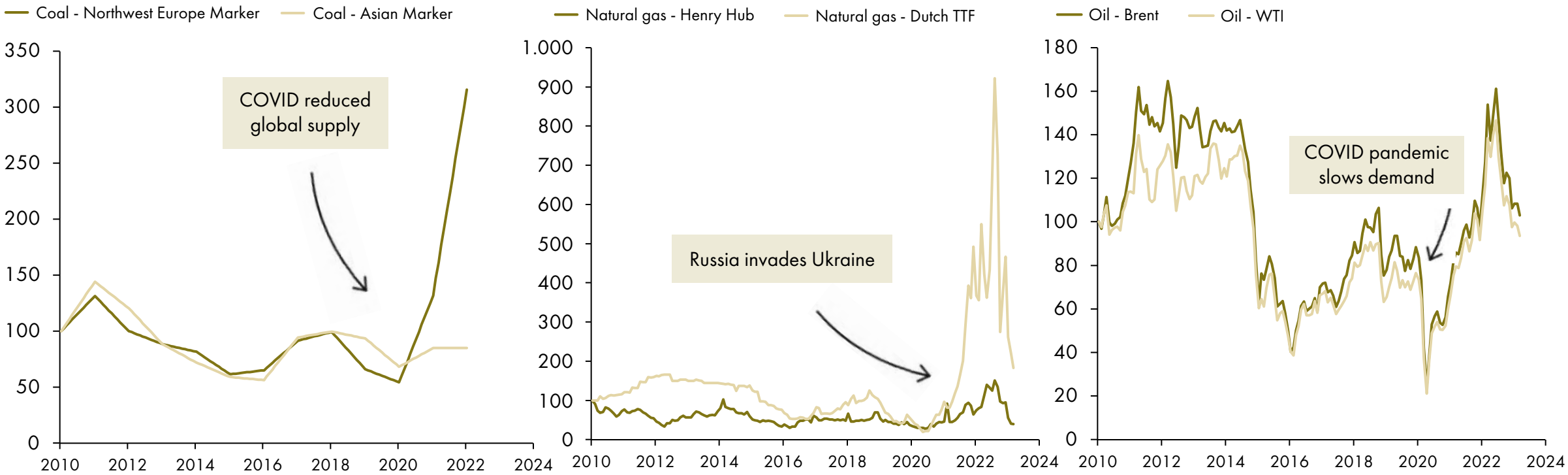
A resounding majority of businesses want policymakers to transition away from volatile fossil fuels toward a renewables-based electricity system and are willing to move their operations to places that have one.

Electricity is the new champion of energy. Electrifying end uses offers significant opportunity for domestic value creation and will enable deeper transformation across all sectors of society.

# Clean energy context

# Global fossil fuel prices experience significant price shocks due to geopolitical events, undercutting the economic case of fossil fuels

Evolution of price markers for coal, gas and crude oil from 2010-2023 In index, 2010 = 100 values

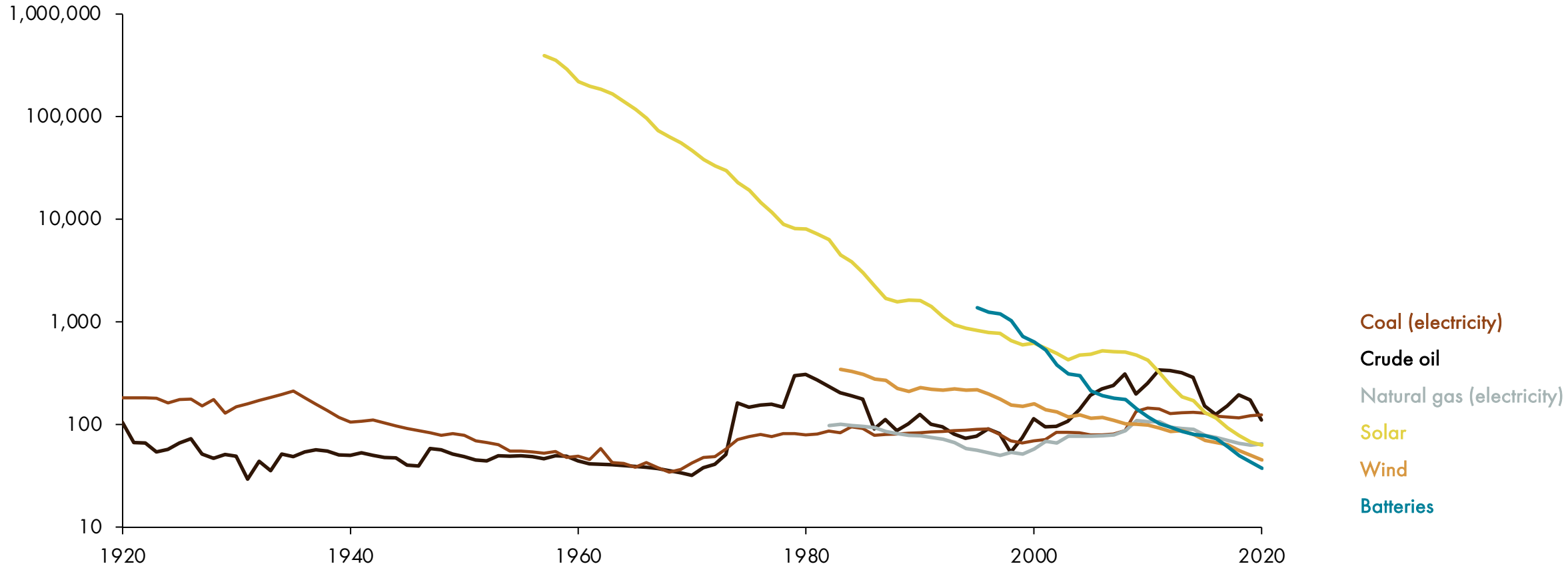



During the recent global energy crisis, governments spent USD 900 billion to help consumers manage sky-high energy prices caused by fossil fuels price volatility

Source: Chart from ETC (2023) *Fossil Fuels in Transition,* underlying from Systemiq analysis of EIA (2023), *Henry Hub Natural Gas Spot Price;* EIA (2023), *Europe Brent Spot Price FOB;* Nasdaq (2023), *Dutch TTF Natural Gas Forward Day Ahead;* Nasdaq (2023), *Coal Marker Prices;* EIA (2023), *Cushing, OK WTI Spot Price FOB.* Text box data source IEA (2024), *Strategies for Affordable and Fair Clean Energy Transitions*, License: CC BY 4.0

# Renewable technologies continue to get cheaper, while fossil prices cost the same or more than they did 100 years ago

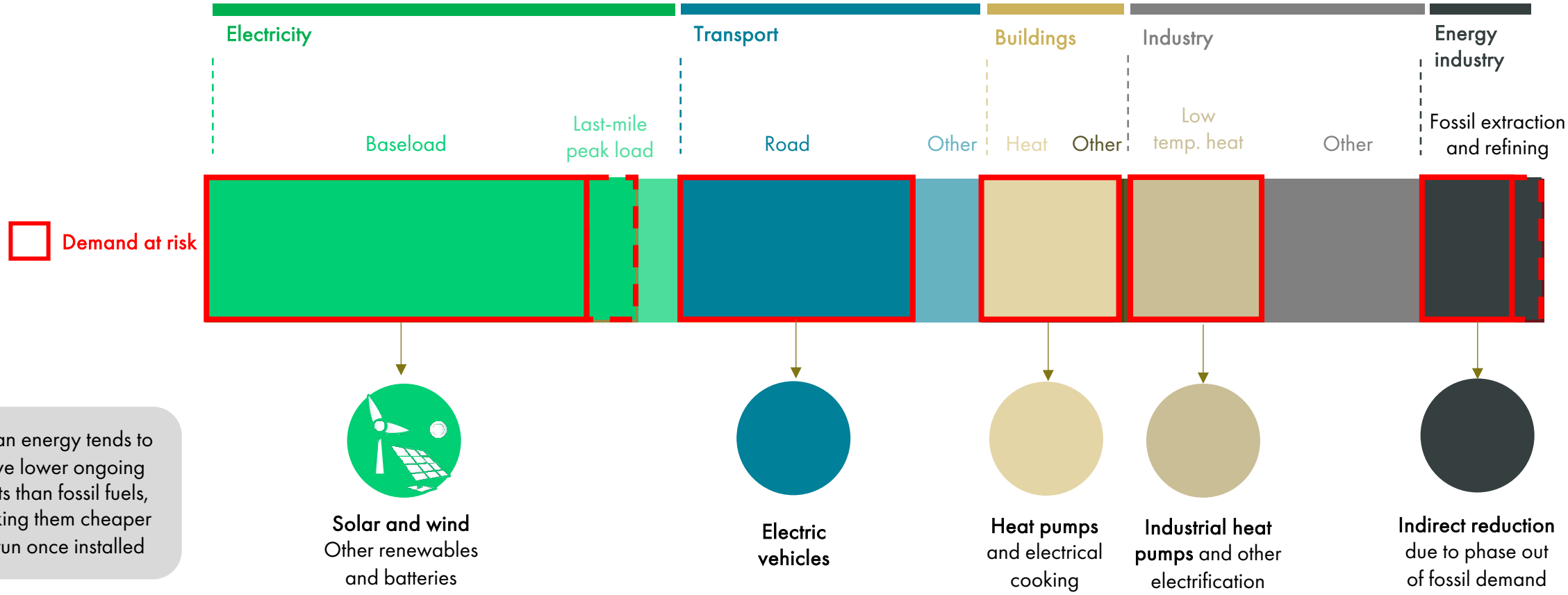
Historical costs of energy sources [2020 $ per MWh of useful energy]




Notes: Useful energy is the total energy left after all processing and conversion losses.
Source: Chart from RMI (2024), *The Cleantech Revolution*

# Today's clean tech has the potential to displace 75% of today's fossil fuel demand

Fossil fuels' share of final energy demand by sector (2024)

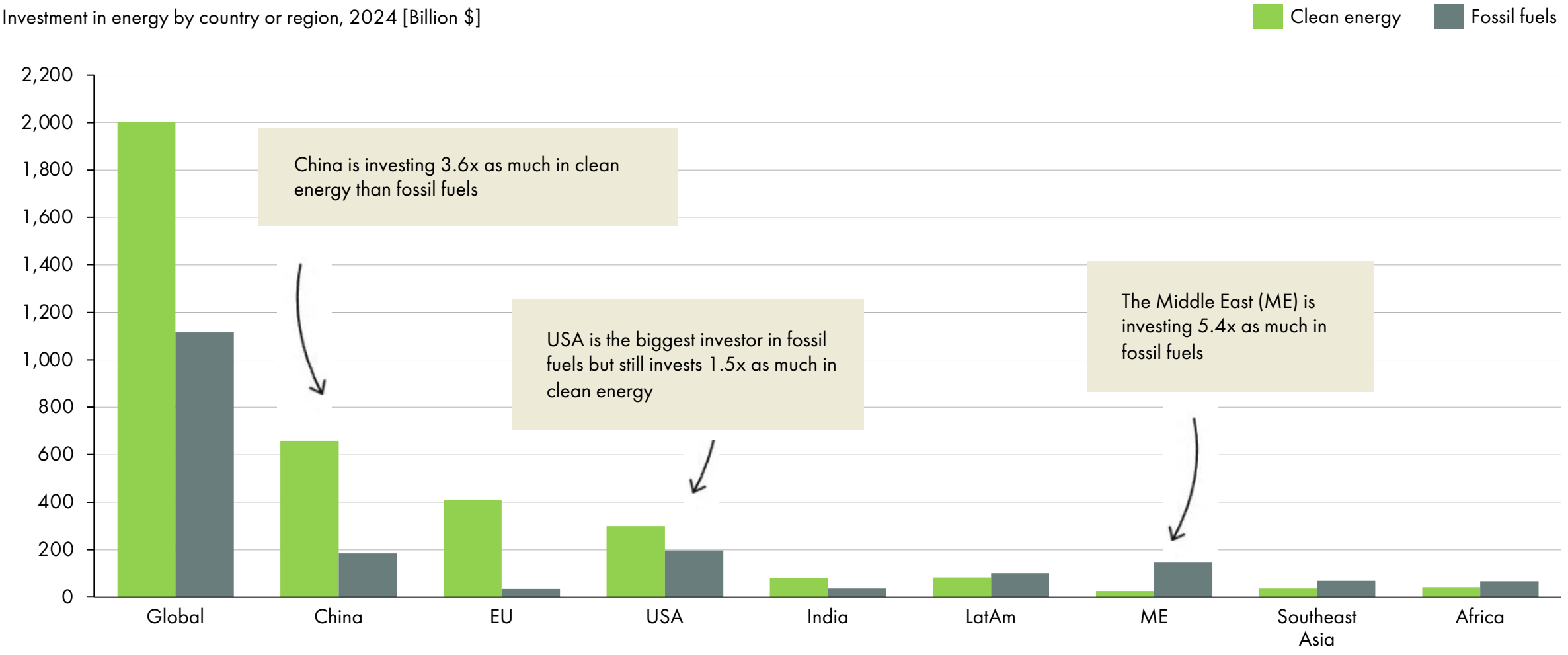



Clean energy tends to have lower ongoing costs than fossil fuels, making them cheaper to run once installed

Source: Chart from RMI (2024), *The Cleantech Revolution*

# The world now invests nearly twice as much in clean technologies as it does in fossil fuels

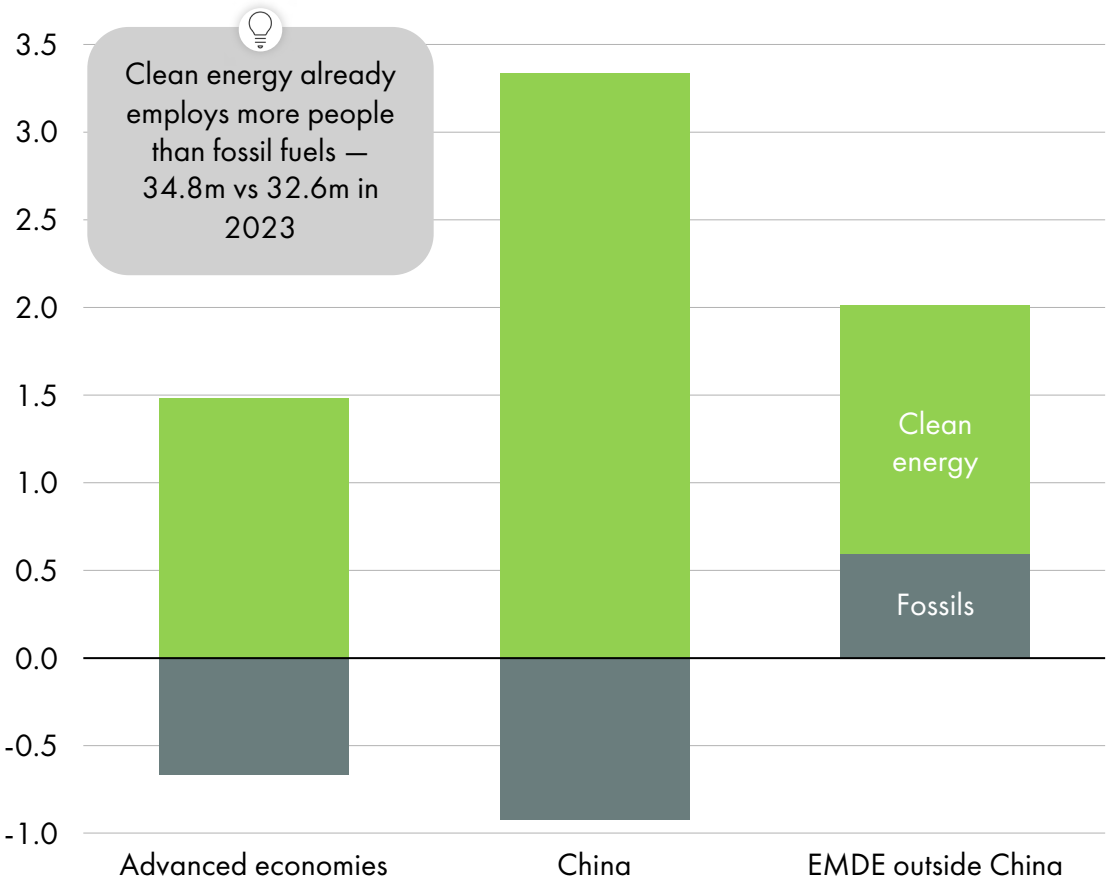
Investment in energy by country or region, 2024 [Billion $]



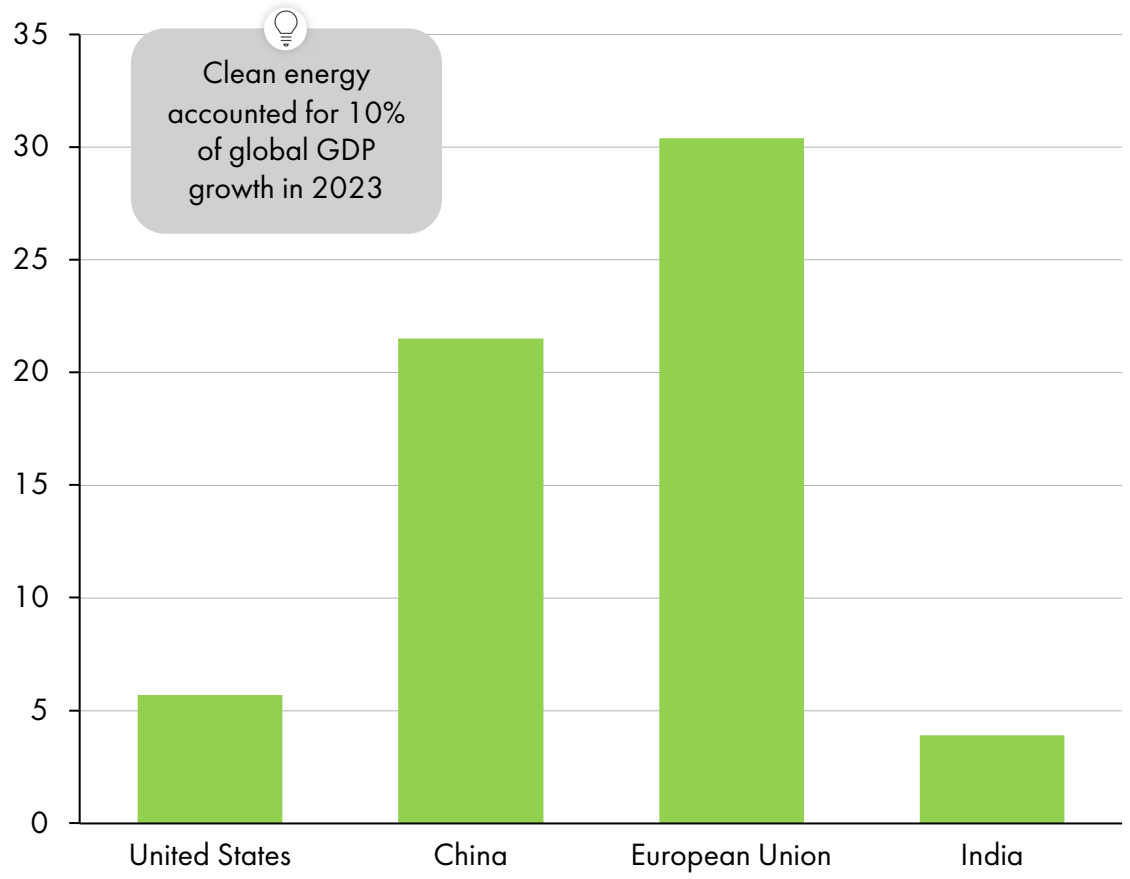

Notes: Clean energy includes renewable power, grids and storage, energy efficiency and end-use, nuclear and other clean power, low-emission fuels (i.e. where non-bioenergy inputs such as hydrogen or methanol are from low-emissions hydrogen).
Sources: IEA (2024), *World Energy Investment 2024*, License: CC BY 4.0; IEA (2025), *World Energy Investment 2025*, License: CC BY 4.0

# A new economy is rising as clean energy technologies are generating millions of jobs and boosting economic growth

Change in energy employment, [million jobs, 2019-2024]



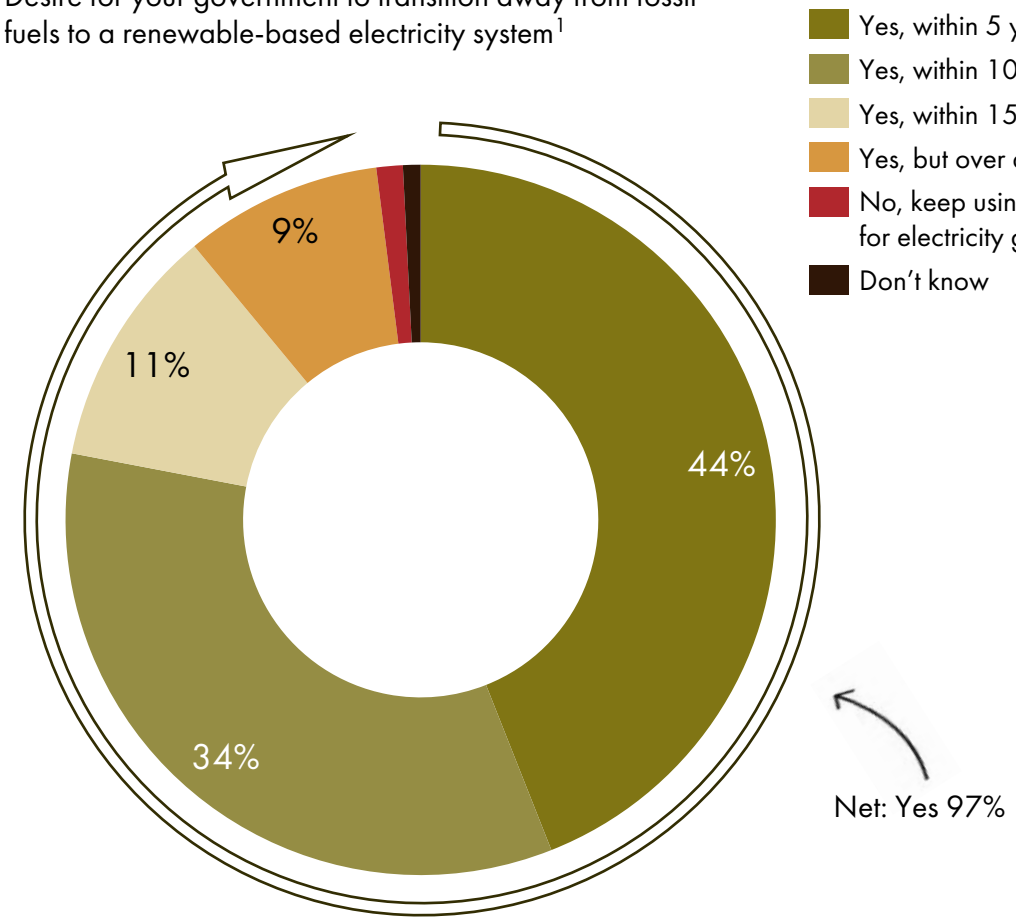

Contribution of clean tech to GDP growth, [% of GDP growth, 2023]



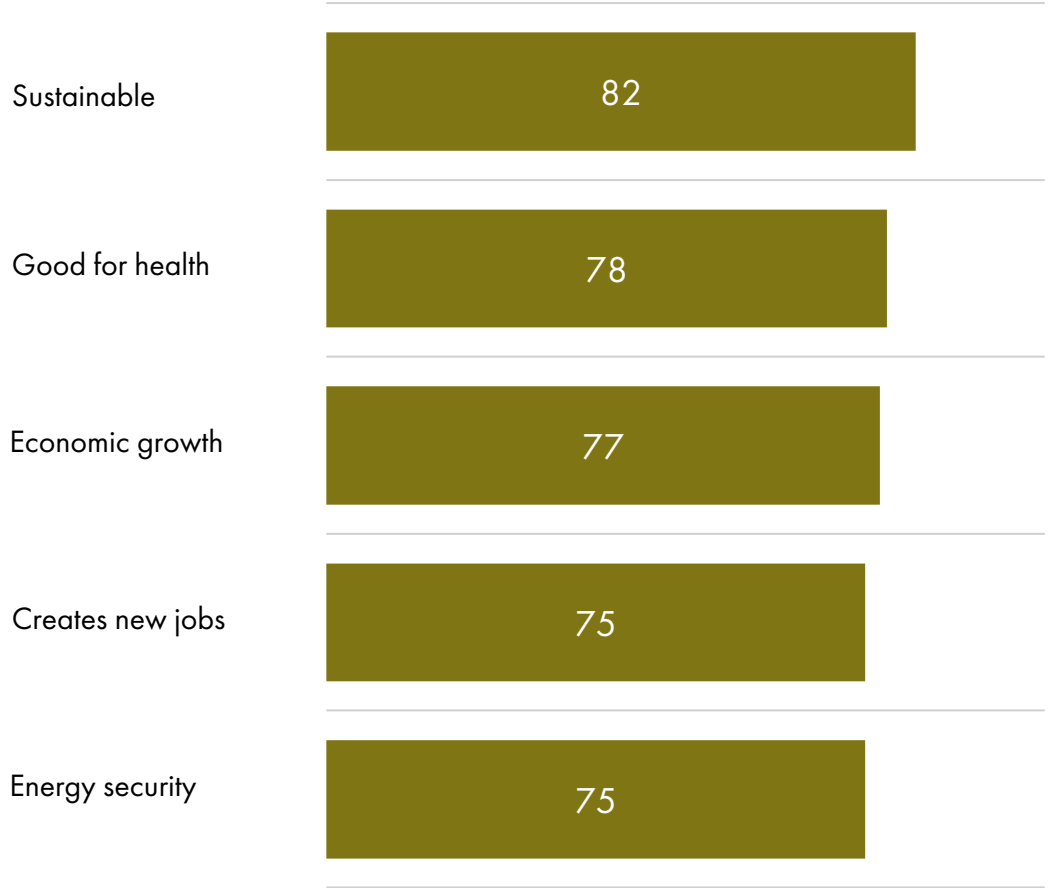

Sources: IEA (2024), *World Energy Employment 2024*, License: CC BY 4.0; Chart from IEA (2024), *Clean energy is boosting economic growth*, License: CC BY 4.0

# Businesses want a rapid transition to a renewables-based electricity system because it delivers energy security, economic growth and jobs

Desire for your government to transition away from fossil fuels to a renewable-based electricity system[1]




Which attributes do you associate with a renewable-based electricity system, %[2]

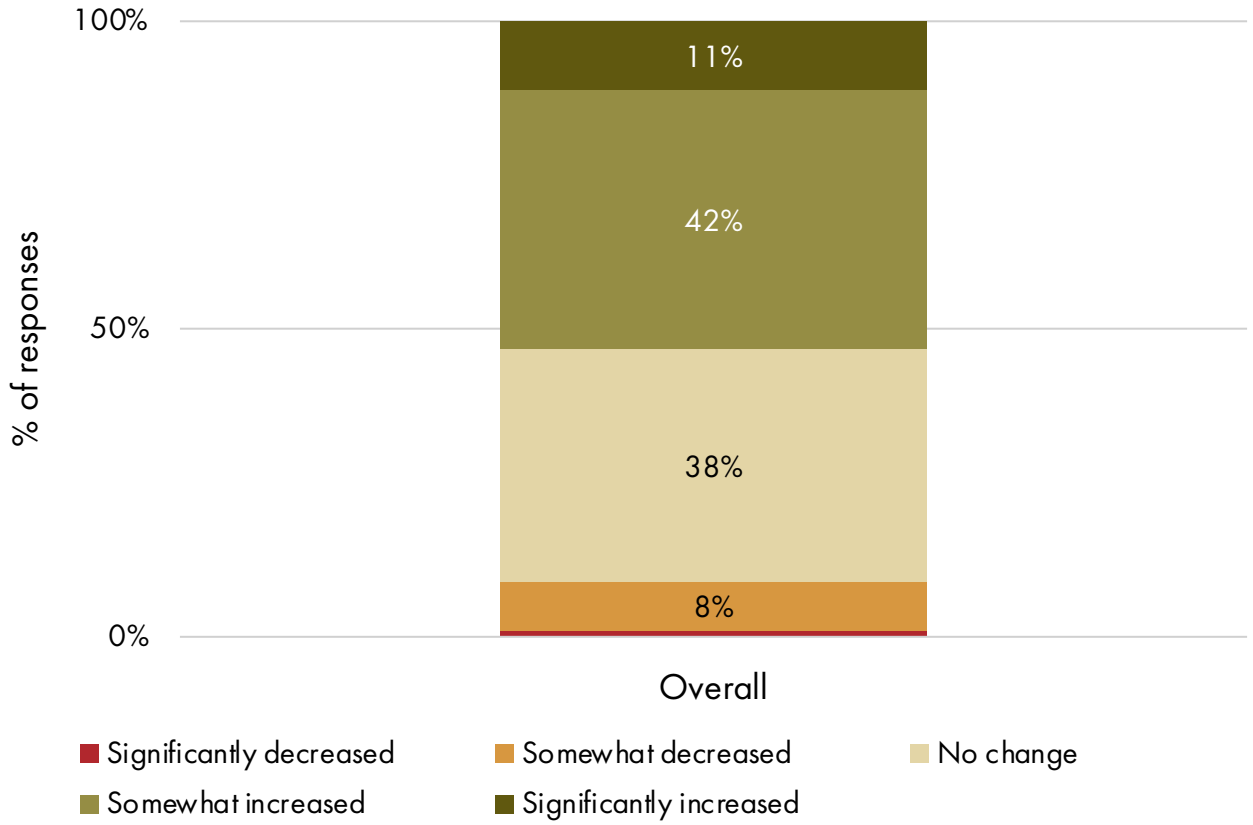



Notes: Survey of wide range of industry business executives globally in December 2024, 1477 respondents, detailed sample description in E3G report. [1]'Do you think your government should transition away from fossil fuels to a renewables-based electricity system?' [2]' Which of these attributes do you associate with the following electricity sources?

Source: Chart from E3G, BFF and WMBC (2025), *Powering up: Business perspectives on shifting to renewable electricity*

# Over 90% of business leaders have maintained or ramped up investments in clean solutions and infrastructure over the past year

Change in net-zero transition investments compared to previous year[1]




**Businesses surveyed say:**

The primary driver for investing in the transition is to secure long-term competitiveness (56%)

Asia and Europe are the most attractive destinations for investment

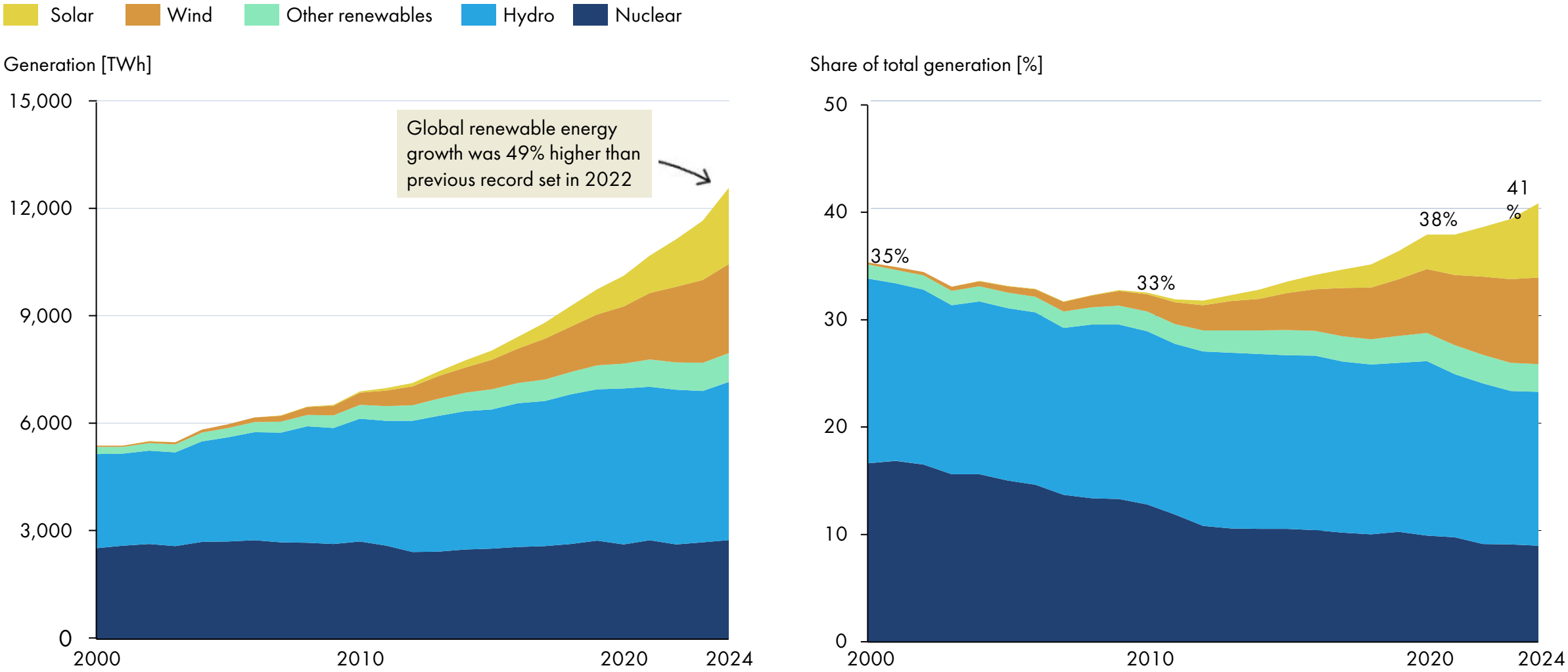
Governments should stay the course on net-zero commitments (96%)

Source: WBCSD (2025) Barometer '25 Survey, *Business Breakthrough Barometer 2025*

Notes: Survey of senior executives from businesses at the forefront of the transition. [1] How has your organization's investment in the net-zero transition changed compared to 12 months ago?
Source: WBCSD (2025) Barometer '25 Survey, Business Breakthrough Barometer 2025

# Renewable electricity

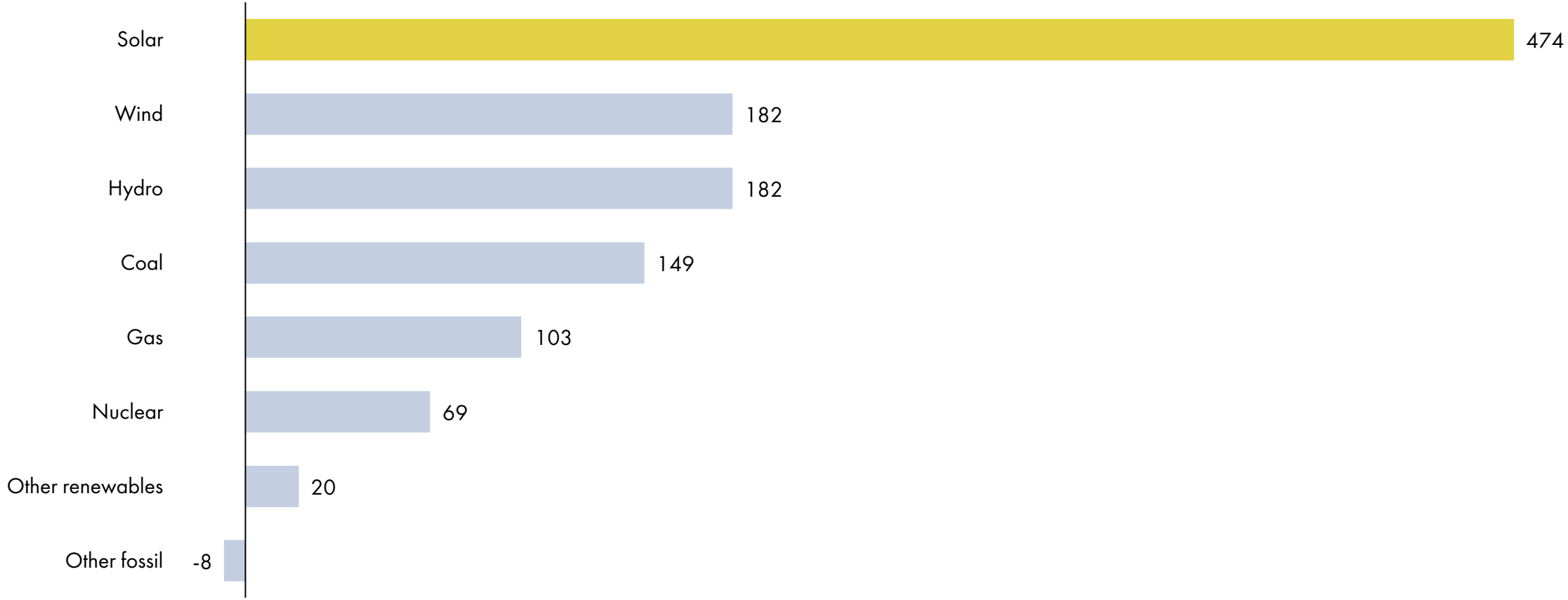
# Renewable electricity is picking up speed, pushing the share of clean electricity above 40% of the global power mix in 2024




Notes: 'Other renewables' includes bioenergy, geothermal, tide and wave energy.
Source: Charts from Ember (2025) *Global Electricity Review,* underlying data from Ember's yearly electricity data

# Solar is driving the growth in generation, adding more than twice as much as any other source in 2024

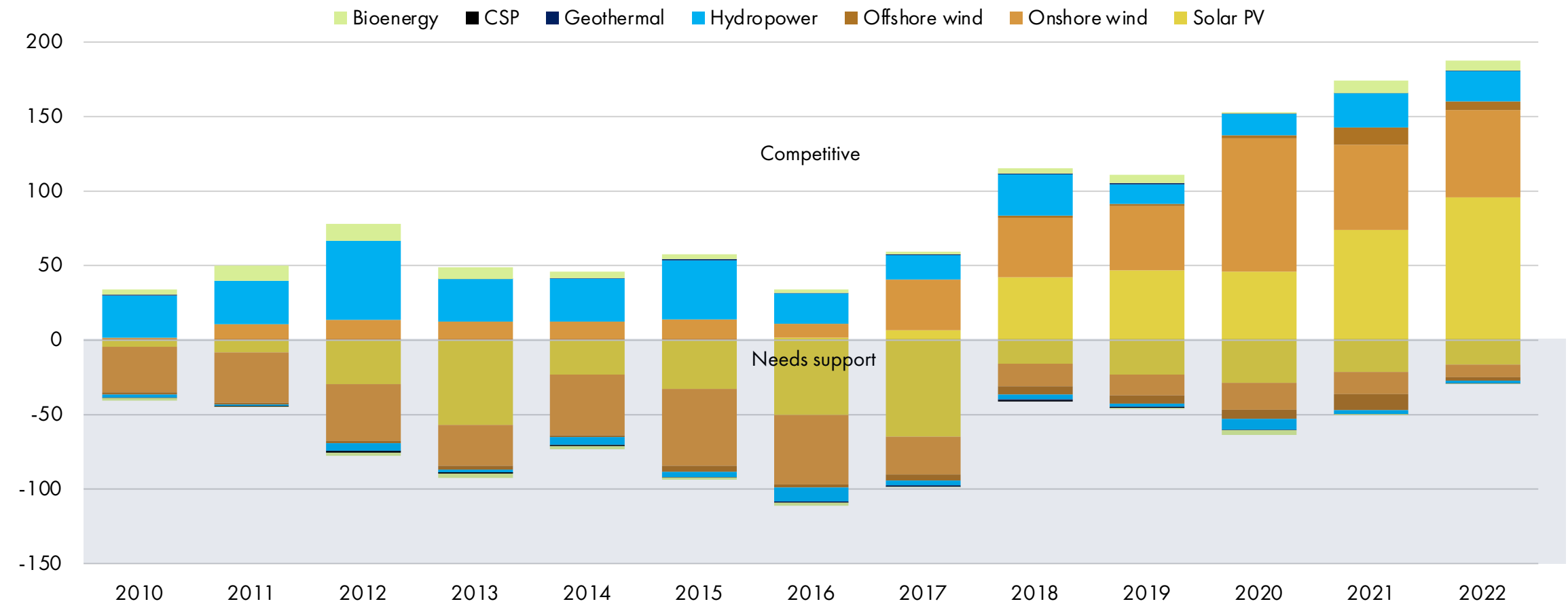
Year-on-year change in electricity generation[TWh]




Notes: 'Other renewables' includes bioenergy, geothermal, tide and wave energy.
Source: Charts from Ember (2025) *Global Electricity Review,* underlying data from Ember's yearly electricity data

# Most new wind and solar capacity was added at lower cost than cheapest fossil fuel alternatives over the last several years

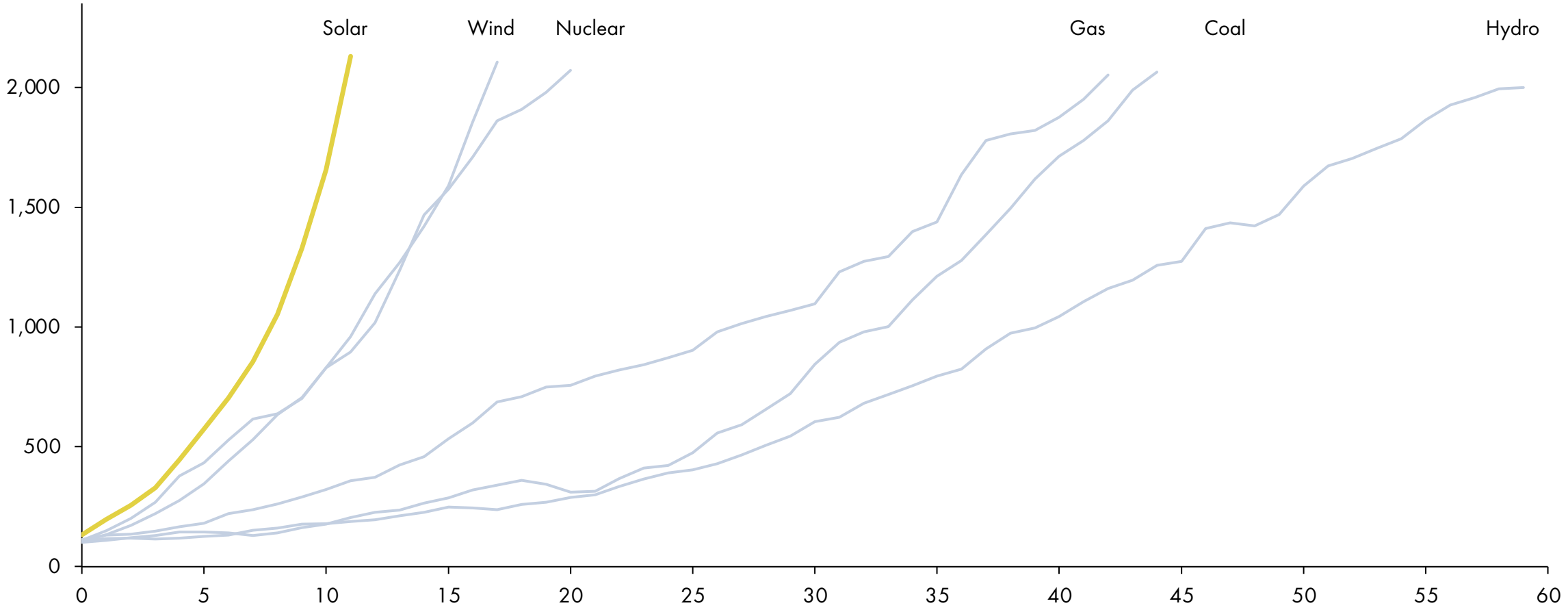
New capacity added ** [GW]




Notes: **Competitive = project level renewable LCOE is lower than the cheapest fossil-powered alternative in that country; 2022 figures are conservative since they use 2021 fossil LCOE; CSP is Concentrated solar power
Sources: Ember (2024) *Why wind and solar are key solutions to combat climate change* using data from IRENA (2023), *Renewable Power Generation Costs in 2022*

# Solar has grown faster than any source in history, taking just 8 years to go from 100 TWh to 1,000 TWh, and 3 years to pass 2,000 TWh

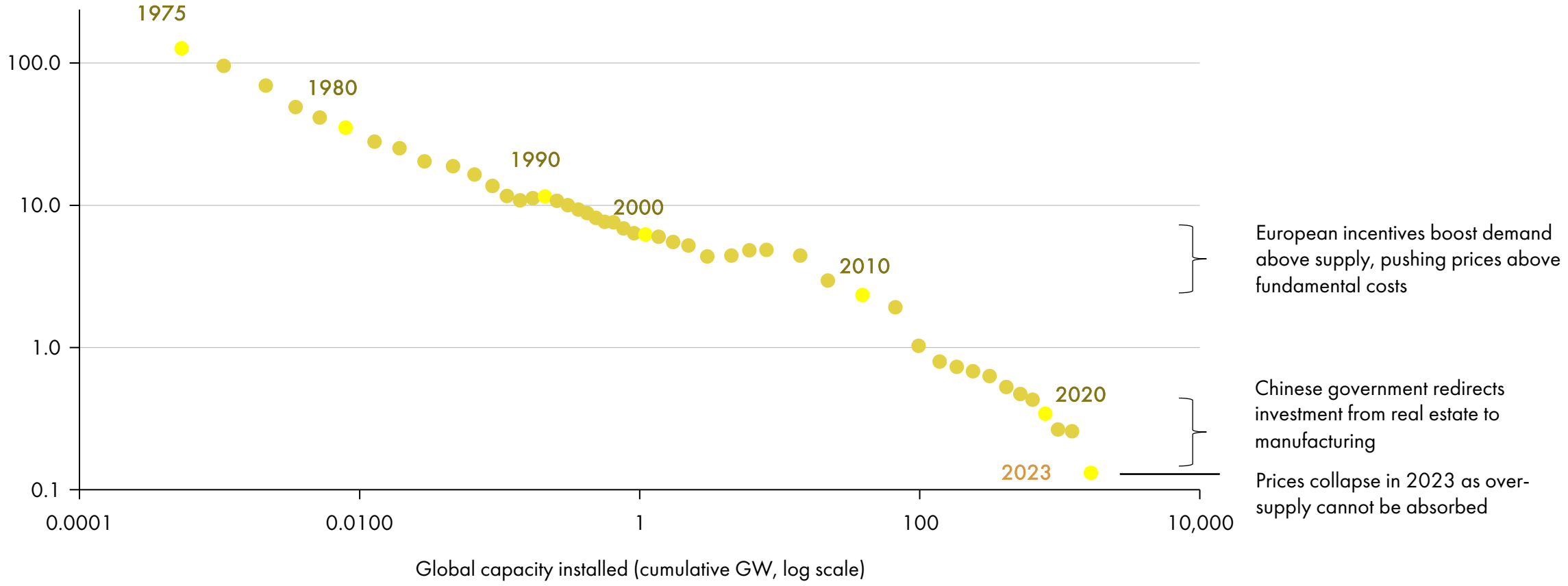
Global electricity generation per source, by year since passing 100 TWh[1] [TWh]




Notes: [1]Data only shown until the point where each source generated just over 2,000 TWh
Source: Chart based on Nat Bullard (nathanielbullard.com/presentations), data from wind and solar generation data from Ember's yearly electricity data. Nuclear, gas, coal and hydro data from Pinto et al. (2023).

# Solar's dominance is driven by rapidly declining solar module prices in line with Wright's law

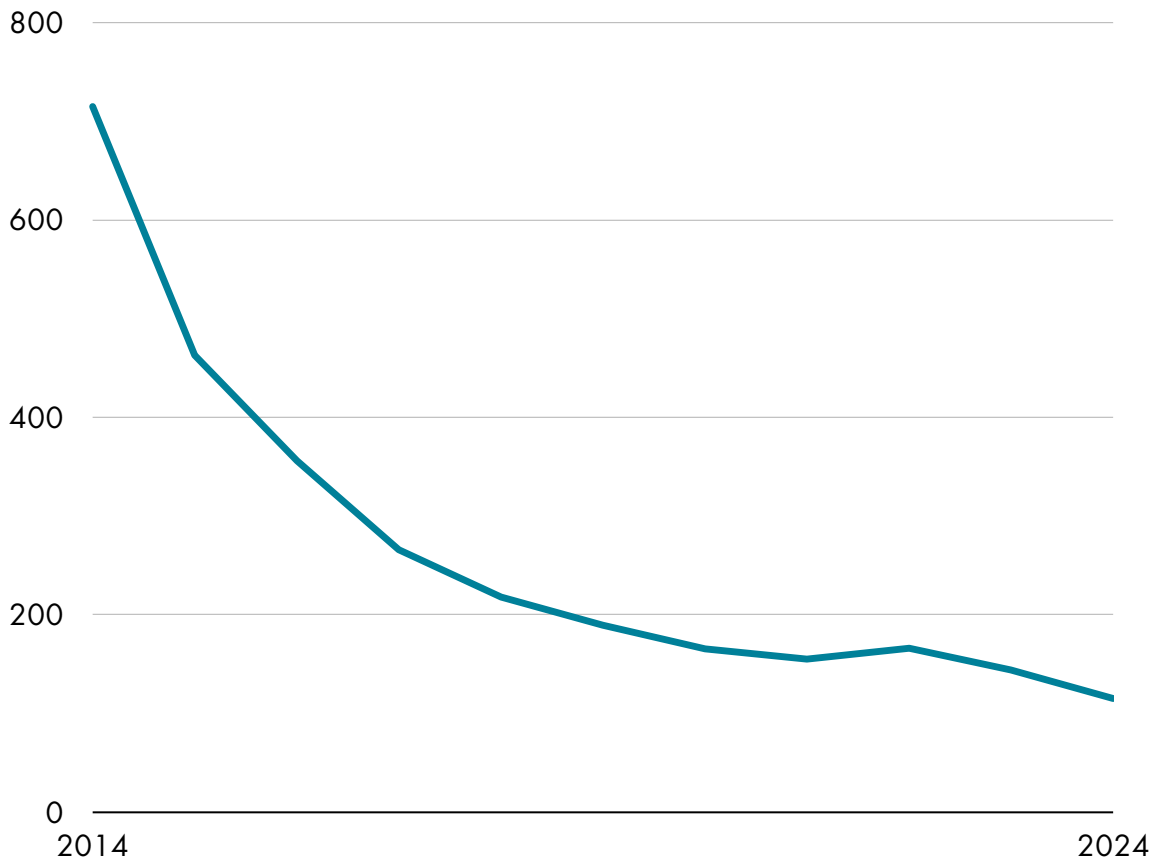
Solar power price development [$ / kW, log scale]



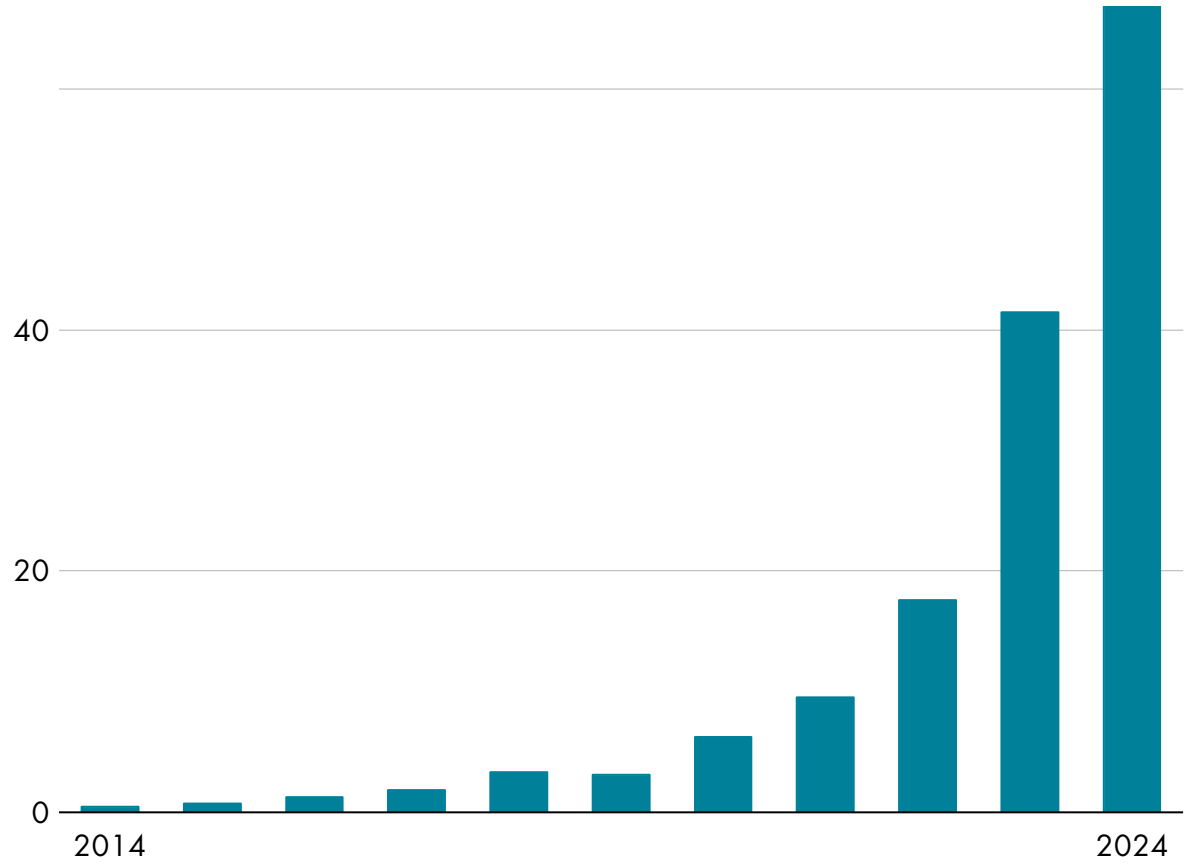

Notes: Wright's law is also known as a technology learning curve, whereby a technology gets cheaper as it is deployed more and its is deployed more as it gets cheaper.
Source: Chart from Ember (2024) *Global Electricity Review 2024*

# Steep declines in the cost of batteries will unlock even greater solar penetration

Average battery pack cost[1] [$/kWh]




Battery pack storage capacity additions [GW]




Notes: [1]Prices are volume-weighted and expressed in real terms (2024 prices).
Source: Charts from Ember (2025) *Global Electricity Review*

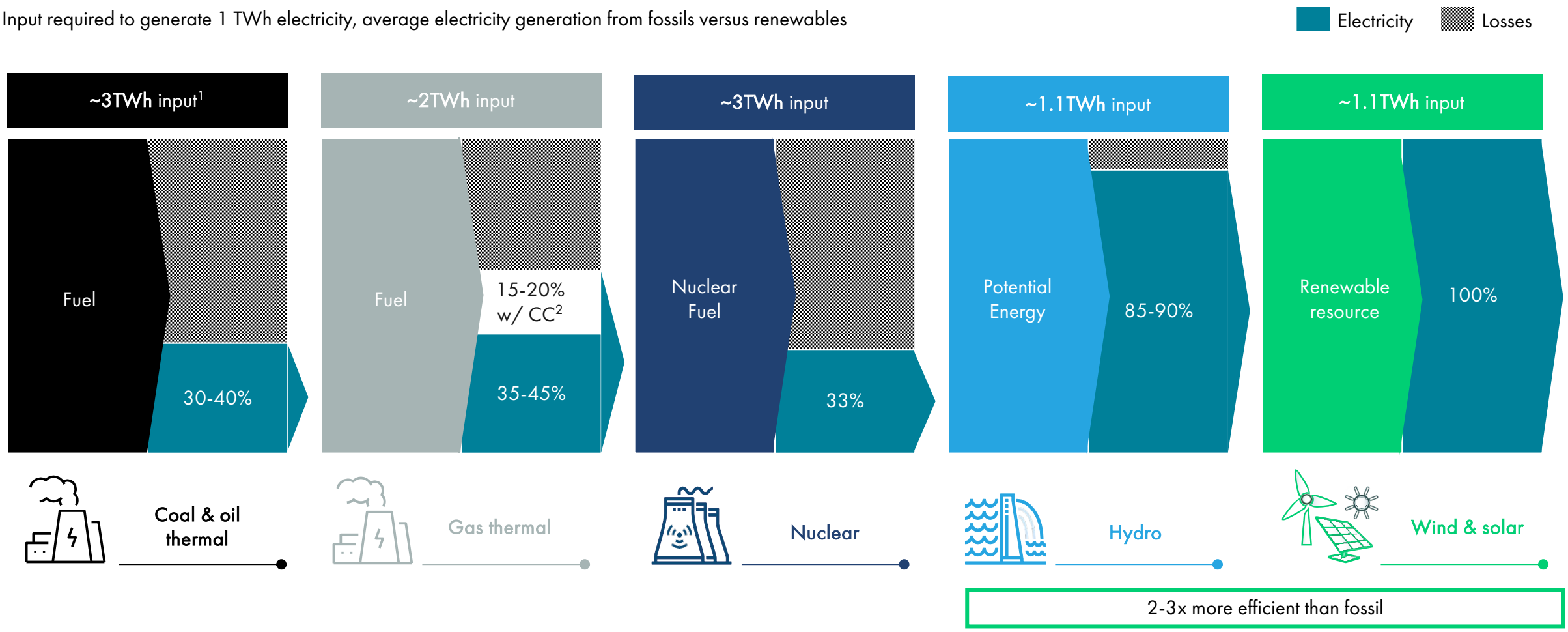
# It has become quicker and cheaper to deploy solar and batteries than import gas

| | Steps to deploy new energy | Construction time | Minimum size of investment | | Dependency after deployment |
|---|---|---|---|---|---|
| Gas import case | Secure LNG offtake agreement and open new shipping route → Build new LNG terminal in harbor → Build new gas pipelines → Build a new gas power plant → Build out centralized network to deliver power | 5-10 years | 1-5 GW | ~$3-10 billion | Dependent on gas supplier and exposed to volatile gas market |
| Solar + battery power case | Import solar panels and battery packs through existing harbor → Deploy solar + battery locally → Build a localized grid to deliver power | <0.5 year | 1-10 KW | ~$2-3 thousand | Fully independent until solar panel and battery are at end of life in 20-25 years |

Source: Chart adapted from Ember (2025) *Energy Security in an Insecure World*

# Renewables are more efficient: Each TWh from renewables displaces 2-3 TWh of fossil fuels in power generation

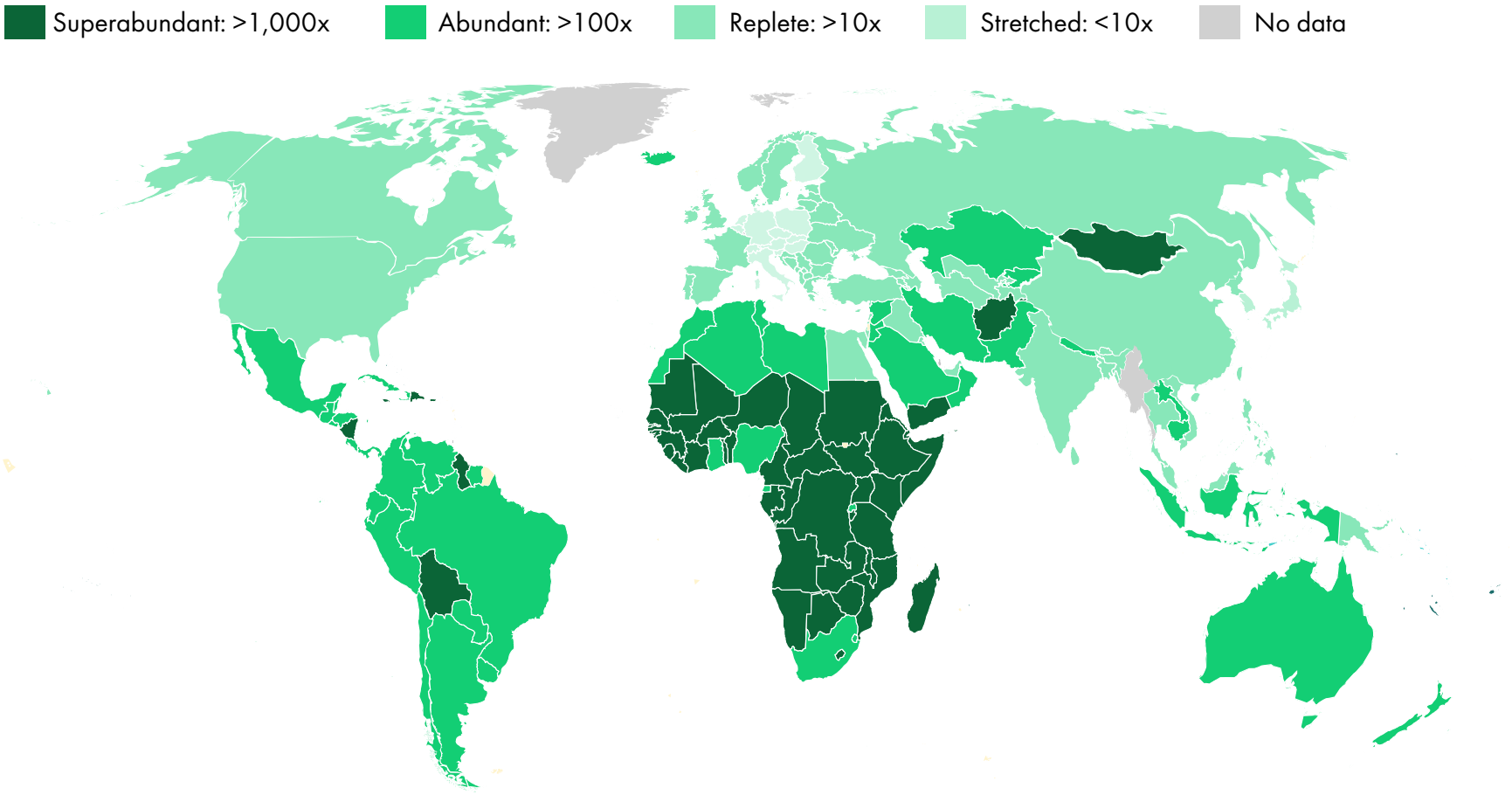
Input required to generate 1 TWh electricity, average electricity generation from fossils versus renewables




Notes: [1] Input required to generate 1 TWh electricity. [2]Combined Cycle. Solar and wind's 100% efficiency represents the fact that there are no conversion losses from primary to secondary energy.

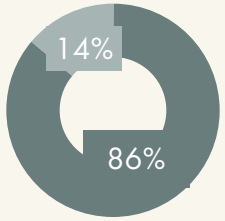
# And renewables are available everywhere, to everyone, enabling home grown energy security

Renewable potential as a multiple of energy demand (2022)




Share of population living in countries that import fossil fuel

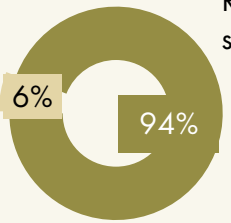
Fossil fuel exporters




Fossil fuel importers

Share of population endowed with replete or better renewable resource

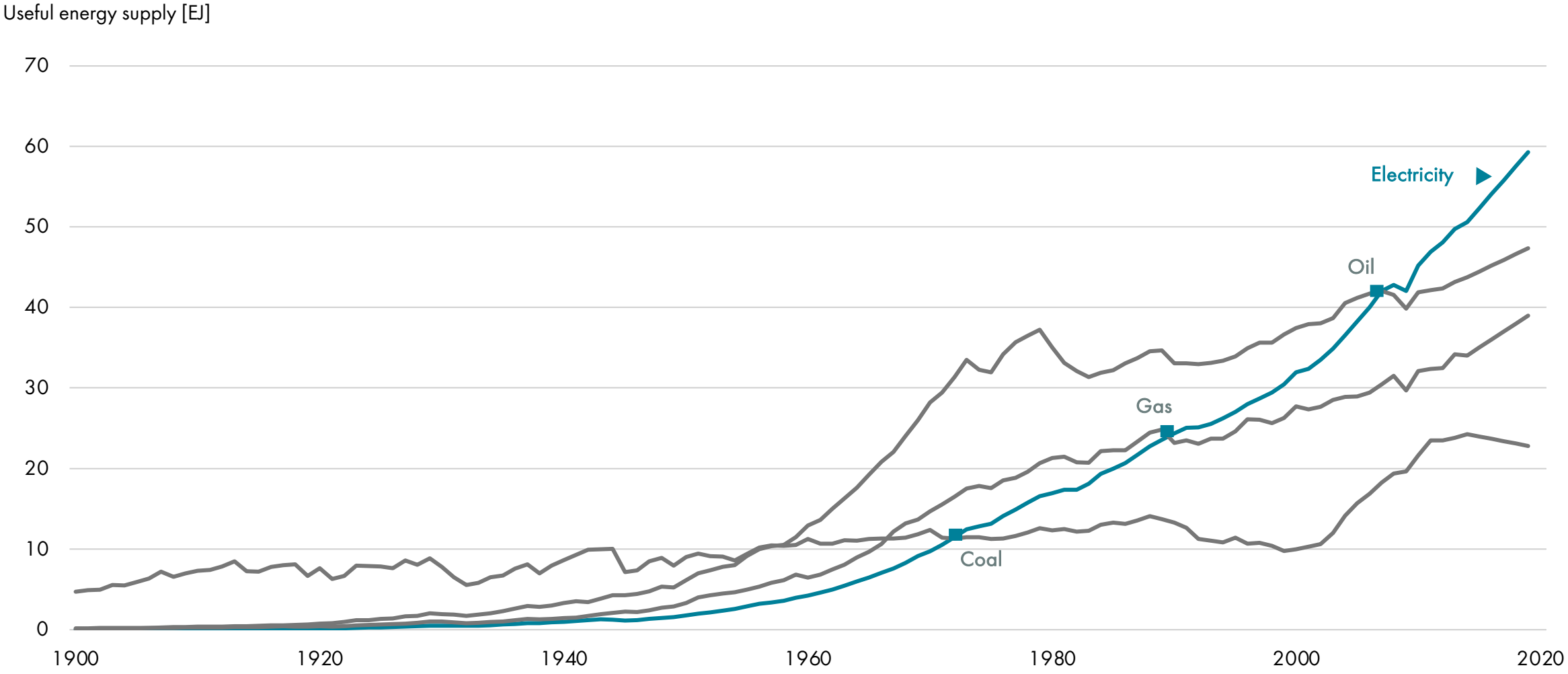
Stretched




Replete to superabundant

Source: Chart from Ember (2025) *Energy Security in an Insecure World*, based on Carbon Tracker (2021) *The Sky's the Limit*

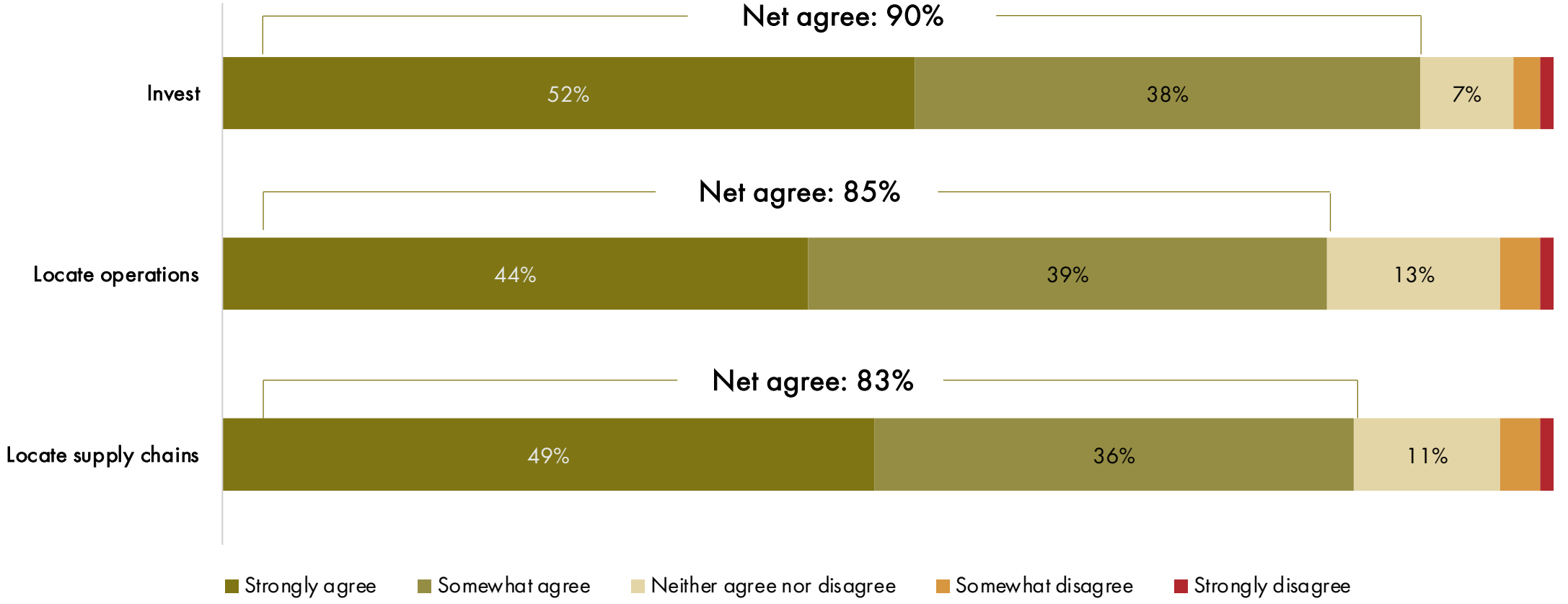
# Electricity is the new champion of energy and will enable a deeper transformation across sectors




Notes: All sectors excluding non-energy uses. Useful energy is the total energy left after all processing and conversion losses.
Source: Chart from RMI (2024) *The Cleantech Revolution*

# A renewables-based electricity system can help regions attract companies' investments and supply chains

Question: For each of the following, to what extent do you agree or disagree with the following statement?
'Access to renewables-based electricity is a priority when considering where to...'

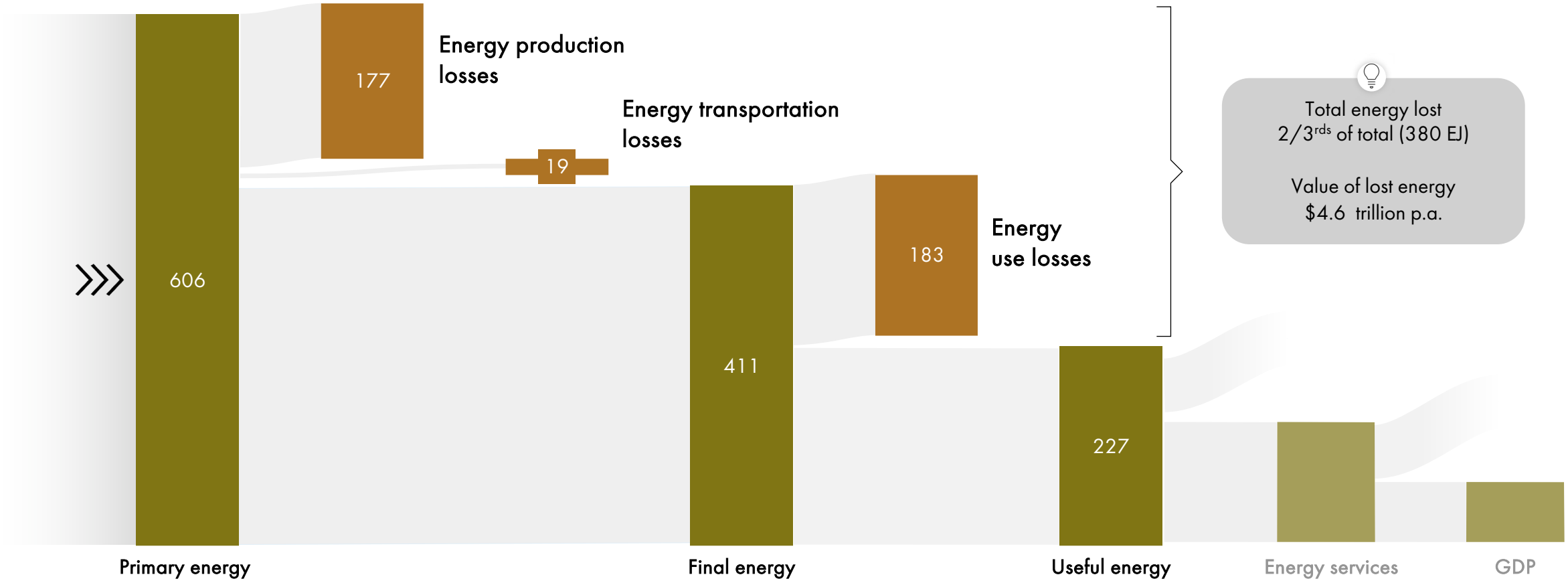



Source: Chart from E3G, BFF and WMBC (2025), *Powering up: Business perspectives on shifting to renewable electricity*

# Electrification

# Today's fossil system is inefficient and wasteful

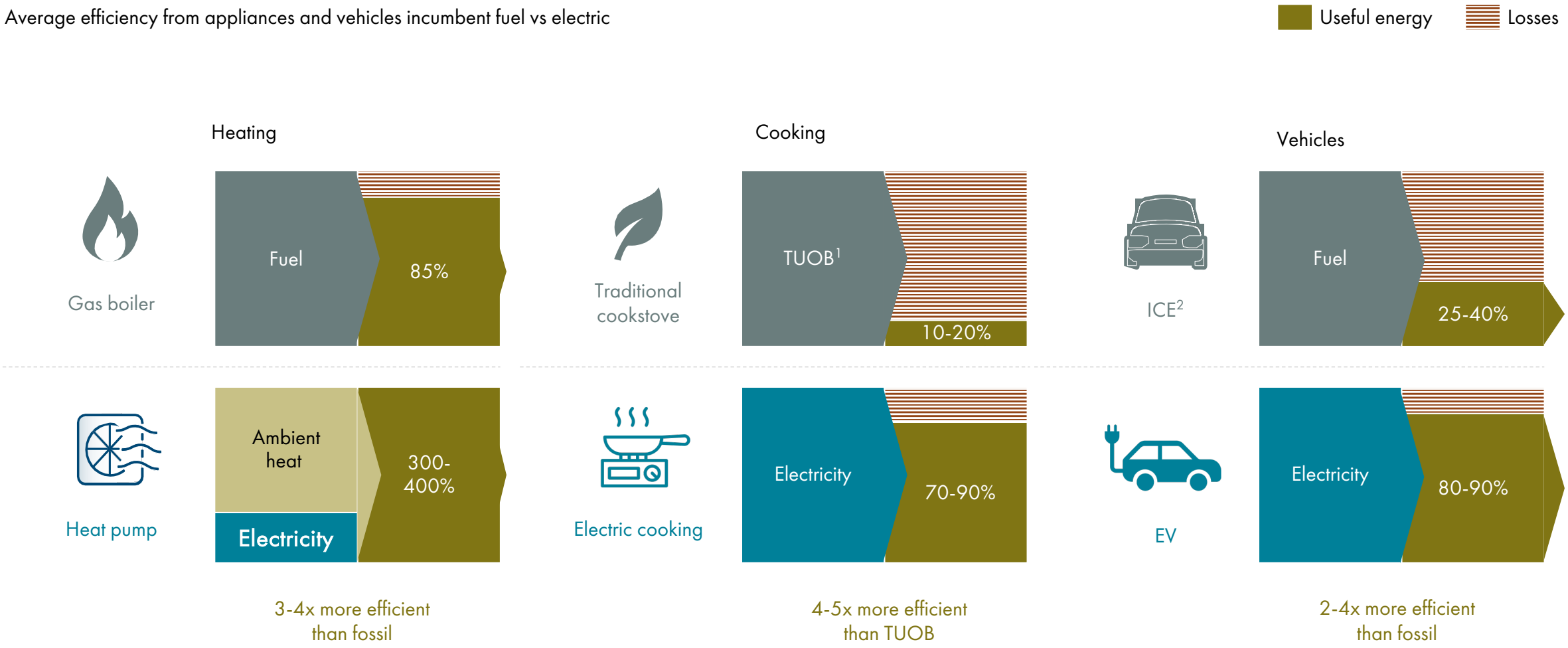
Global energy flows and waste, 2019 [EJ per year]




Source: Chart from RMI (2024) *The Cleantech Revolution*

# Electrification is efficient: Switching to heat pumps, electric cooking and EVs uses 3-5 times less energy than fossil-based alternatives

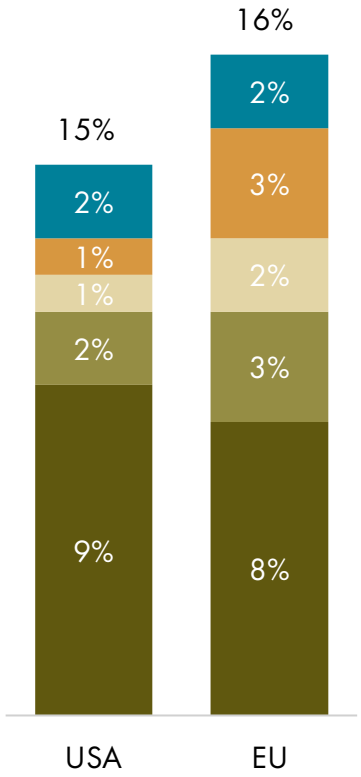
Average efficiency from appliances and vehicles incumbent fuel vs electric




Notes: 1. Traditional use of biomass; 2. Internal combustion engine.
Source: Chart from RMI (2024), *Clean Tech Revolution*

# And electrification can help reduce energy costs for consumers and businesses alike

Energy related spending,
% of household Income, 2023, est.



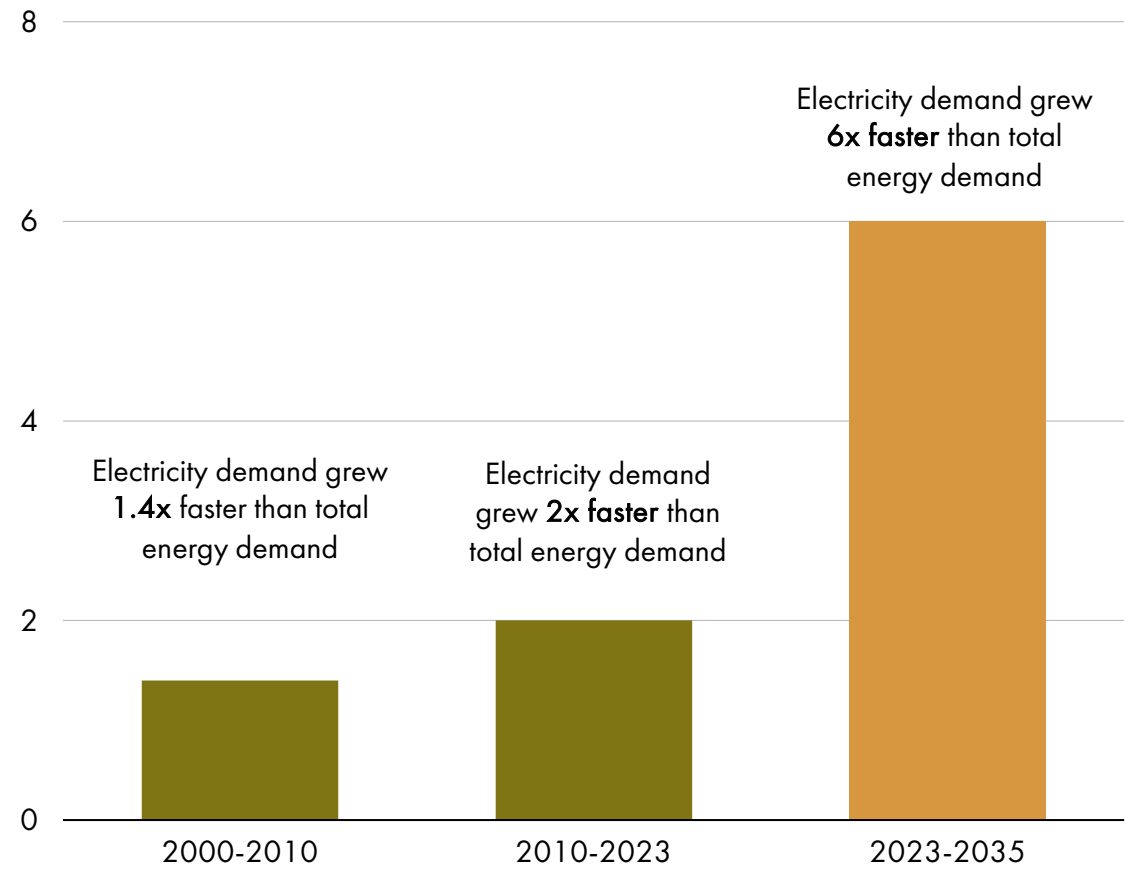

| Vector of direct impact | | Impact on spending | Impact on quality of life |
|---|---|---|---|
| Electricity | Renewables | Freeing up **<0.5%** of income per year[1] | **Marginal** – Renewables deliver the same product as fossil power electrons. |
| Heating fuel<br>Heating equipment cost<br>Transport fuel<br>Transport equipment cost | Electrification | Freeing up **3-5%** of income per year[2] | **Significant** – Electric vehicles deliver a quieter, smoother drive with minimal maintenance and home charging.<br><br>Heat pumps offer consistent output of not just heat but also cooling. Both enhance everyday convenience with smart controls and streamlined operation. |

Note: [1] Even if renewables lower wholesale prices by 20-30%, impact on final residential prices, and hence household expenditure is smaller and in the order of hundreds of dollars per year
[2] Electrifying heating and transport lowers fuel expenditure. Electrifying transport can also lower equipment expenditure due to lower maintenance sot as well as lower prices.

Source: Chart from Ember (2025) *The electrification imperative* based on Ember analysis of BLS and Eurostat data

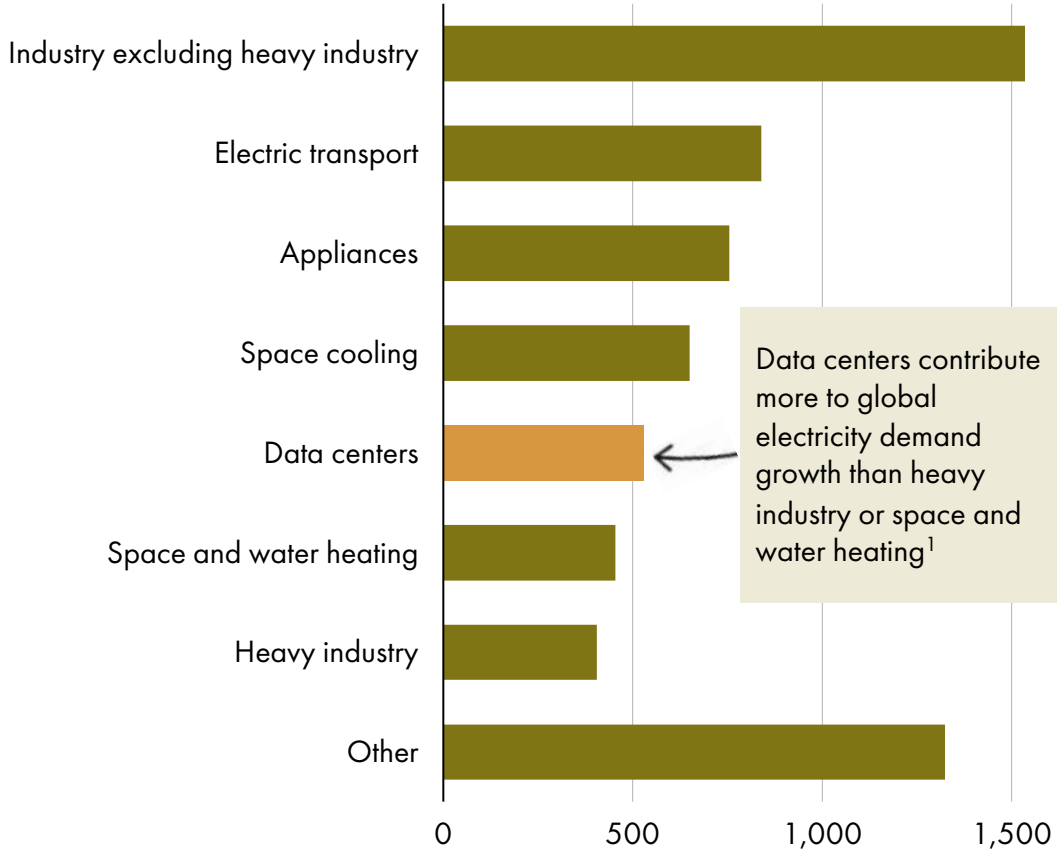
# The world is entering a new age of clean electrification, set to add the equivalent of Japan's energy demand to electricity use each year

Ratio of electricity demand growth to total




Notes: [1]Base case IEA
Source: IEA (2024), *World Energy Outlook 2024*, License: CC BY 4.0, *chart adapted from IEA post, 29 Nov 2024*

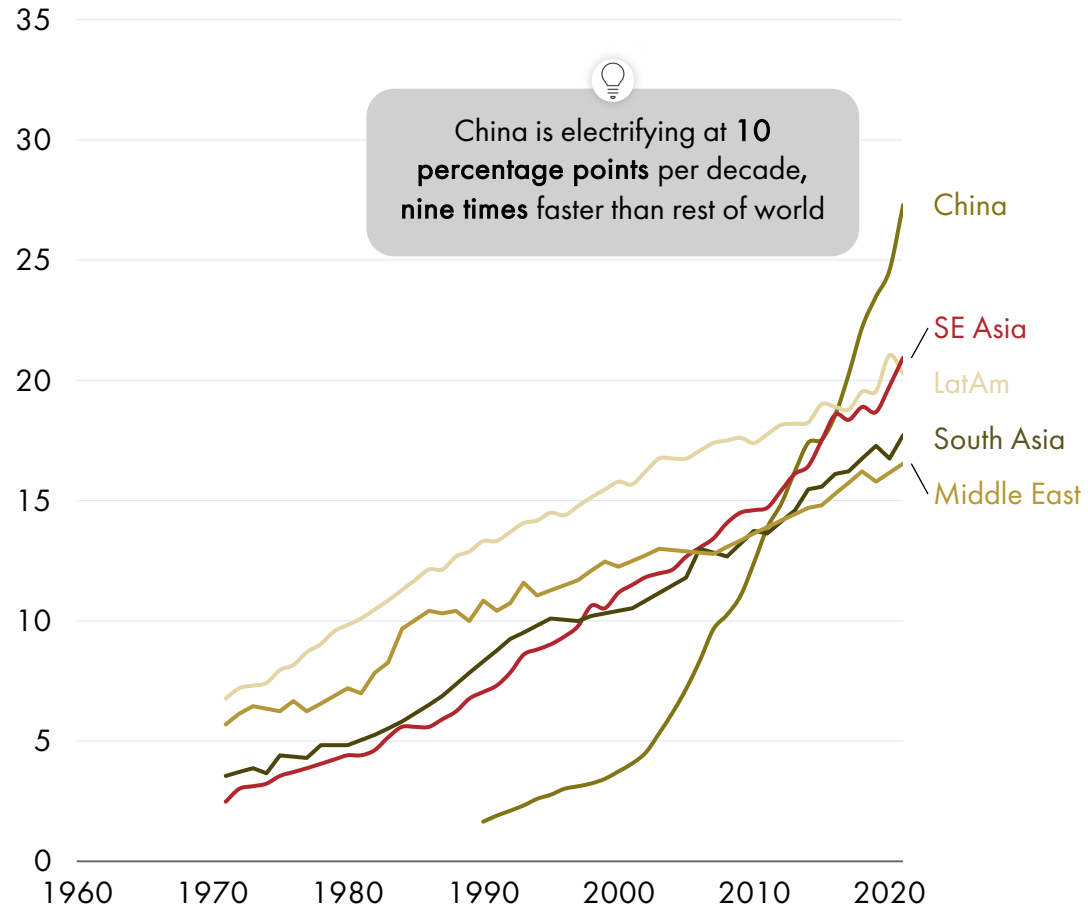
Electricity demand 2024-2030 [TWh]



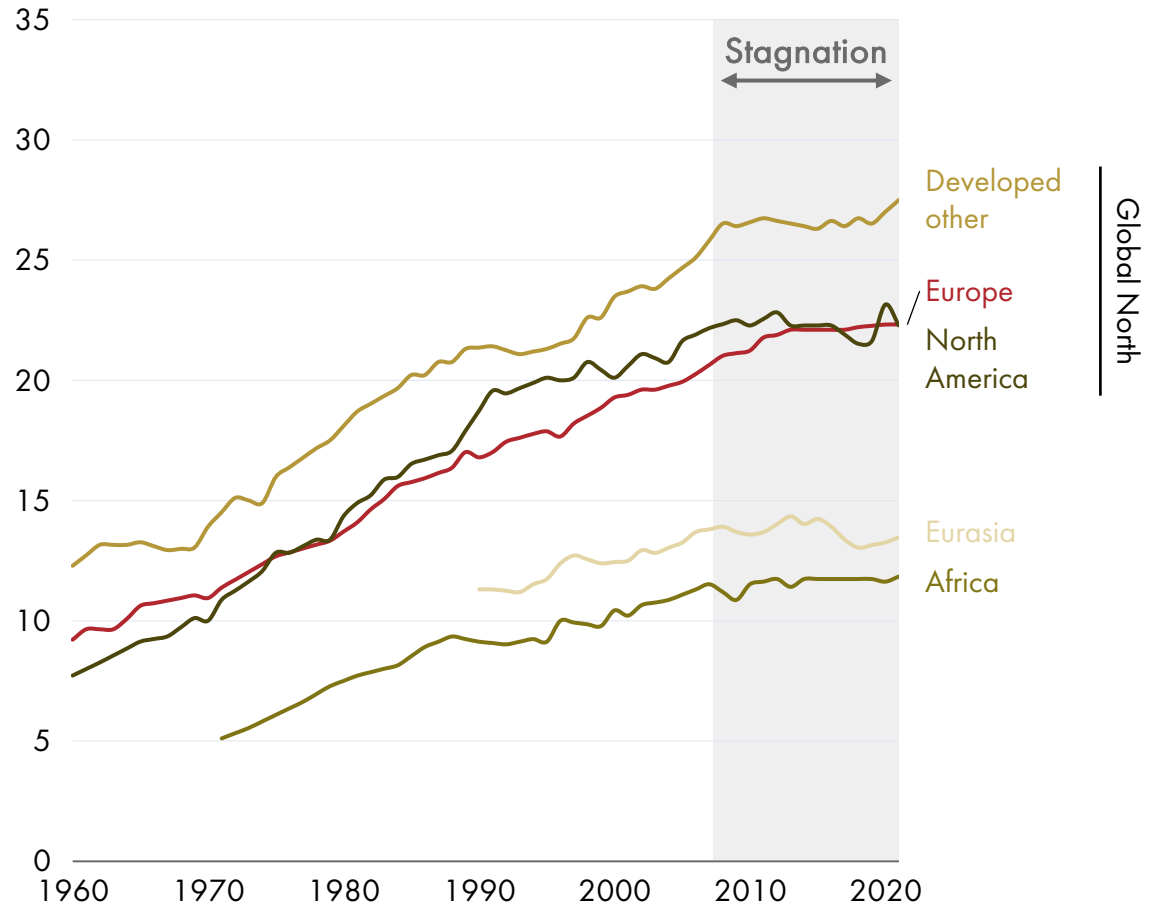

Source: IEA (2025), *Energy and AI*, License: CC BY 4.0

# Rates of electrification are uneven, with electrification stagnating in the Global North over the last decade

Regions where electrification is growing [% of FEC from electricity]



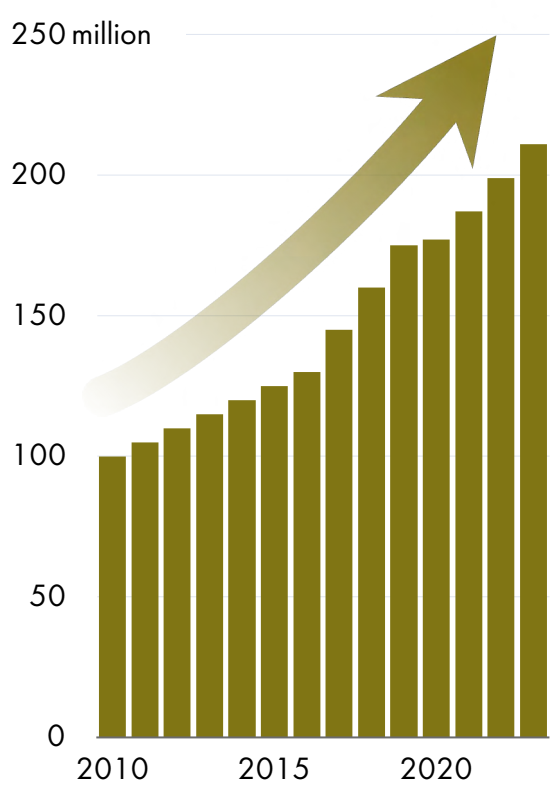

Regions where electrification stagnated [% of FEC from electricity]



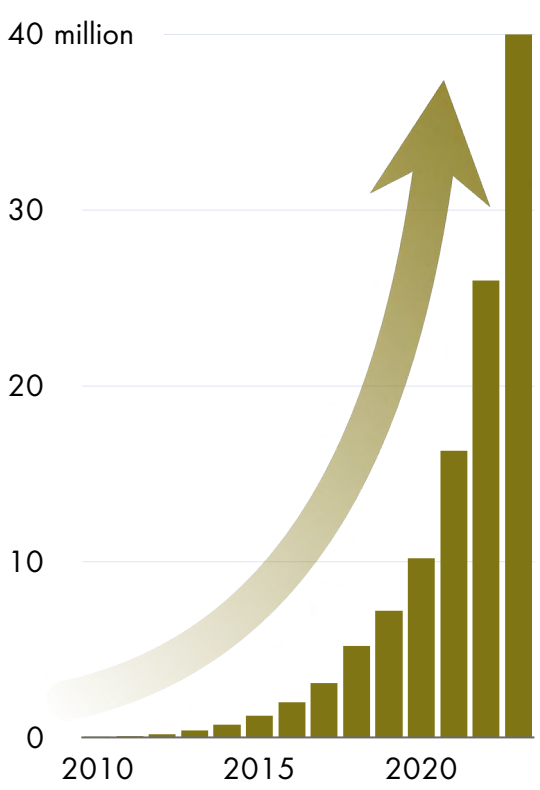

Source: Charts from RMI (2024) *The Cleantech Revolution*

# Growth of electric technologies are accelerating: The global stock of EVs and digital devices has been doubling every 2 years

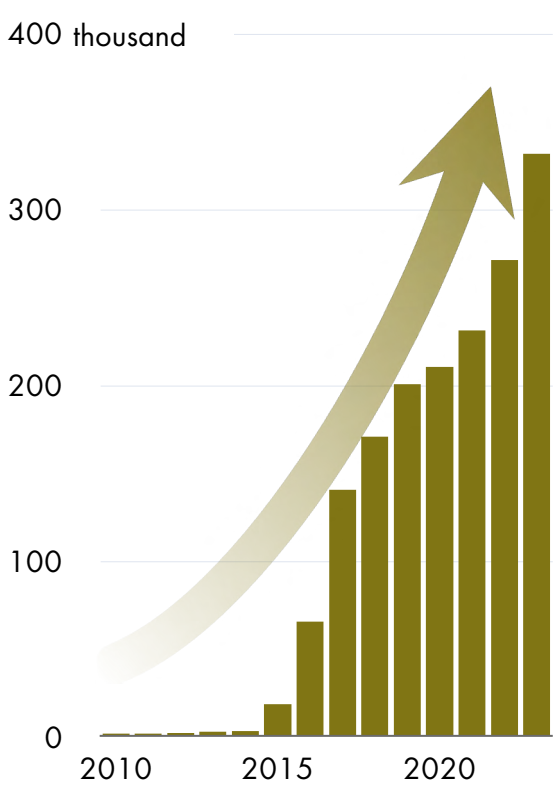
Heat pumps



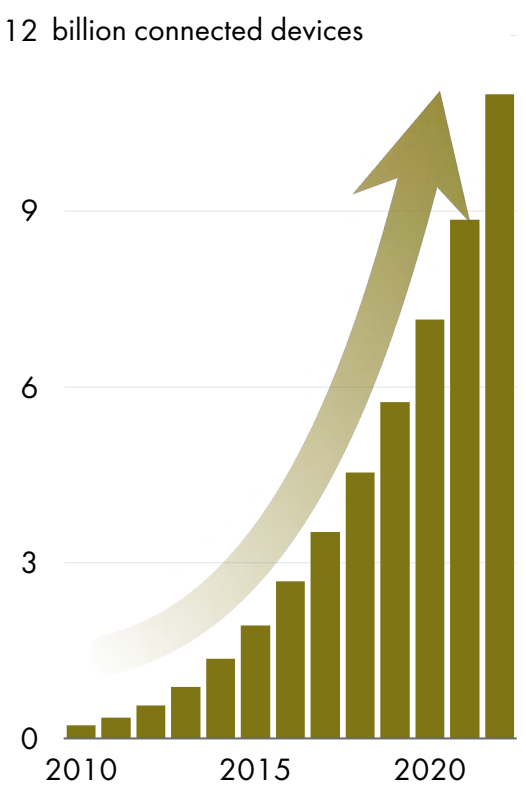

EV cars




EV trucks




Digitally enabled automated devices



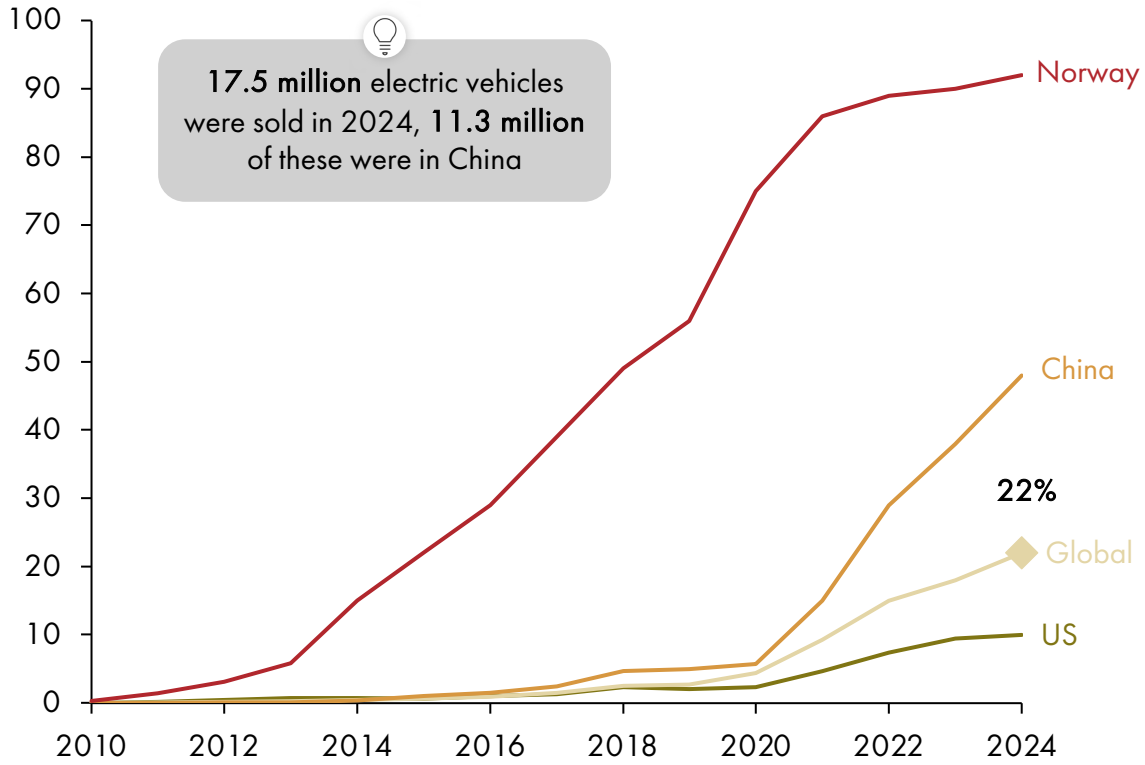

Source: Charts from RMI (2024) *The Cleantech Revolution*

# Electric vehicle sales are soaring across the world as low-cost options start to emerge, catering to the mass market

EVs are becoming cheap enough for the mass market; the compact BYD Seagull is available for less than $8,000 in China

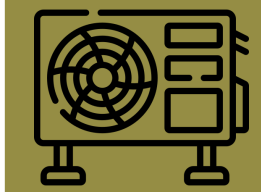

In the UK, Octopus Energy has launched a home charging bundle including the BYD Dolphin EV, a bi-directional Zaptec Pro charger and access to a smart tariff that offers completely free home charging for £299 per month

Share of new car sales that are battery-electric or plug-in hybrid [%]



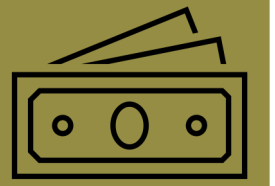

Notes: BYD Seagull EV starts at just 56,800 yuan, or under $8,000. In 2024 14% of global car sales were battery electric, 8% were plug-in hybrid. Sources Electrek (2025) *BYD's low-cost Seagull EV now starts at under $8,000 in China;* Reuters (2025) *China's BYD turns up heat in Europe with launch of Dolphin Surf EV.*
Source: IEA (2025) *Global EV Outlook 2025 - processed by Our World in Data.*

# Customers who have upgraded to electric technology have very high satisfaction levels



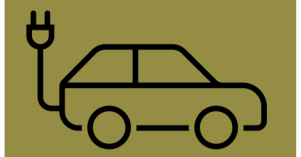
**80%**

of UK heat pump owners would recommend one to a friend.



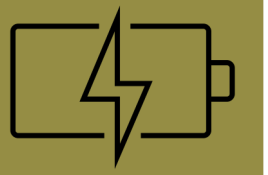
**85%**

of UK heat pump owners said their heat pump costs the same or less to run, despite having highest electricity prices in Europe.



**96%**

of EV drivers are happy with their vehicles and say that it is likely that their next car will also be electric.



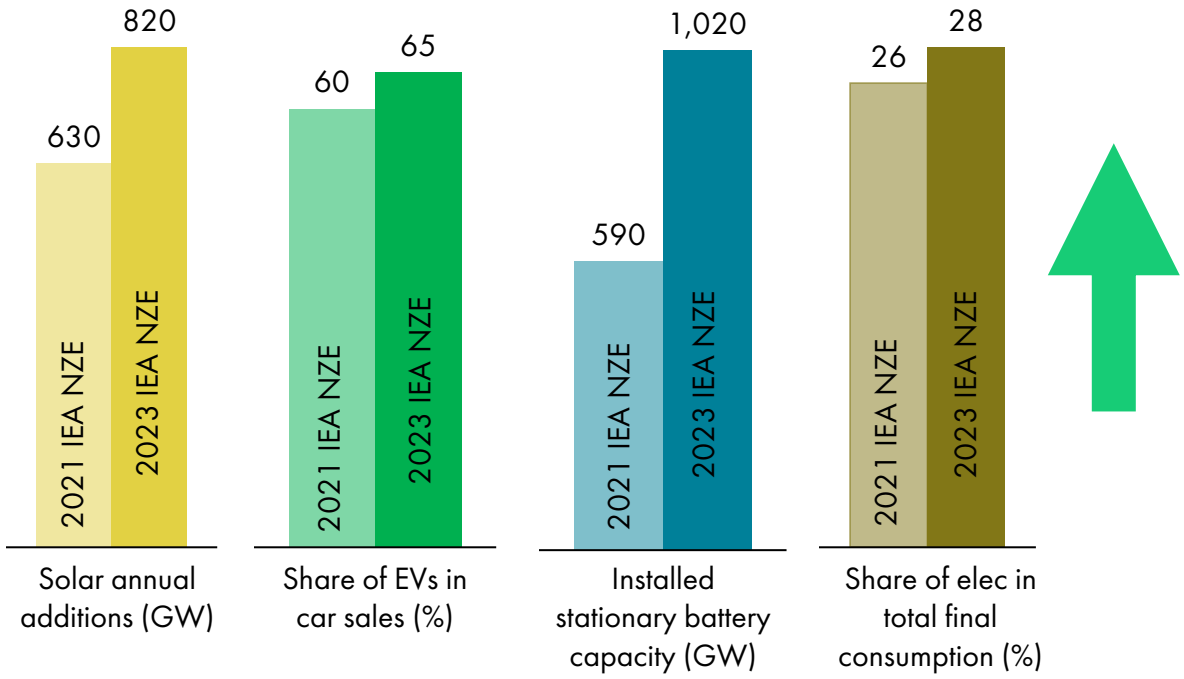
**79%**

of EV drivers say they've had a good overall experience with public charging in the UK.

Source of data points: Octopus Energy (2025) & Octopus Energy (2024) Heat pump icon: flaticon.com

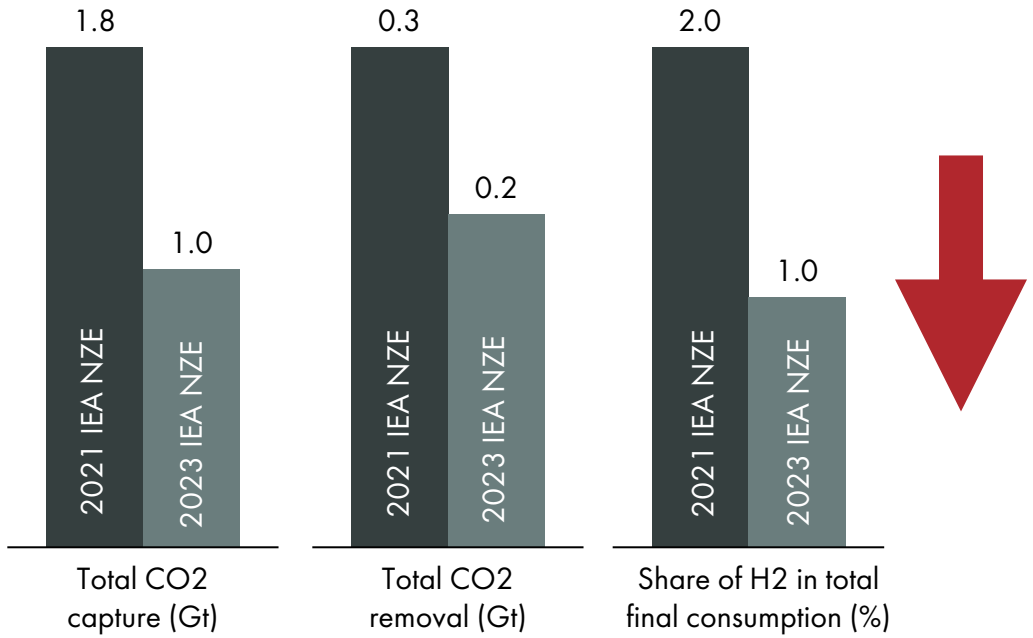
# As a result of these trends, the role of electrification continues to grow, undercutting the future of fossil capture and hydrogen

IEA sees increased role for electrification [IEA NZE, 2030 targets]




Clean energy technologies have reduced in price and scaled faster than anticipated, leaving more confidence in role to replace fossil fuels

IEA sees reduced role for fossil capture/hydrogen [IEA NZE, 2030 targets]

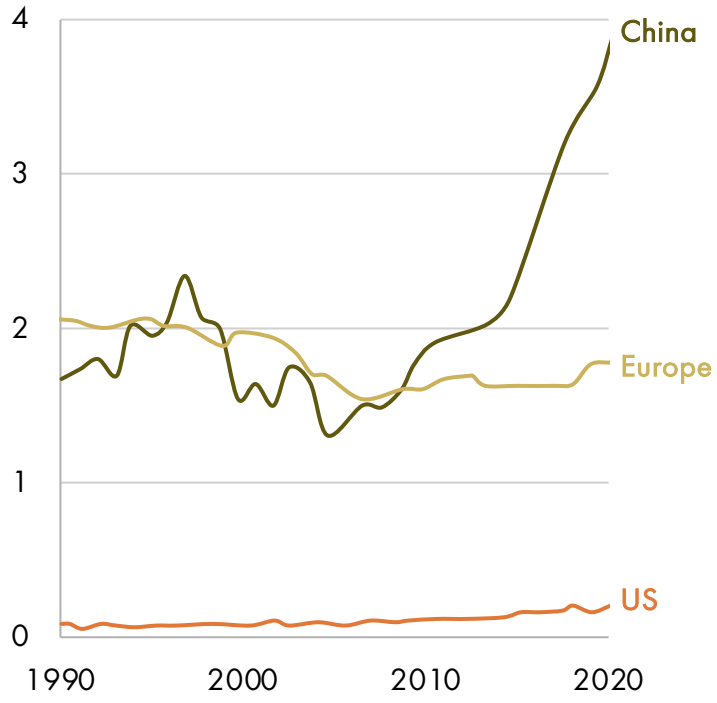



Fossil capture and hydrogen projects have not reduced in price or scaled as anticipated, leaving less confidence in role to replace fossil fuels

Notes: The IEA Net Zero Scenario relates to their best estimate of the most technically and economically possible pathway to get to net zero by 2050.
Source: IEA (2023), *Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach*, License: CC BY 4.0

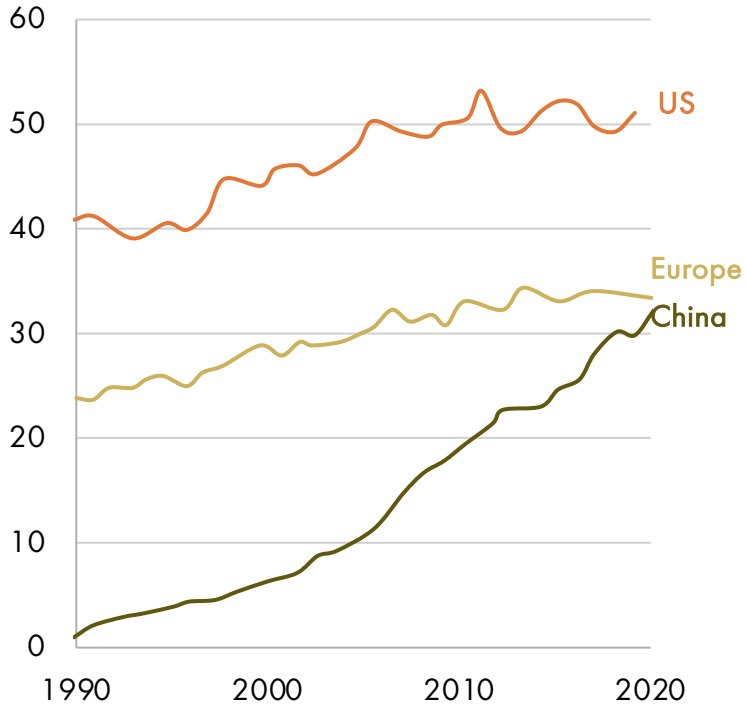
# China is the world's first electrostate: Electrification is increasing in sectors across transport, buildings and industry

Electricity's share of final energy in transport, %



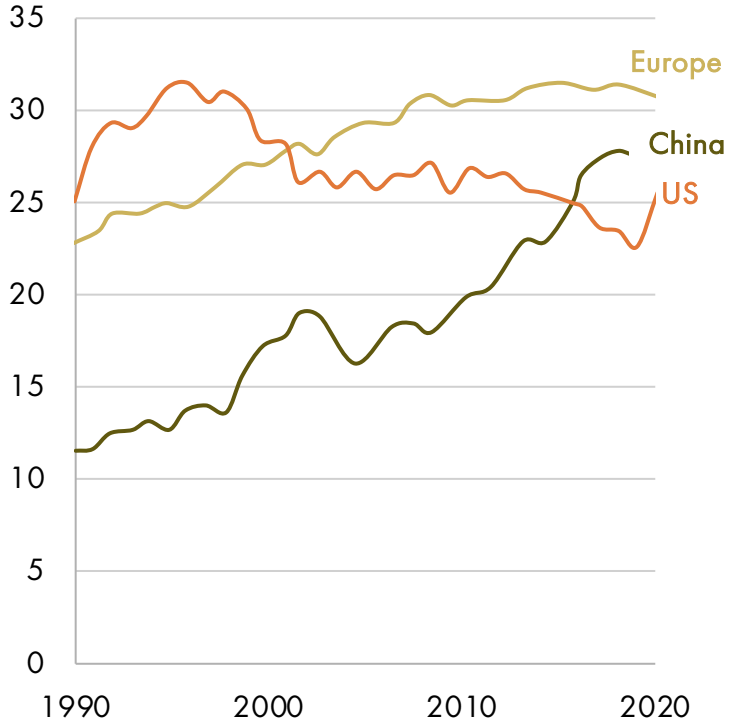

China is rapidly electrifying its transportation system across cars, trucks, buses and high-speed rail

Electricity's share of final energy in buildings, %




Rising air conditioner usage is a key driver in buildings, related to increasingly extreme temperatures

Electricity's share of final energy in industry, %

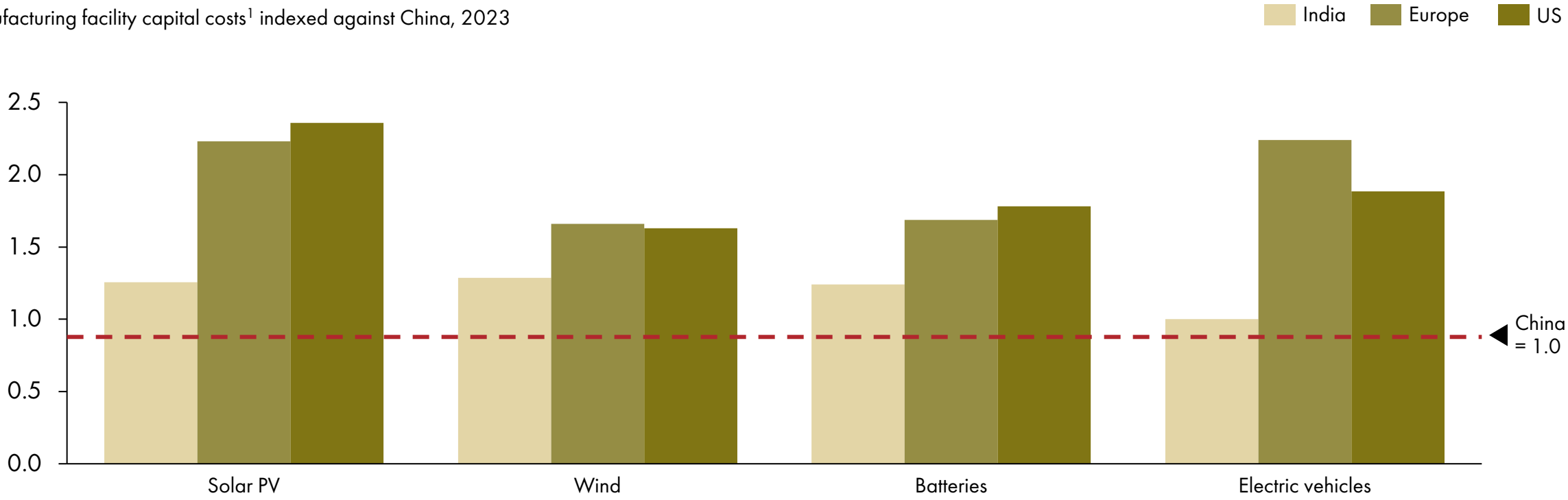



The industrial sector is becoming more electricity intensive across industrial uses, including chemicals and clean tech manufacturing

Source: Charts from RMI (2024) *X-Change: The Race to the Top Cleantech competition between China, Europe, and the United States*

# China installs and produces most of the world's clean technologies, enabled by their competitive edge in manufacturing

Manufacturing facility capital costs[1] indexed against China, 2023




| | Solar PV | Wind | Batteries | Electric vehicles |
|---|---|---|---|---|
| Capital costs in China, 2023 | 185 USD/kW | 260 USD/kW | 75 USD/kWh | 7,100 USD/vehicle |

Note: Manufacturing facility capital costs include the total upfront costs of building factories and installing production equipment but exclude financing and land costs; Capital costs are shown per unit of annual rated capacity. Solar PV includes polysilicon, wafer, cell and module production facilities; batteries include cell, anode and cathode production facilities; wind includes nacelle, tower and blade facilities. Costs refer to greenfield, non-integrated facilities where these attributes could be isolated in the data and constitute averages across plants of different sizes today. Data gaps were filled using regional multipliers based on differentials in cost for constructing other facilities where more data are available. No explicit policy incentives (e.g. investment tax credits) are applied in this assessment. USD = USD (2023, MER) (IEA (2024), *Energy Technology Perspectives*).

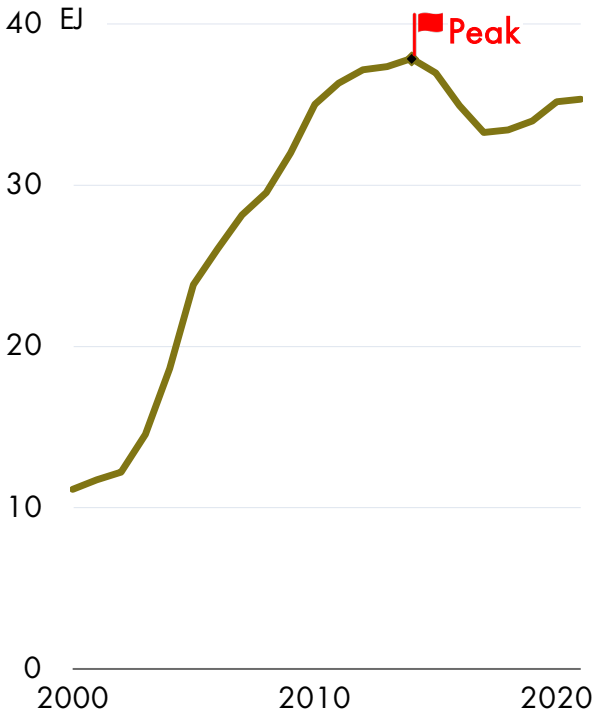
# By prioritizing renewables and electrification, China is already seeing an erosion of fossil fuel demand across different sectors

Peaking behind us

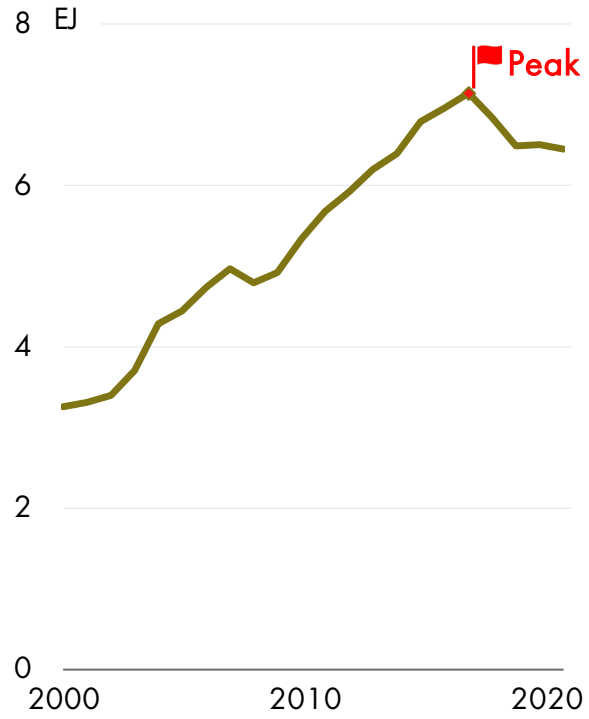
Peaking now

Peaking shortly

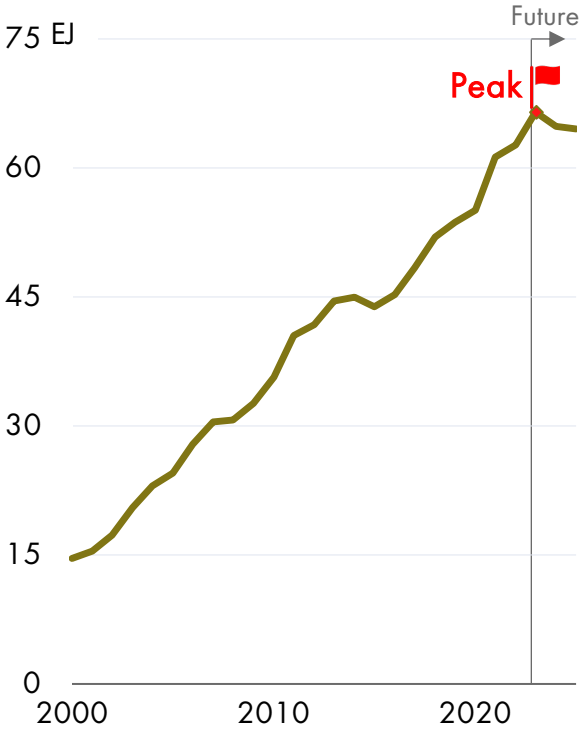
Fossil fuels in industry



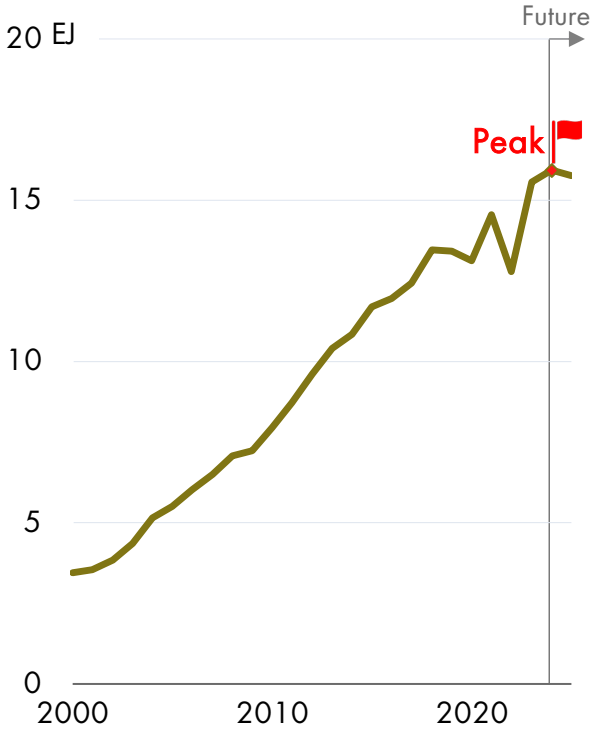

Fossil fuels in buildings




Fossil fuels in electricity




Fossil fuels in transport




Notes: IIASA data to 1971, IEA onwards. WEB defines final energy slightly differently than WEO. EJ = exajoule

Sources: Chart from RMI (2024) *The Cleantech Revolution;* IEA WEB (past), Ember, IEA *Electricity 2024*, License: CC BY 4.0 (electricity generation forecast), BNEF NZS (transport forward), CarbonBrief (2025) *Analysis: Record solar growth keeps China's CO2 falling in first half of 2025*

# SECTION 2

## THE FUTURE OF FOSSIL FUELS IS UNCERTAIN

The enormous potential for solar deployment based on the vast availability of sunshine in many emerging and developing economies has the potential to limit future fossil demand in these economies.

As the cost of solar and batteries decline, gas for power is increasingly uncompetitive, especially in countries reliant on LNG. Existing technologies have the potential to displace large amounts of gas demand in industry and buildings, but policy support will be critical.

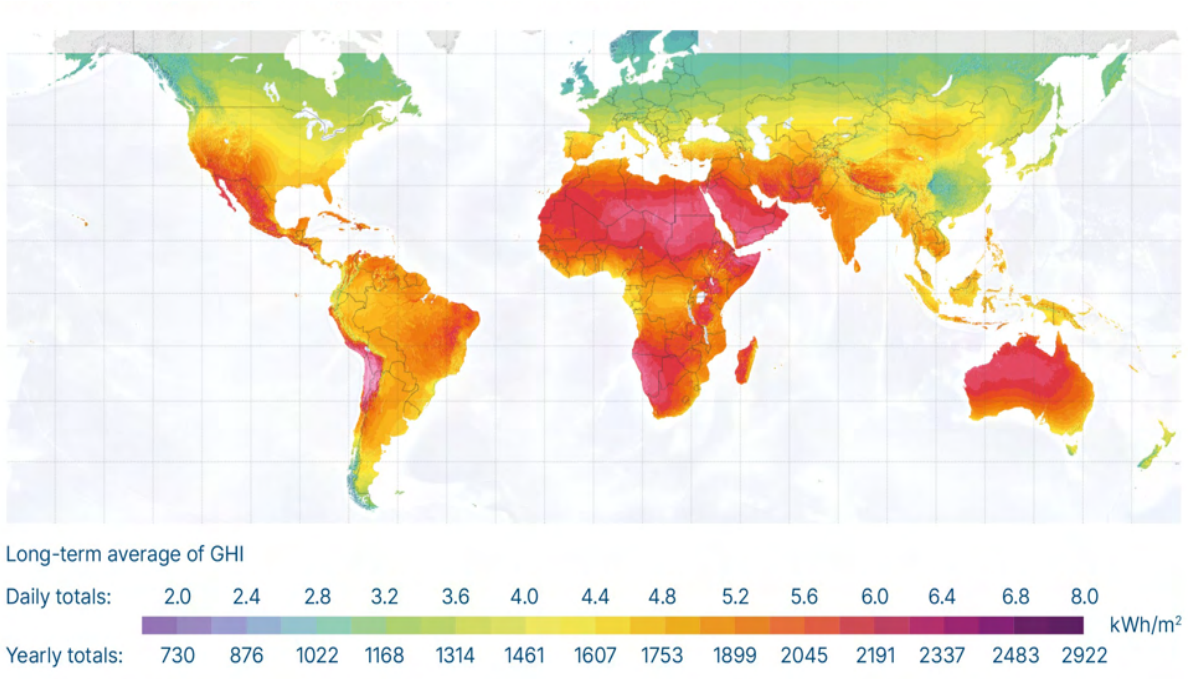
Oil demand from road transport will steadily decrease as the global stock of vehicles increasingly becomes electric. Even where oil demand is set to increase, such as in petrochemicals, it is not enough to offset this lost demand.

The share of coal in the global electricity mix is steadily falling and new coal plants risk low utilization rates and early retirement as renewable electricity expands.

# Renewable electricity in emerging markets and developing economies

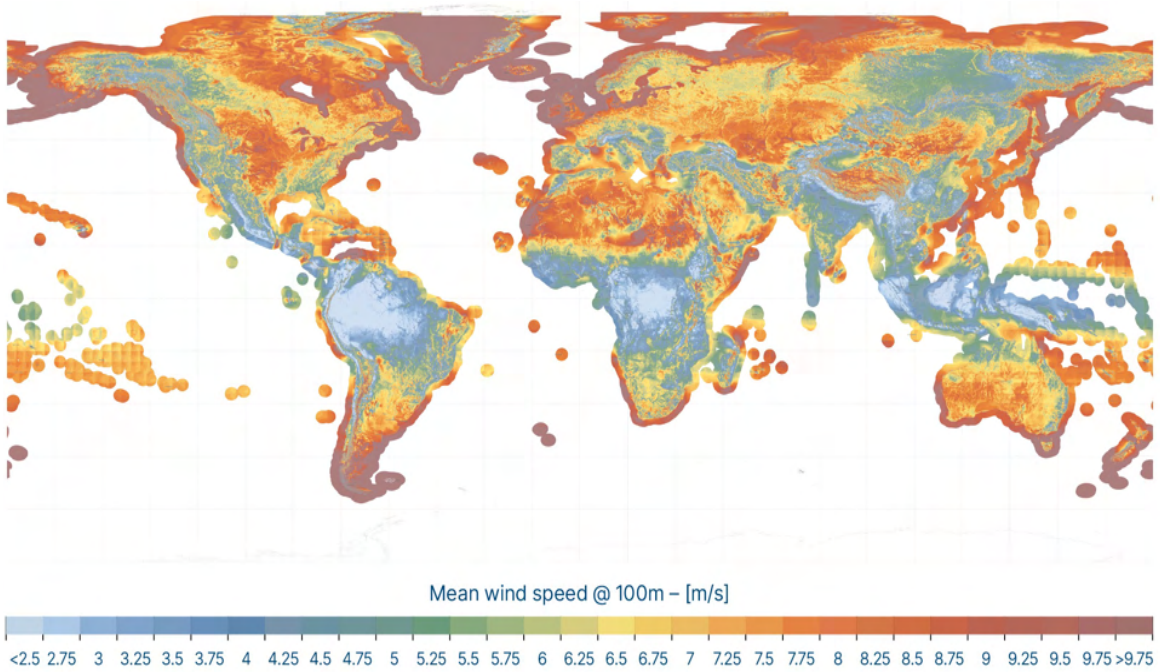
# Abundant solar and wind have the potential to meet the rapidly growing energy demand in emerging and developing economies

Long-term yearly average of daily and yearly GHI totals




'Sunbelt' countries, many of which are developing countries, have enormous potential for solar deployment based on the vast availability of sunshine at lower latitudes

Mean wind power density at 100 m above surface level



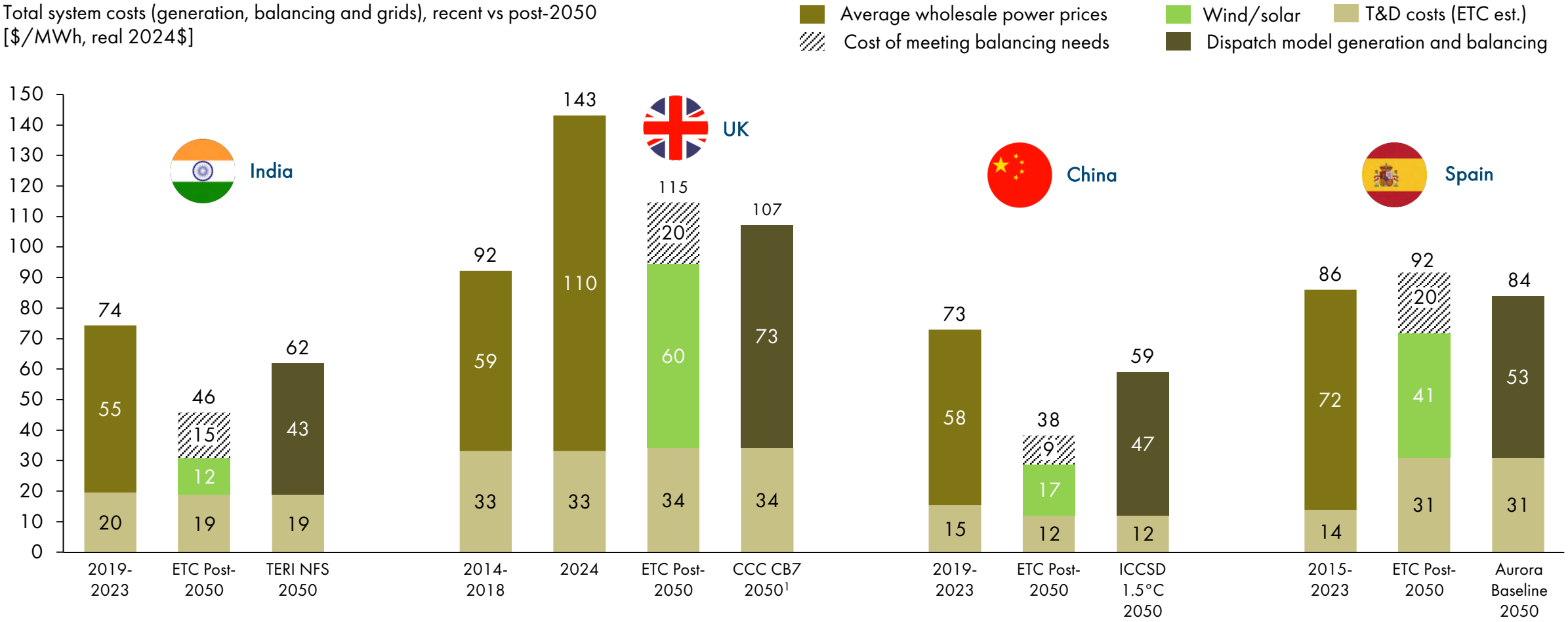

'Windbelt' countries, many of which are developed countries, cannot rely as much on solar and will have higher shares of more expensive wind, which is prevalent at higher latitudes

Notes: GHI = Global Horizontal Irradiance.

Sources: Chart from ETC (2025) *Power Systems Transformation: Delivering Competitive, Resilient Electricity in High-Renewable Systems* based on data from Global Solar Atlas, Global Wind Atlas

# ‘Sun belt’ countries are best placed to reduce total power system costs by transitioning to low-cost, solar-led systems

Total system costs (generation, balancing and grids), recent vs post-2050
[$/MWh, real 2024$]

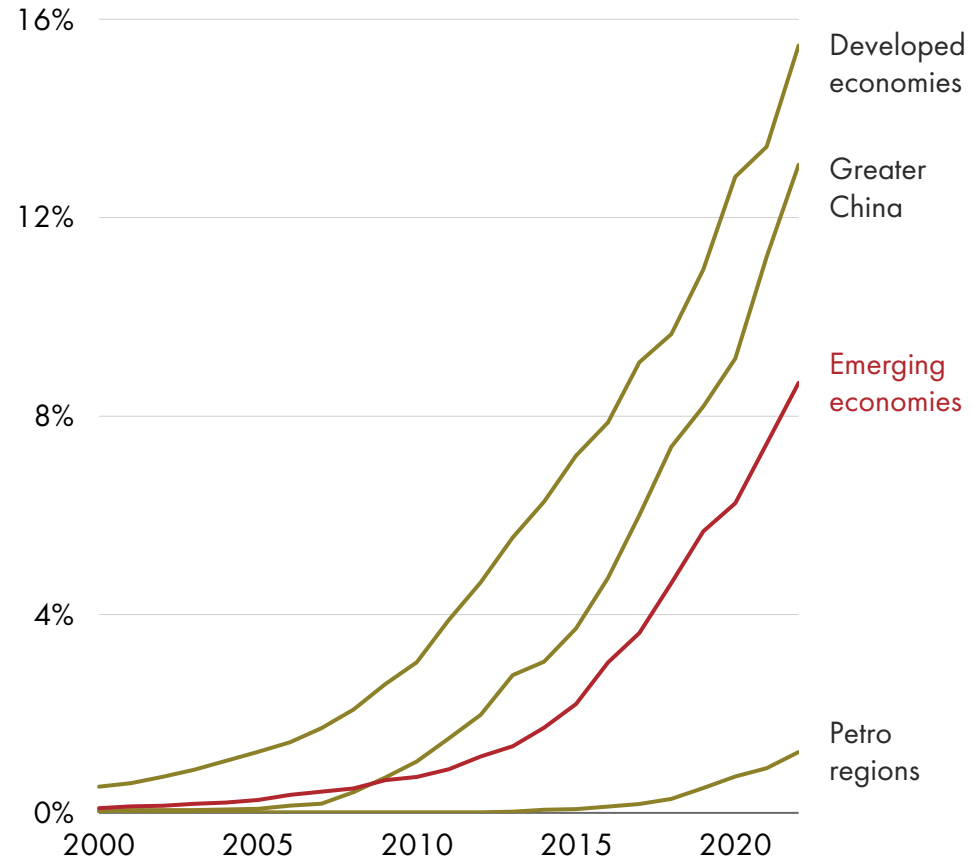



Notes: T&D = Transmission and distribution. T&D costs per MWh have been assumed based on ETC modelling. [1]Based on ETC adjustment

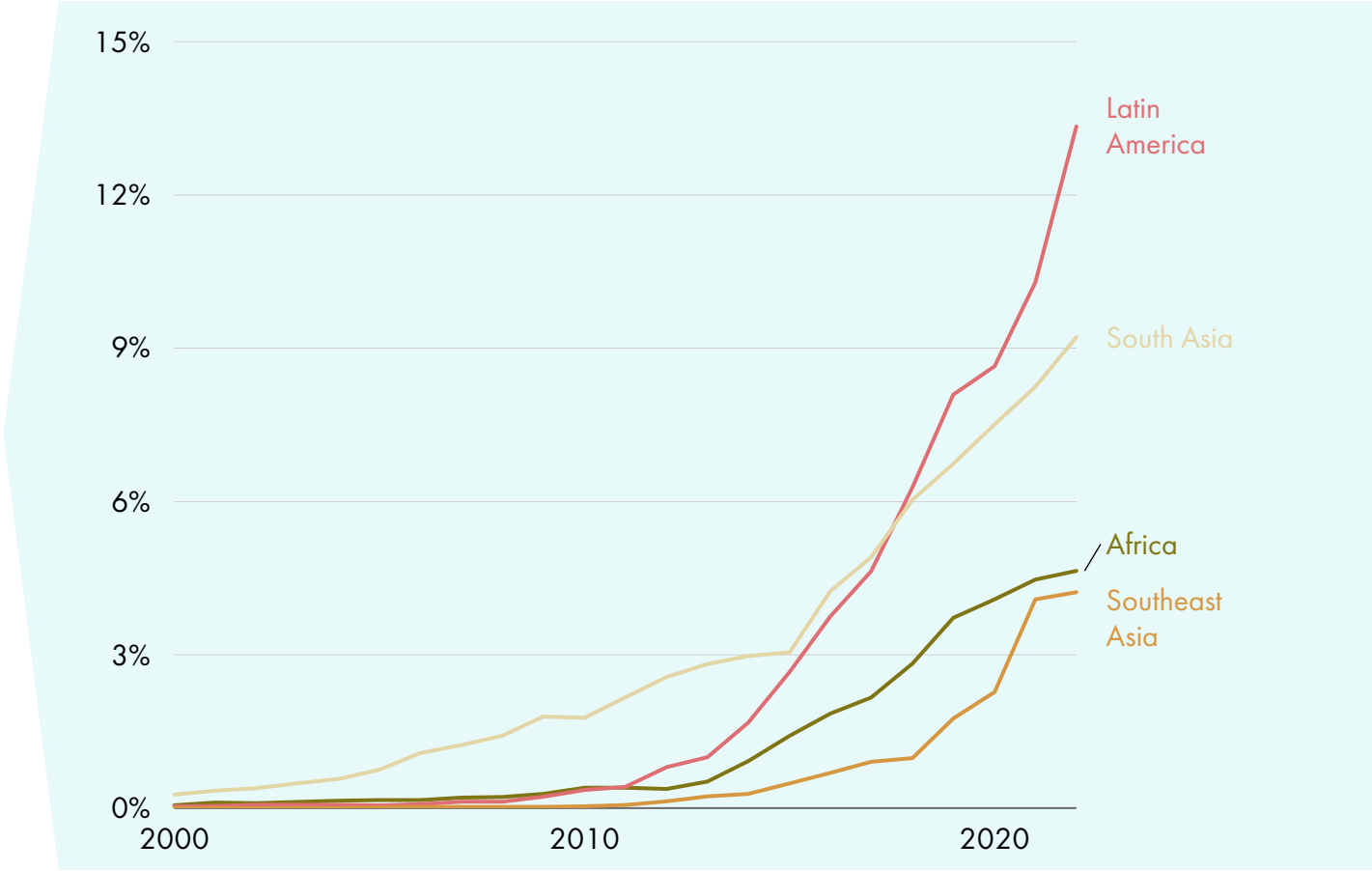
Sources: Systemiq analysis for the ETC; BNEF (2025), *LCOE: Data Viewer*; Ofgem (2025), *Wholesale market indicators – Electricity Prices: Forward Delivery Contracts – Weekly Average (GB)*; IEA *(2023)*, *Electricity Market Report – Update 2023*, License: CC BY 4.0; Statista (2024), *Average electricity prices for enterprises in China from September 2019 to September 2024;* Ember (2025), *Wholesale electricity prices in Europe*; CCC (2025), *The Seventh Carbon Budget;* TERI (2024), *India’s Electricity Transition Pathways to 2050: Scenarios and Insights;* ICCSD (2022), *China’s Long-Term Low-Carbon Development Strategies and Pathways;* Aurora (2023), *Long Duration Energy Storage in Spain.*

# While starting from a smaller base, renewables deployment is accelerating rapidly in emerging and developing economies

Solar & wind share of generation by region



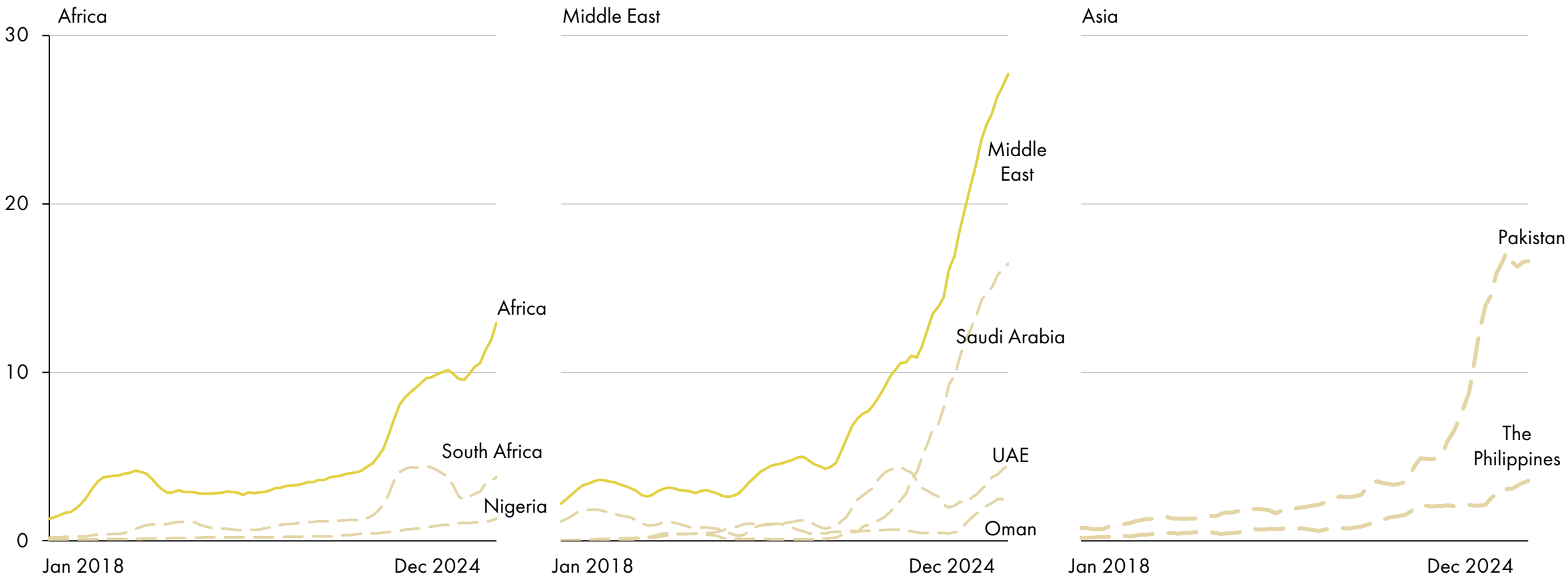

Solar & wind share of generation by developing regions




Sources: Charts from RMI (2024) *Powering up the Global South*

# Exports of Chinese solar panels to new markets are growing, helping foster a solar surge in many emerging and developing economies

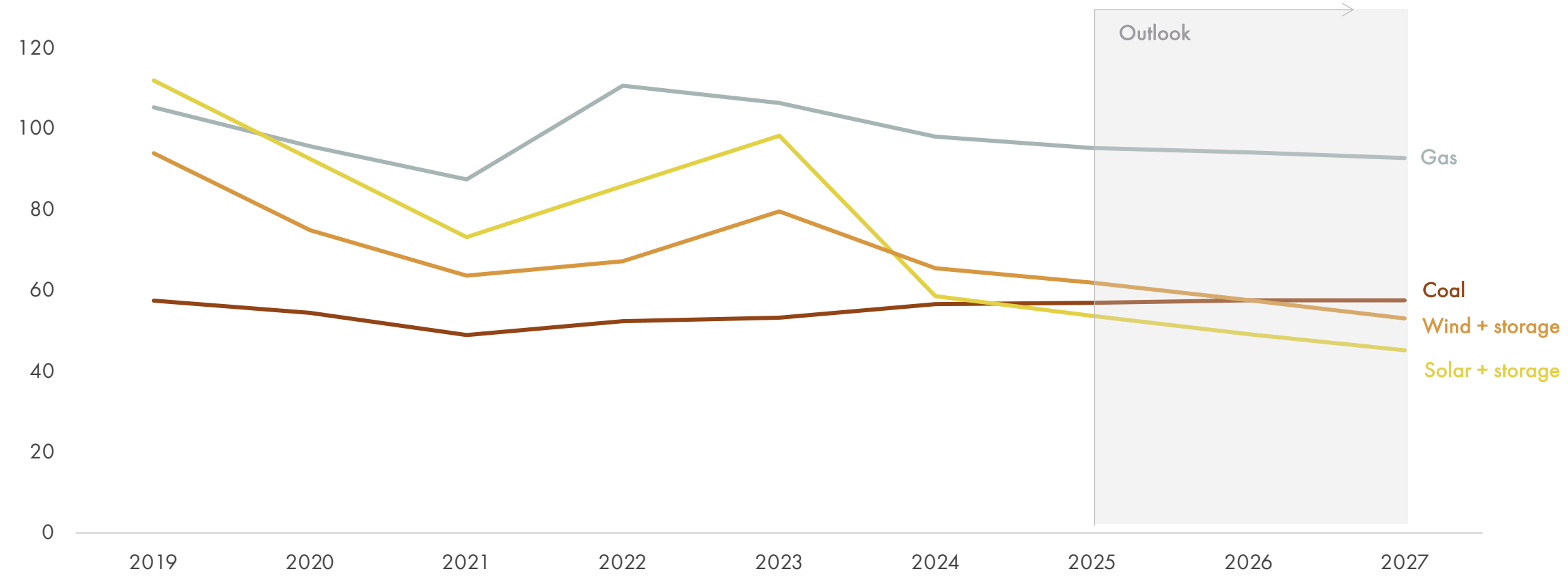
12-month trailing sum of Chinese solar exports [GW]




Notes: China accounts for more than 80% of global solar manufacturing capacity. A granular breakdown of African solar panel imports can be found in Ember's China Solar PV Import Explorer.
Sources: Chart from Ember (2025) *China's solar PV Import Explorer*

# India is an example of where renewables + storage is quickly becoming the least cost option for generation

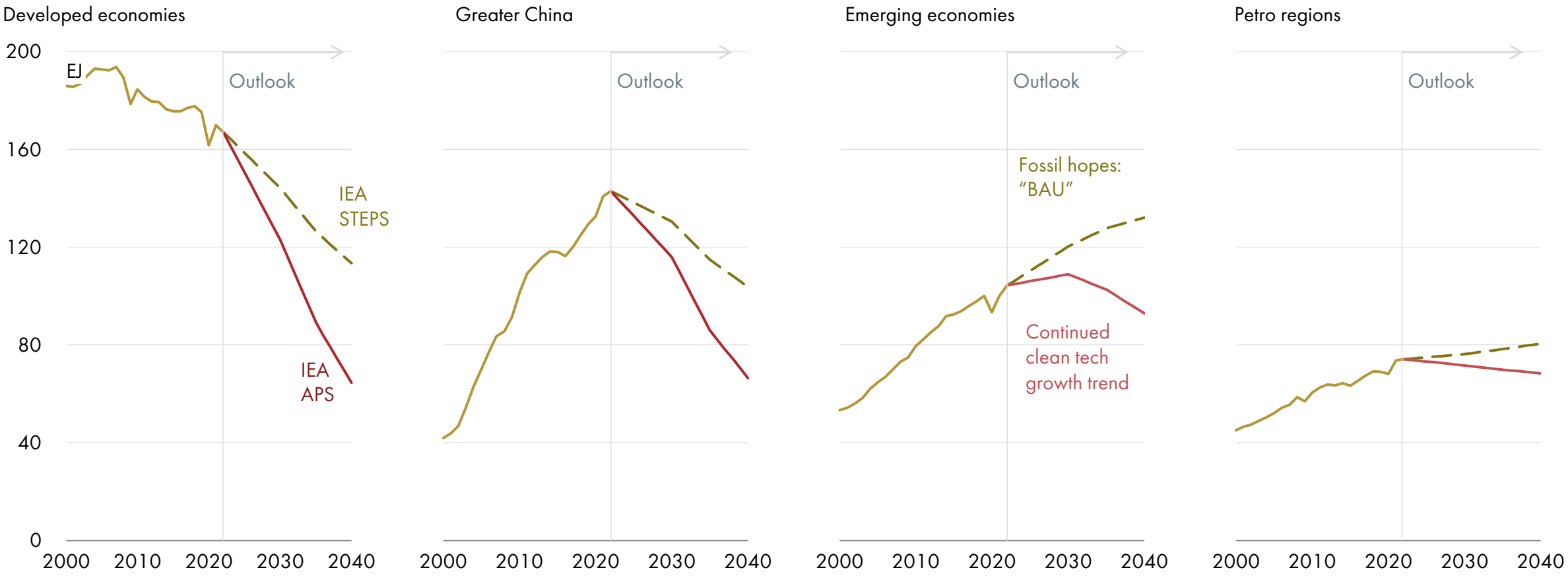
LCOE of new generation [$/MWh]




Notes: Solar is fixed-axis, wind is onshore, gas is combined-cycle gas turbine, and mid-case storage assumes a 50% capacity ratio. LCOEs exclude subsidies and tax credits. More details can be found in the BNEF report methodology.
Sources: BNEF (2025) *Levelized Cost of Electricity (LCOE) Mid Case*, RMI analysis

# It's clear that fossil fuel producers shouldn't count on emerging economies as the next source of significant demand growth

Fossil fuel demand by region [EJ]




Notes: IEA Stated Policies Scenario (STEPS) (dotted lines) versus Announced Policies Scenario (APS) (firm lines), RMI framing.
Source: Charts from RMI (2024) *Powering up the Global South*

# Oil demand

# Oil is a core part of the global economy — with roughly half of demand sitting in road transport

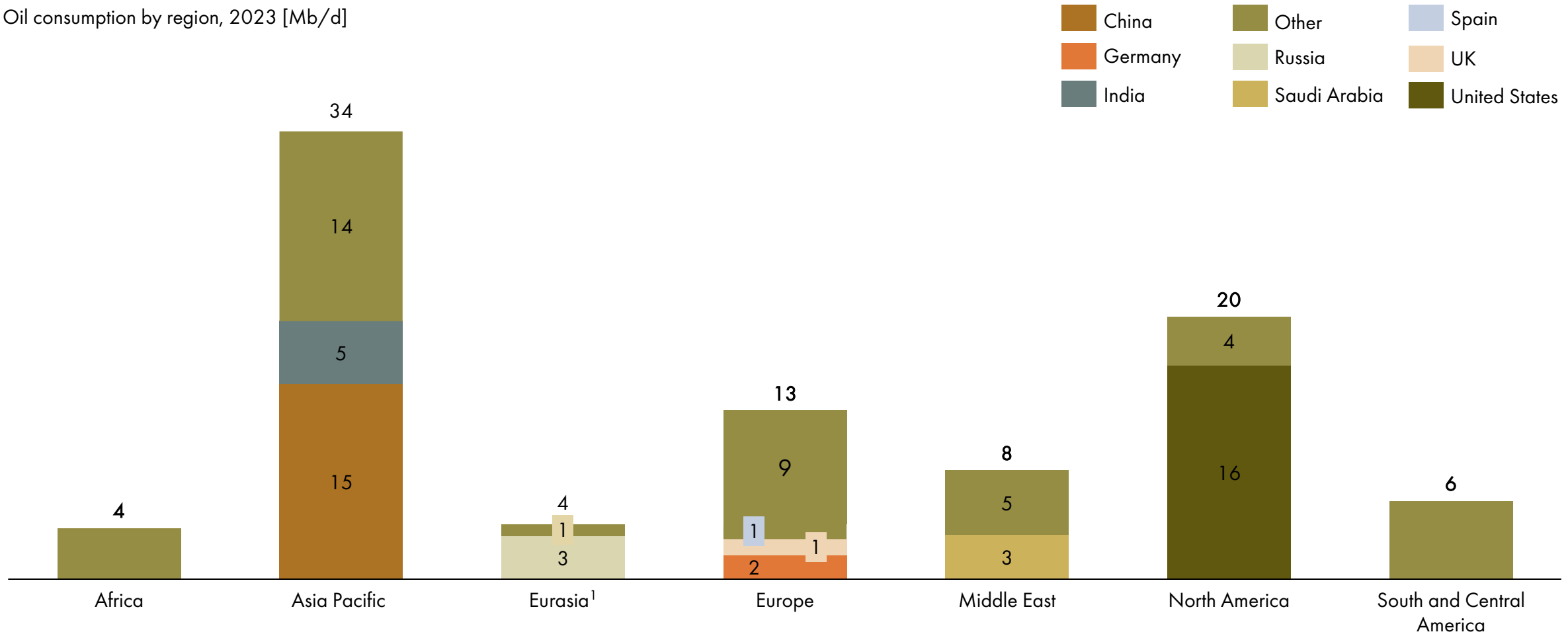
Sectoral breakdown of oil[1] consumption for 2022 [Mb/d]


Notes: All numbers are rounded. [1]Represents total liquids demand, including biofuels and processing gains from refineries; [2] Light and Medium Commercial Vehicles. [3] refining; [4] incl. Agriculture, mining etc; [5] incl. Non energy uses; assumed 90%/10% split for oil use in feedstock and energy for the petrochemicals sector, difference from bottom-up aggregation with reported total demand with IEA (2.8%) is equally allocated across sectors.

Source: Chart from ETC Fossil Fuels in Transition (2023), data from Systemiq analysis for the ETC; RystadEnergy (2022), Oil Market Transition Report 2022; IEA (2023), *World Energy Outlook 2023,* License: CC BY 4.0; IEA (2023), Oil Market Report; IEA (2018), *The Future of Petrochemicals,* License: CC BY 4.0.

# Demand is spread across the globe — the US and China are by far the largest consumers

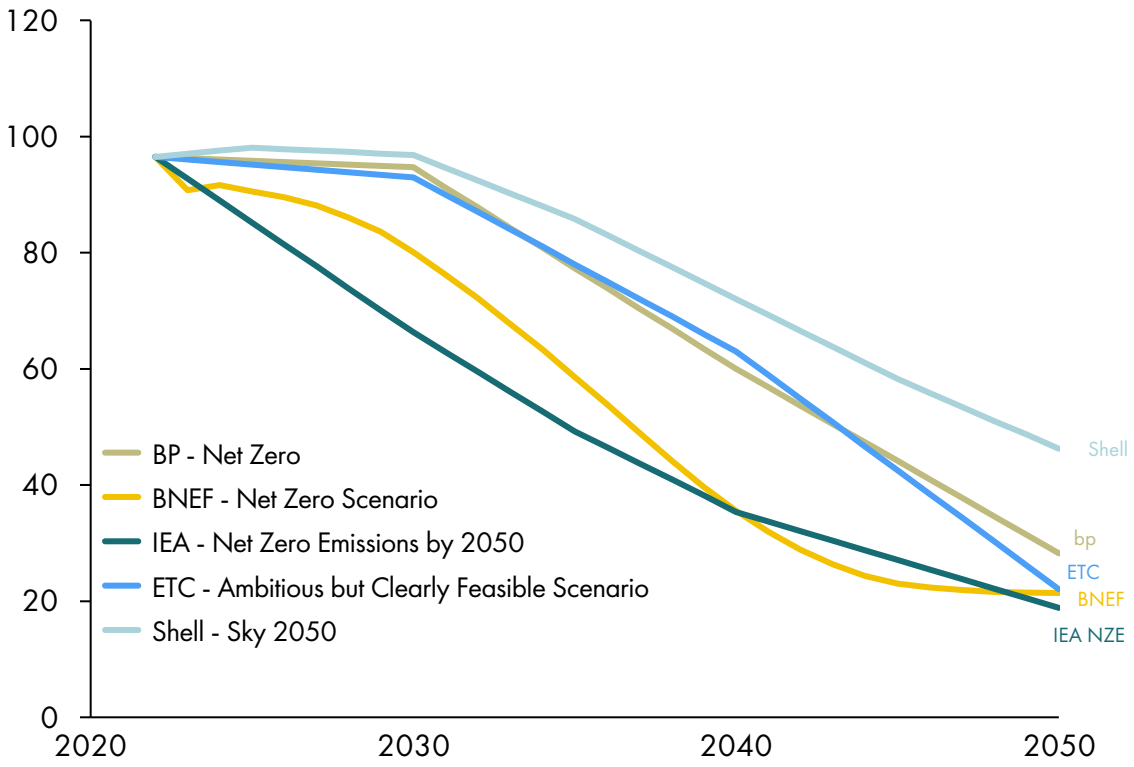
Oil consumption by region, 2023 [Mb/d]




Notes: TWh from OurWorldInData, converted to Mb/d by following 1 BOE = 5.8 MMBTU industry standard. [1]Eurasia represents the OurWorldInData CIS (Commonwealth of Independent States).
Sources: OurWorldInData (Accessed May 2025), *Oil consumption by region*

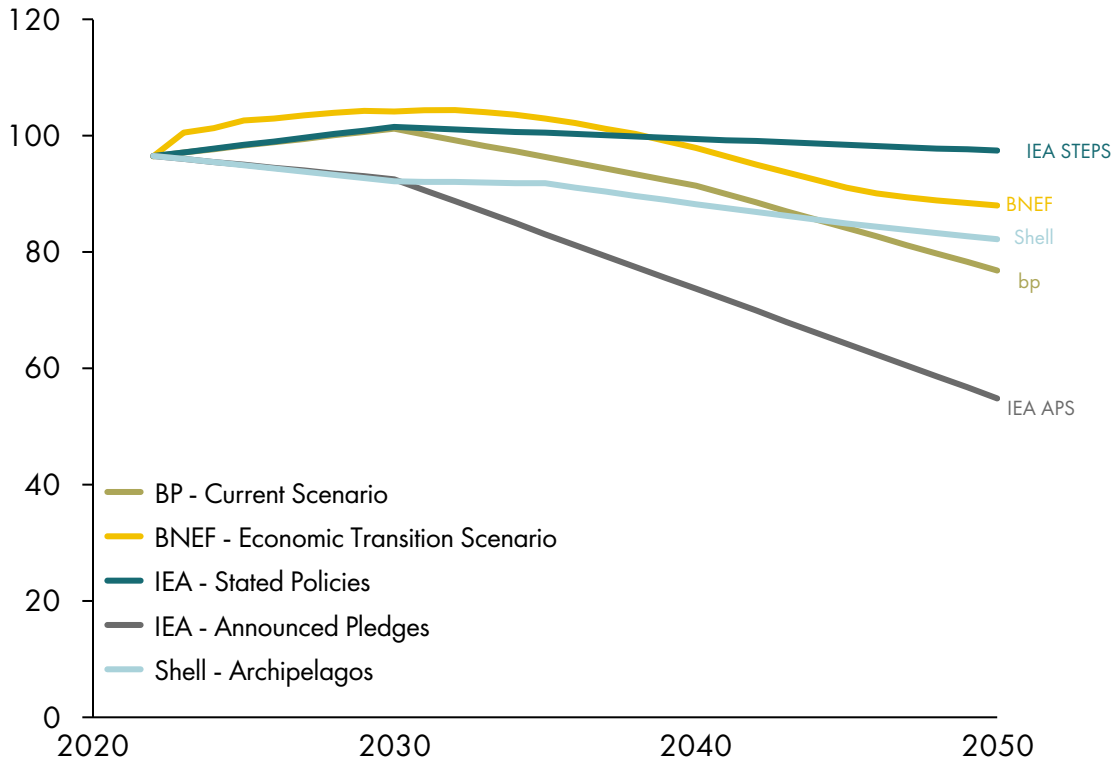
# Experts agree demand must drop rapidly; however, projections based on current policies/trends highlight wide uncertainty and require more ambition

Global net-zero oil demand trajectories [Mb/d]




Net-zero scenarios describe desired or ideal future outcomes (e.g., net zero by 2050) and outline pathways to achieve them

Global current trends oil demand trajectories [Mb/d]

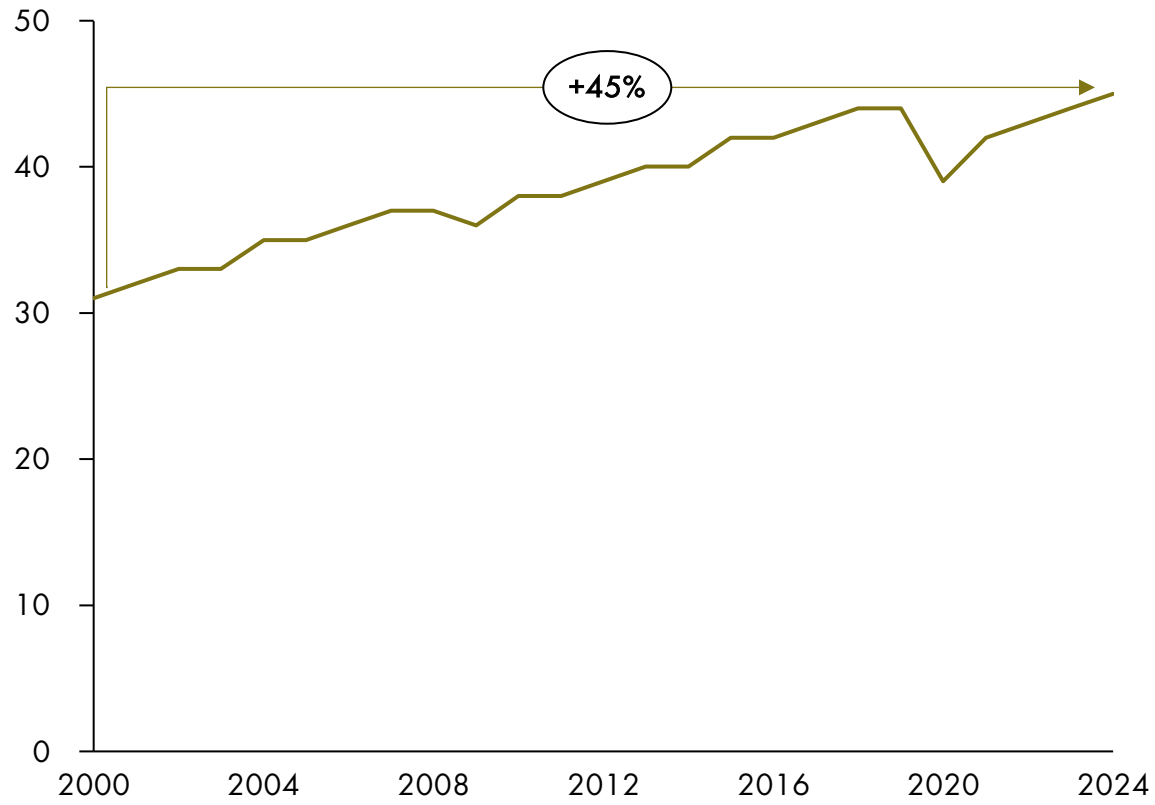



Current trends scenarios reflect projections of future developments based on current trends, technologies and policies

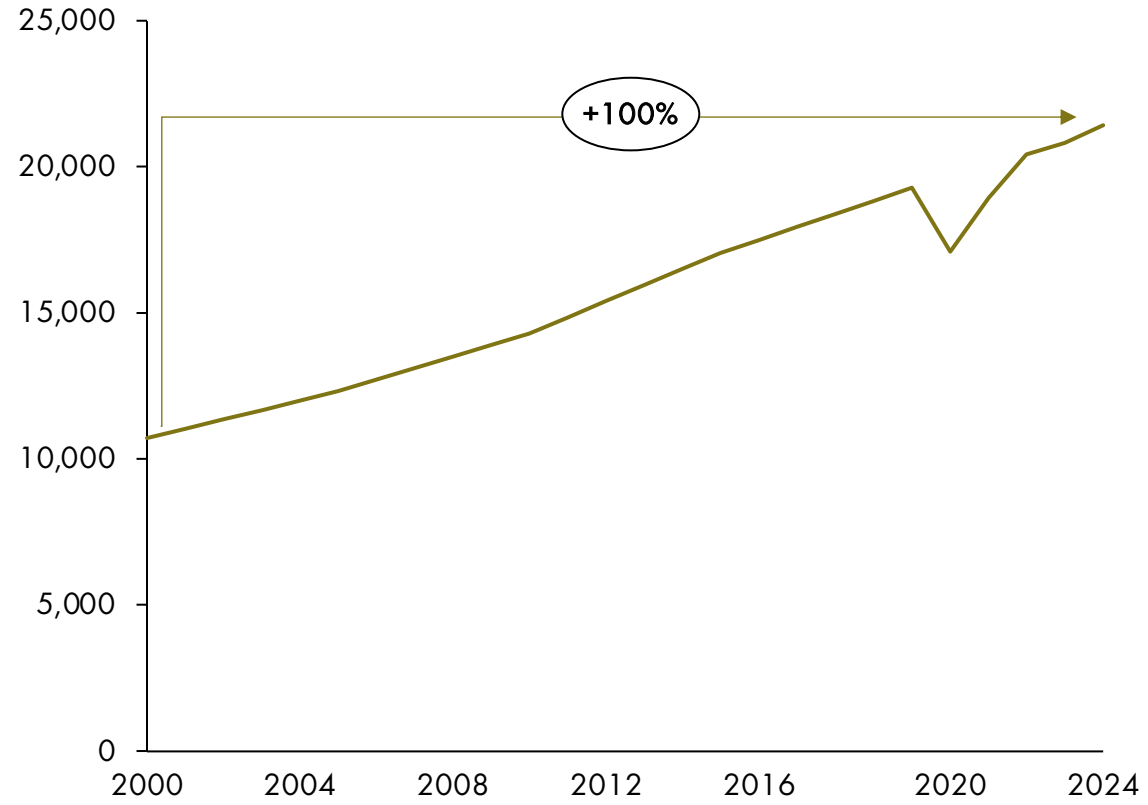
Notes: 2022 values for all scenarios fixed using the IEA's 2022 data. Only BNEF data is on year-on-year basis, e.g. IEA goes from decade to decade. Shell Archipelagos 2025 data point removed to prevent data skew.
Sources: ETC (2023), *Fossil Fuels in Transition;* BP (I2024), *Energy Outlook;* BNEF (2025), *New Energy Outlook;* IEA (2023), *World Energy Outlook;* Shell (2025), *Energy Security Scenarios;* BP (2024), *Energy Outlook*

# Road travel has doubled since 2000; however, oil demand has only grown by 45% due to EV adoption and increases in vehicle efficiency

Global oil demand for road transport [Mb/d]



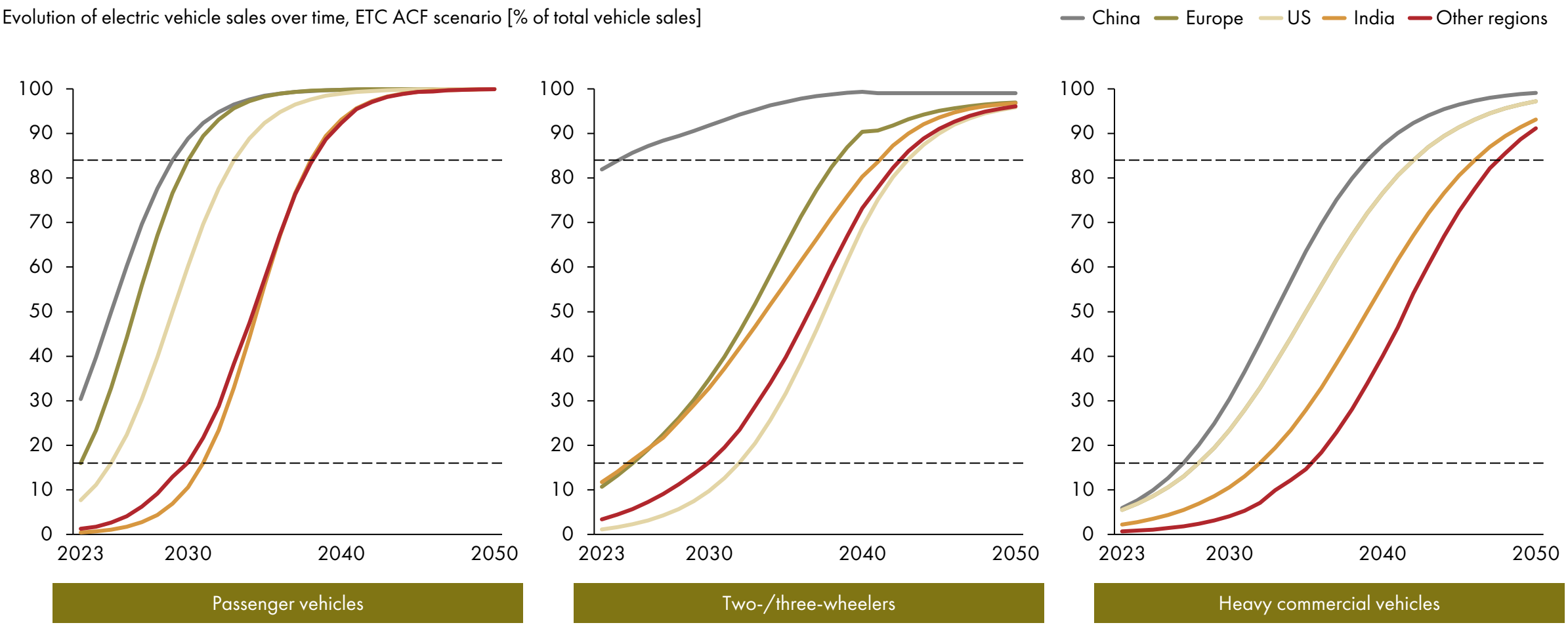

Passenger vehicle km travelled per year – Shell [Billion km]




Sources: BNEF (2025), *World Energy Outlook*; Shell(2024), *Energy Security Scenarios*

# Electric vehicle sales have started to take off across the globe and are projected to rapidly scale in the 2030s

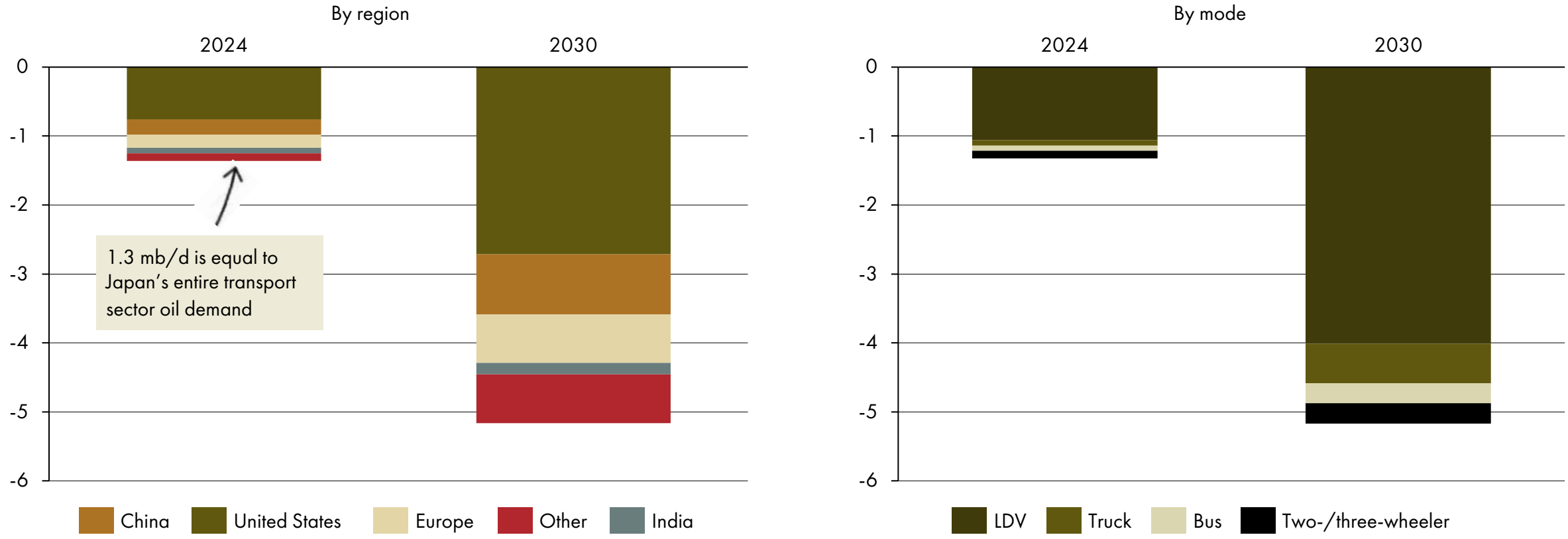
Evolution of electric vehicle sales over time, ETC ACF scenario [% of total vehicle sales]




Notes: Electric vehicle include both battery electric and fuel-cell vehicles for heavy commercial vehicles. S-curve methodology is based on Rogers' innovation diffusion theory (1962). Dotted lines represent the maximum growth and inflection points, respectively equivalent to 16 and 84% of sales. These points are defined as points on the curve in which the concavity changes. Growth and inflection point are calculated based on BNEF 2023 Electric Vehicle Outlook. For HCV, Europe and US curves are identical and thus Europe's curve is hidden.
Source: Chart from ETC Fossil Fuels in Transition (2023), underlying data from BNEF (2023), *Electric Vehicle Outlook,* MPP (2022), *Making Zero-Emissions Trucking Possible.*

# Oil displacement from EVs is projected to increase almost 5-fold between 2024 and 2030, largely driven by light-duty vehicles in China

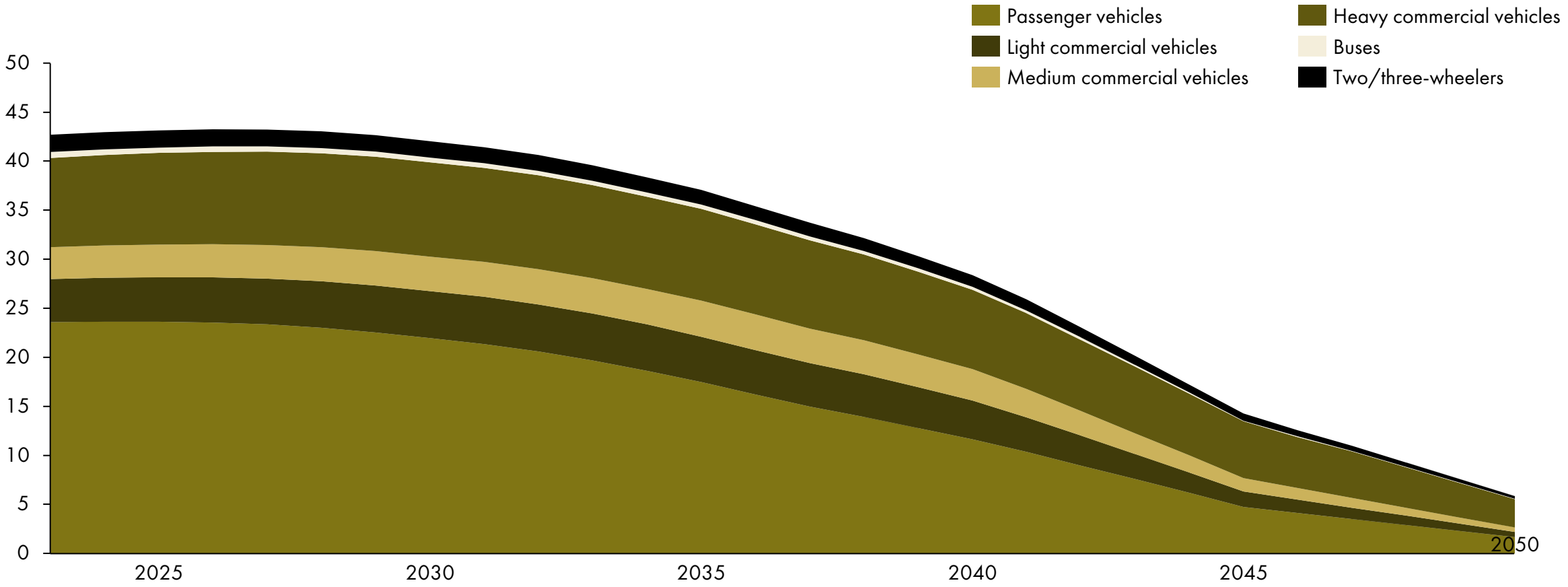
Oil displacement by region and mode in IEA Stated Policies Scenario, 2024-2030 [Mb/d]




Notes: The baseline is of ~45 mb/d in 2024; STEPS = Stated Policies Scenario; LDV = light-duty vehicle. Oil displacement based on internal combustion engine (ICE) vehicle fuel consumption to cover the same mileage as the EV fleet.
Sources: IEA (2025) *Global EV Outlook 2025,* License: CC BY 4.0

# Oil demand from road transport will steadily decrease as the global stock of vehicles increasingly becomes electric

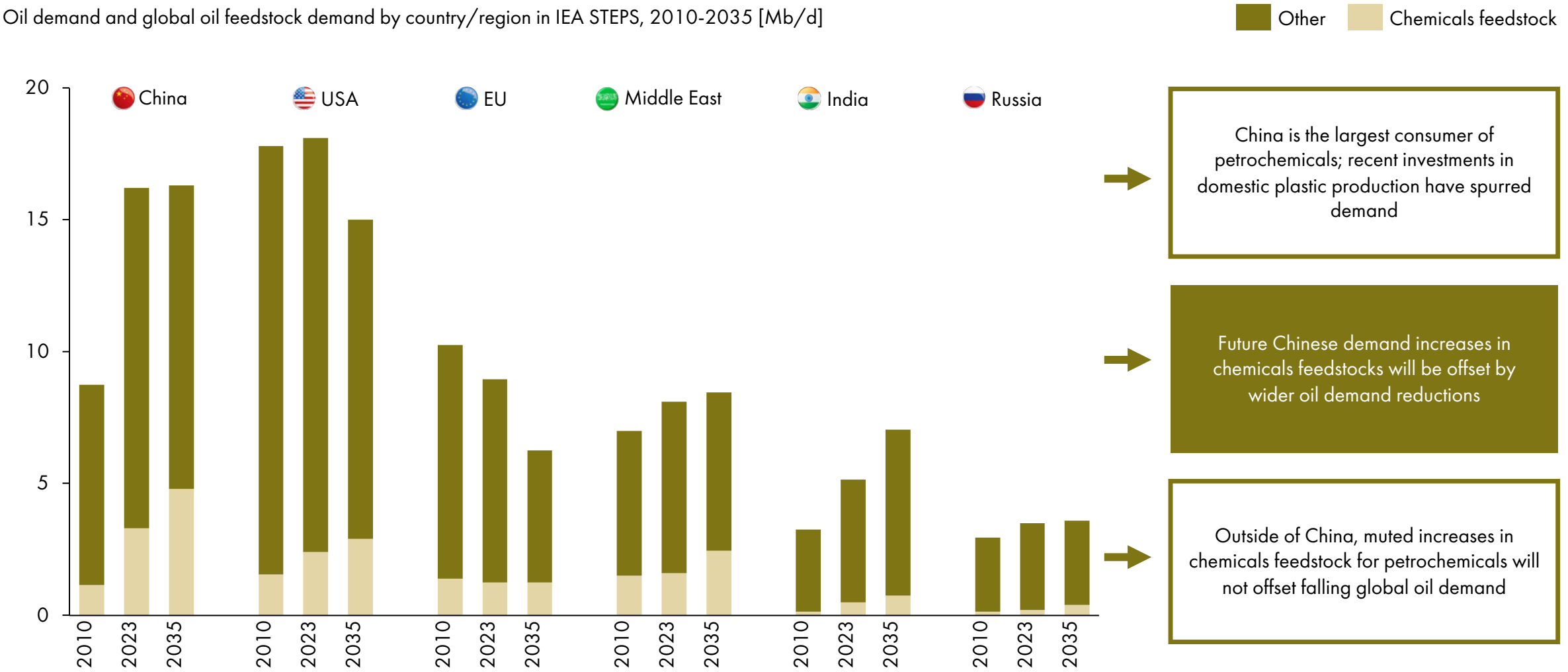
Forecasted oil demand in road transportation in ETC Accelerate but Clearly Feasible scenario[1],2024-2050 [mb/d]




Notes: 1) This ETC scenario is clearly technically and economically feasible, but in some sectors will require more forceful policy support than currently in place. Other vehicles, such as those used in construction or mining are not included. Aggregate oil demand figures exclude biofuels consumption for road transportation. EV sales curves patterns from prior slide used to calculate fuel demand decline.
Source: Chart from ETC (2023) *Fossil Fuels in Transition* (2023), data from Systemiq analysis for the ETC; BNEF (2023), Electric Vehicle Outlook; MPP (2022), Making Zero-Emissions Trucking Possible.

# Global growth in oil demand for petrochemicals is not enough to offset reductions in oil demand for road transport

Oil demand and global oil feedstock demand by country/region in IEA STEPS, 2010-2035 [Mb/d]




China is the largest consumer of petrochemicals; recent investments in domestic plastic production have spurred demand

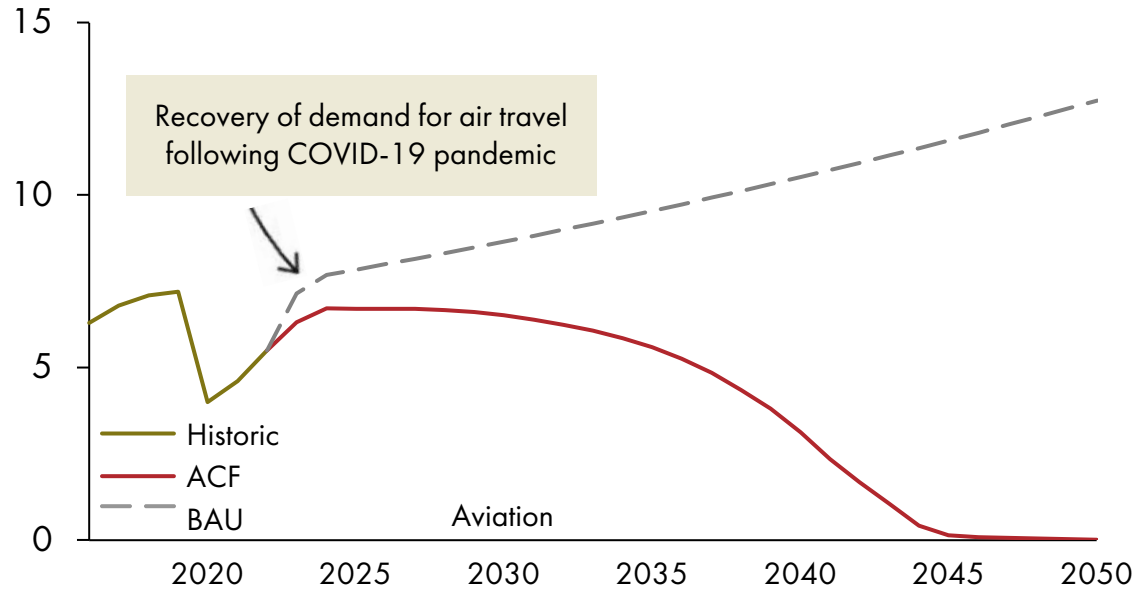
Future Chinese demand increases in chemicals feedstocks will be offset by wider oil demand reductions

Outside of China, muted increases in chemicals feedstock for petrochemicals will not offset falling global oil demand

Source: IEA (2024), *World Energy Outlook 2024,* License: CC BY 4.0

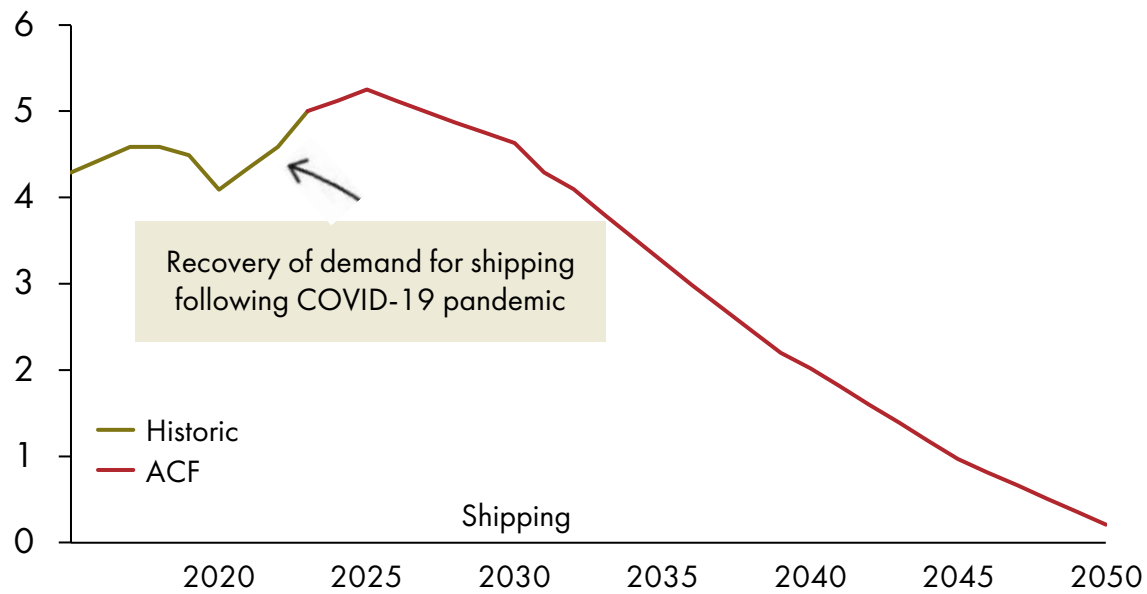
# Pathways exist to decarbonize aviation and shipping, but strong policy support is critical to bring down green premiums and enable scale

1.5°C and net-zero aligned ETC oil demand scenarios [Mb/d]




International Civil Aviation Organization has adopted a long-term aspirational goal for international aviation to achieve net-zero carbon emissions by 2050

New EU regulation mandates increasing shares of SAF supplied at EU airports, reaching 6% by 2030 and 70% by 2050




International Maritime Organization new 2025 global regulations propose carbon tax that incentivizes switching to low-carbon fuels within the next 10 years

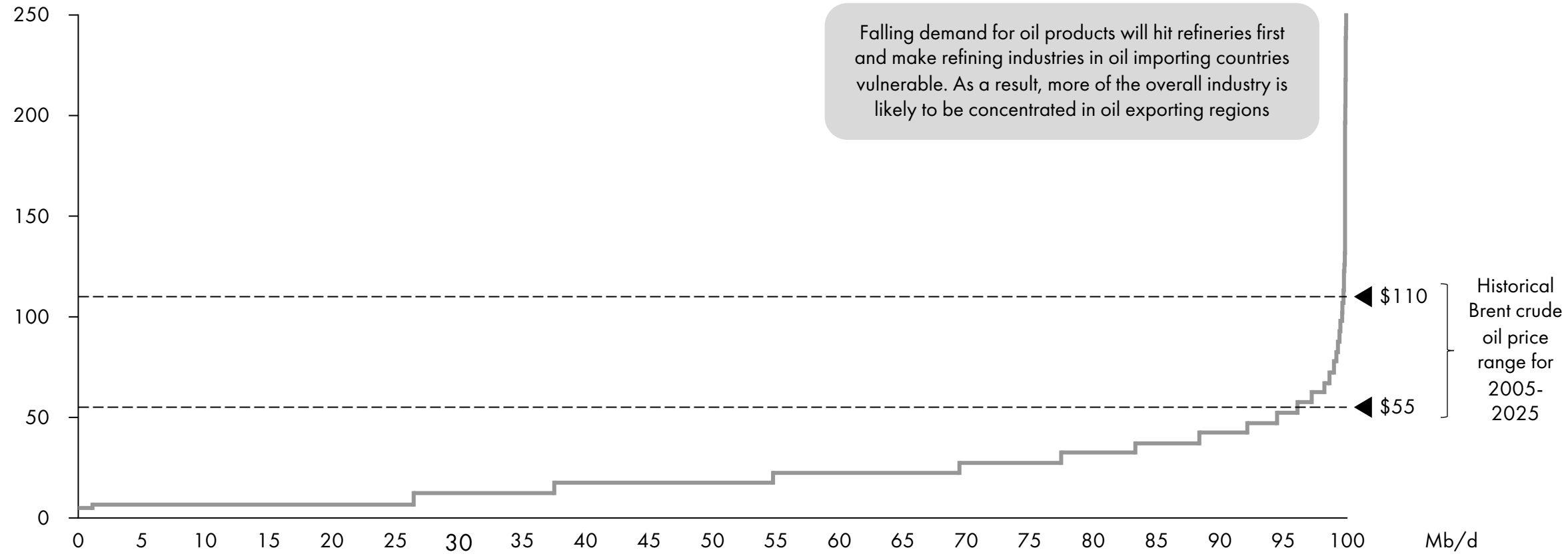
Fuel EU targets emissions reductions of 6% by 2030 and 80% by 2050

Notes: ETC ACF aligned to the "Prudent scenario" from MPP. BAU refers to MPP's "business-as-usual" scenario for aviation, where only technologies which offer an economic advantage are implemented, and most mitigation comes from continued fuel efficiency improvements. Aviation includes air transport for both passenger and freight.

Source: Systemiq analysis for the ETC; MPP (2022), *Making net-zero aviation possible.* Systemiq analysis for the ETC; MPP (2022), *A Strategy for the Transition to Zero-Emission Shipping;* Maersk Mc-Kinney Moller Center for Zero Carbon Shipping (2021), *We show the World it is possible;* IEA *(2023), Energy consumption in international shipping by fuel in the Net Zero Scenario, 2010-2030.*

# Falling oil demand will impact supply, with higher cost producers unable to stay in business

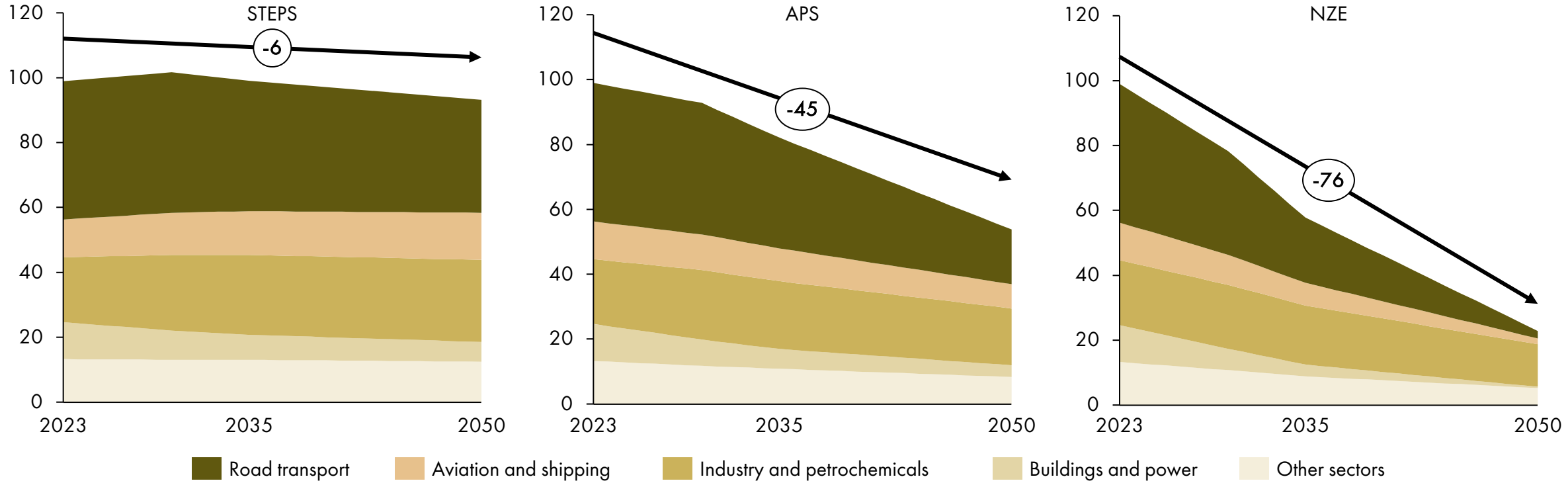
Supply cost curve for oil, 2022 [$/bl]




Notes: Supply cost curves are technical breakeven costs and not lifting costs (or marginal cost of production), exclude financing costs and implicit costs from balancing government and trade budgets, include CAPEX depreciation for the current year.
Source: Systemiq analysis for the ETC (2023) based on Rystad (2022), *Rystad Energy Ucube database*

# Under current trends, oil demand will drop marginally; if announced policies are realized, demand will drop even further

IEA oil demand by sector and scenario, 2023-2050 [Mb/d]




If **stated policies** are not improved upon, reductions in 2050 oil demand **may be limited**

If **announced net-zero pledges** are realized, 2050 demand will be **~50%** of today's levels

If warming is limited to **1.5°C consistent levels, over 75%** of 2050 demand can be reduced

Notes: IEA STEPS scenario projects what will happen under current stated policies and trends; APS projects what will happen under all announced policies and net-zero commitments; NZS describes what needs to happen to limit warming to levels consistent with 1.5°C of warming.

# What does this mean for future oil demand?

| | |
|---|---|
|  | Overall: Oil demand is under significant pressure as EVs scale, with no sector capable of offsetting the lost oil demand from road transport. |
|  | Oil demand for road transport is set to decrease rapidly. Electric vehicles are better driving experiences, more efficient and cheaper to run, and declining battery prices mean the sticker price of EVs will continue to fall. Strong growth in EV sales in emerging and developing economies puts further downward pressure on oil demand for road transport. Increasing and improving charging availability and interoperability is critical to support widespread uptake. |
|  | Oil demand in shipping and aviation is set to decrease slowly over time. International organizations are passing regulations to bring down oil use in these sectors, but the existence of a green premium and need to scale up alternative fuel supply result in steady but slow progress. |
|  | Oil demand from petrochemicals may remain broadly consistent. While non-fossil feedstocks are being created, it may take time for these to scale up and become cost effective. Even if these don't scale, the smaller nature of the petrochemical sector means that even if it grows, it will not be enough to offset declines seen in road transport. |

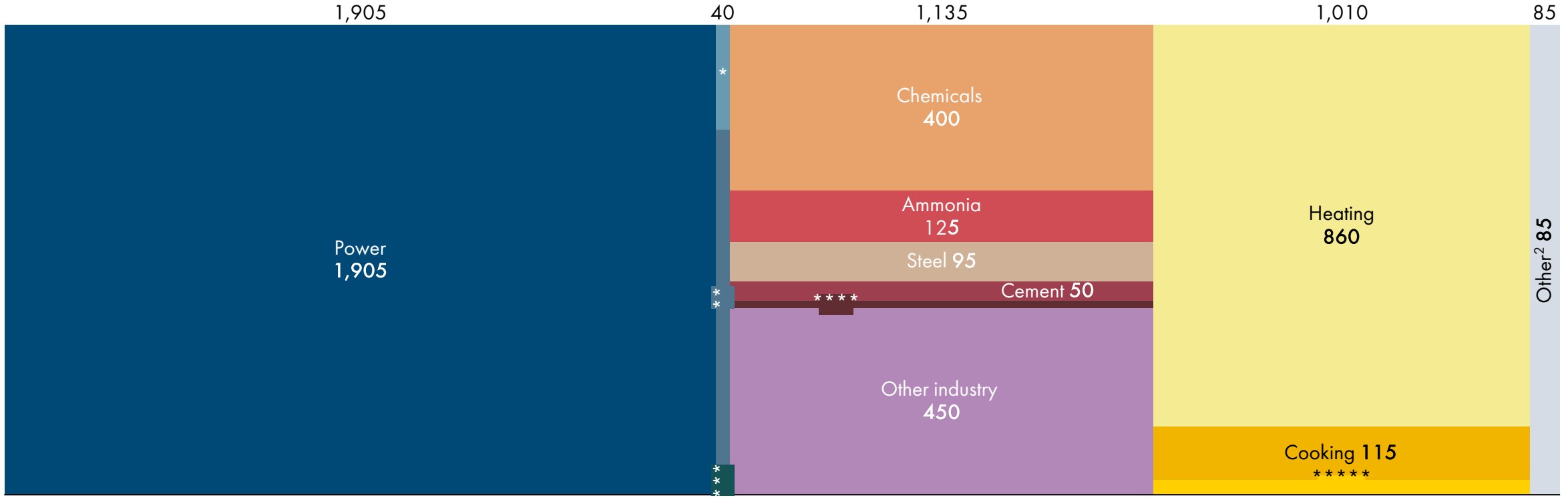
# Key questions

| | |
|---|---|
|  | Do uncertainties about oil demand growth conflict with expansion plans for new oil extraction? |
|  | Could new EV breakthroughs and positive consumer attitudes lead to a more rapid decline of oil fueled cars? |
|  | Is there a risk of oversupply? What might happen if prices crash? |
|  | What will happen to refining as petrol and diesel move out of the fuel slate? |
|  | What are the geopolitical risks of declining demand and concentrating supply? |

# Gas demand

# Today, gas is used in most sectors of the economy, with key uses in power, industry and buildings

Sectoral breakdown of gas consumption for 2022 [bcm]




* LCV/MCV **10**

** Heavy commercial vehicles **25**

*** Shipping **5**

**** Aluminium **15**

***** Buildings-other **35**

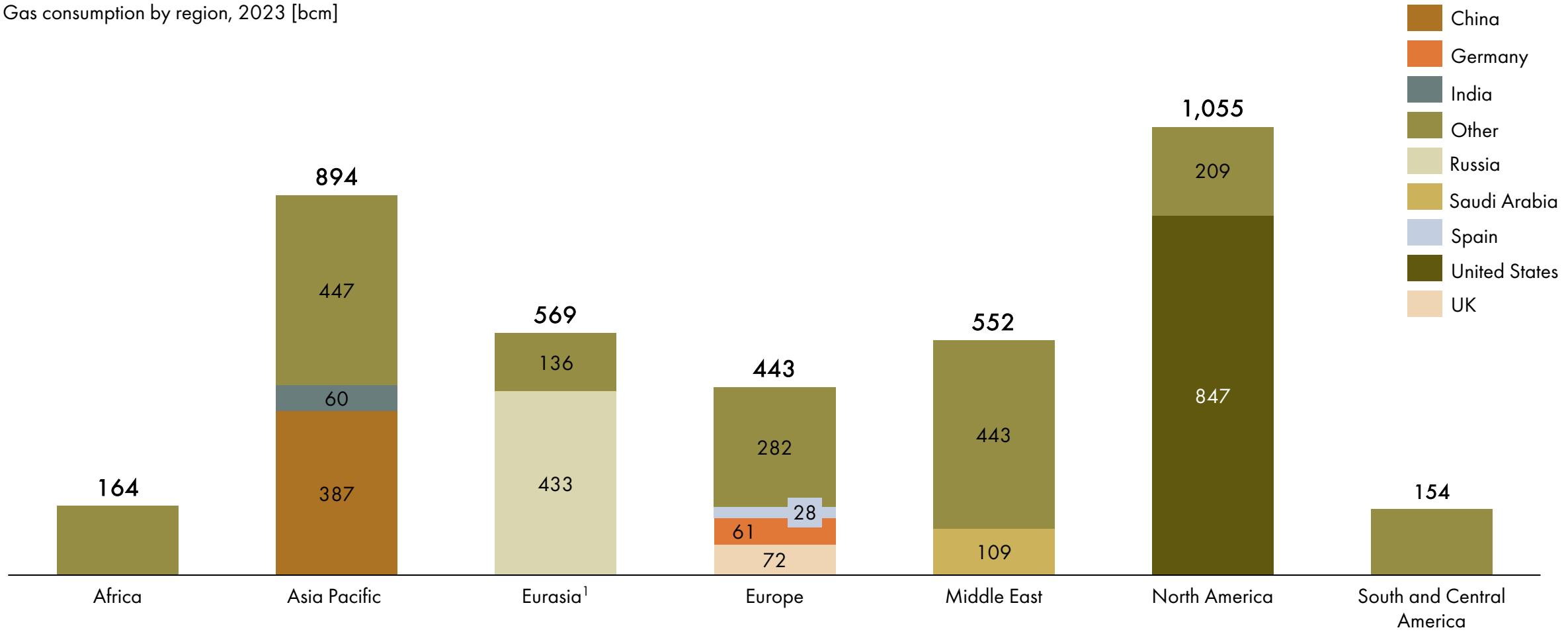
Allocating energy transformation to final energy end-uses

Notes: Final Energy Demand showed, all non-energy use assumed to be petrochemical feedstock (as per BNEF definition), "Energy Industry" considered as being all refining (as per BNEF definition) ; almost all natural gas use in road transportation is for heavy road transport.
1. refining; 2. incl. Agriculture, mining etc; 3. incl. Non energy uses.

Source: Chart *from ETC Fossil Fuels in Transition* (2023), data from *BNEF* (2023), *New Energy outlook 2022*, IEA, *World Energy Outlook* 2022

# Demand is spread across the globe — the US, Russia and China are the largest users

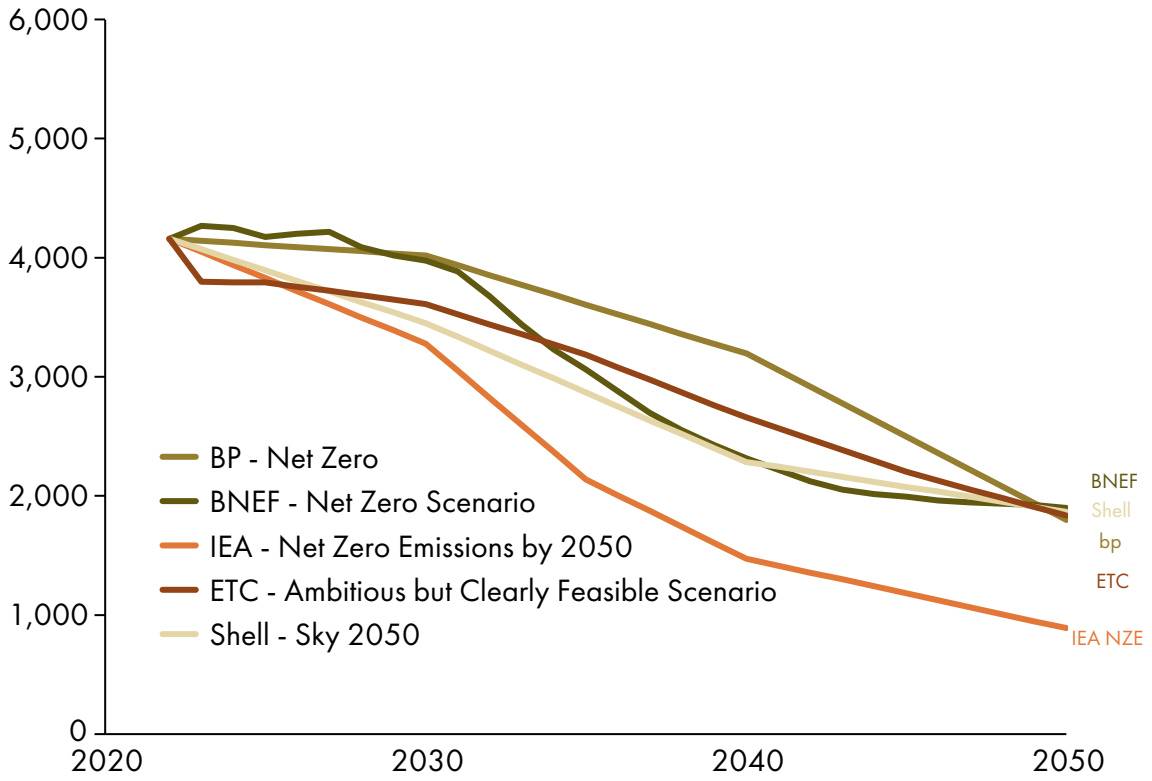
Gas consumption by region, 2023 [bcm]




Notes: TWh from OurWorldInData, converted to Bcm by following 1 BCM = 10.47 TWh. [1]Eurasia represents the OurWorldInData CIS (Commonwealth of Independent States).
Source: OurWorldInData (Accessed May 2025), *Gas consumption by region*

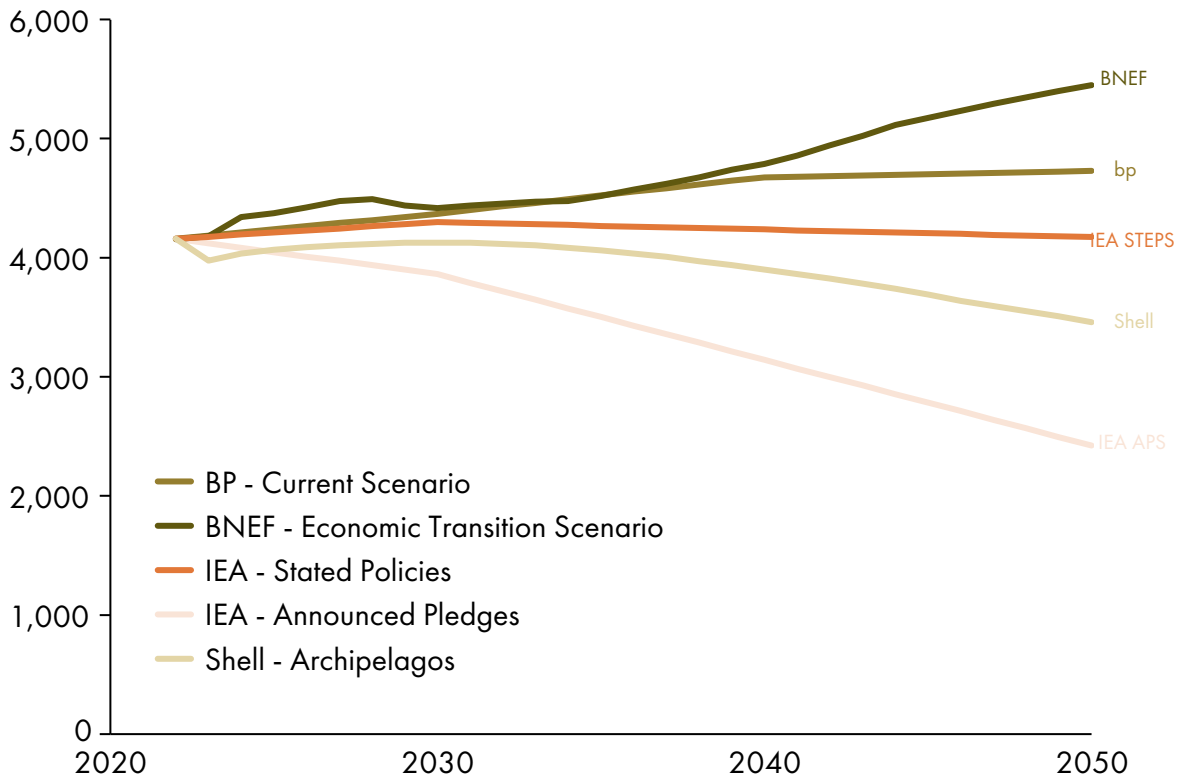
# Experts agree demand must drop rapidly, but projections based on current trends show gap between what's needed and where we are

Global net-zero gas demand trajectories [bcm]




Net-zero scenarios describe desired or ideal future outcomes (e.g., net-zero by 2050) and outline pathways to achieve them

Global current trends/policies gas demand trajectories [bcm]



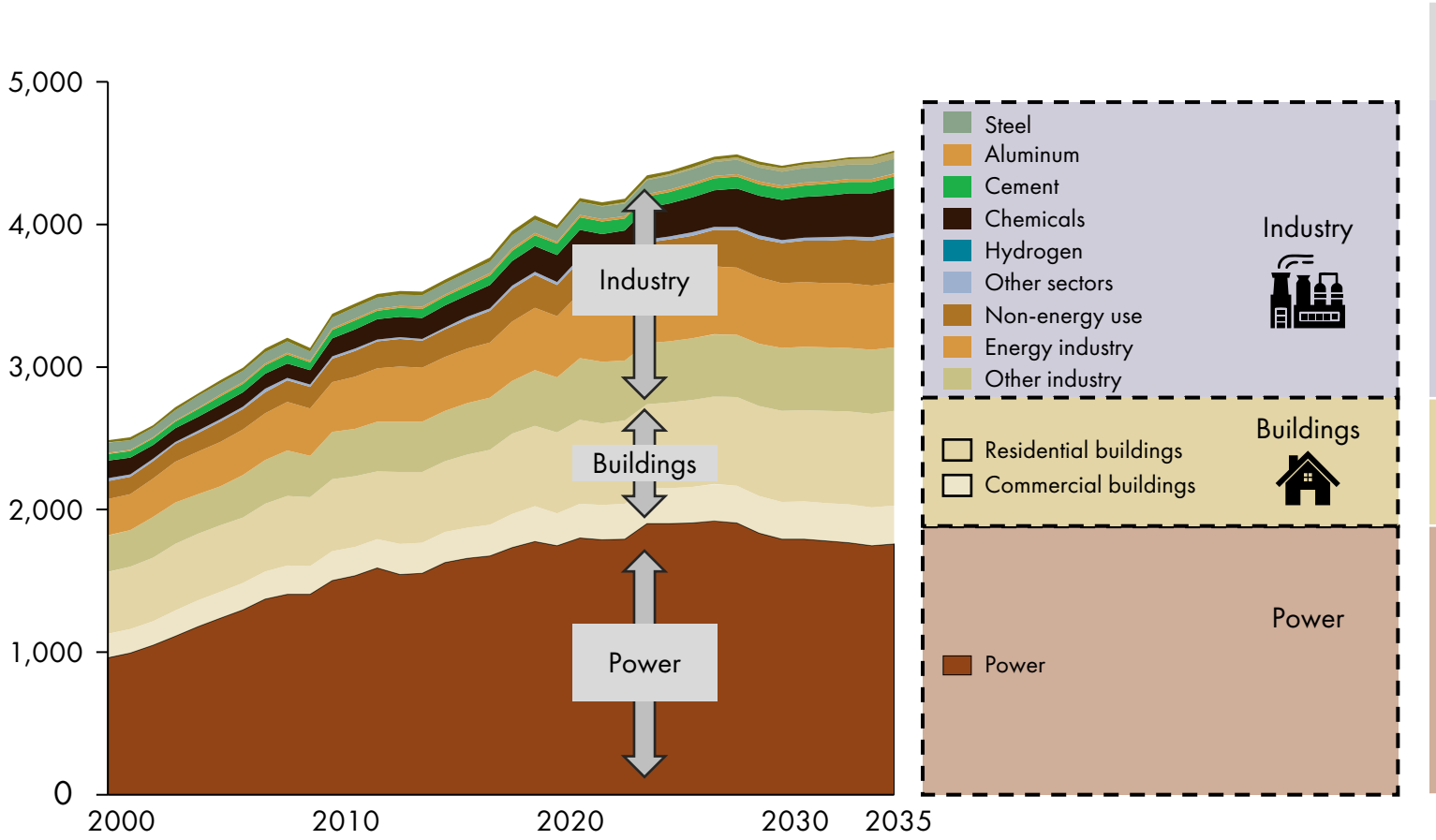

Current trends scenarios reflect projections of future developments based on current trends, technologies and policies

Notes: 2022 values for all scenarios fixed using the IEA's 2022 data. Only BNEF data is on year-on-year basis, e.g. IEA goes from decade to decade. APS = Announced Pledges Scenario, STEPS = Stated Policies Scenario, NZE = Net zero Emissions by 2050 Scenario

Source: ETC (2023), *Fossil Fuels in Transition;* BP (2024), *Energy Outlook;* BNEF (2025), *New Energy Outlook;* IEA (2023), *World Energy Outlook,* License: CC BY 4.0 Shell (2025), *Energy Security Scenarios;* BP (2024), *Energy Outlook*

# If policies stay the same, rising gas demand from buildings and industry will more than offset slight decline expected in the power sector

Gas demand by sector in BNEF ETS Scenario [bcm]







| 2022-2050 change |
|---|
| +16% |
| +14% |
| -2% |

Projected to gradually increase across countries that don't have substantial carbon pricing to incentivise electrification.

Key components:

- Petrochemicals and chemicals
- Manufacturing
- Steel and other metals

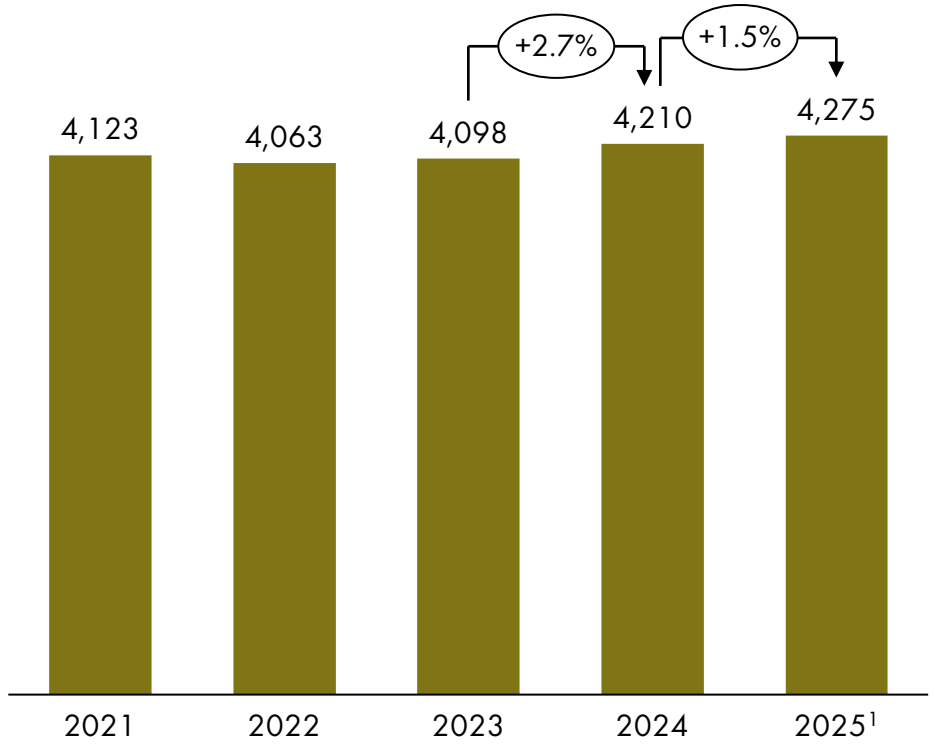
Projected to increase in line with population growth and economic development if heat pumps cannot be rolled out at scale

Projected to marginally decrease as cheaper forms of generation reduce role for gas, particularly solar and batteries – potential to decrease a lot further

Notes: BNEF Economic Transition Scenario provides a projection of what is likely to happen to gas demand under current trends and policies. Road (2022 = 26, 2050 = 6) and shipping (2022 = 3 2050 =95) expected to have small role.
Source: BNEF (2025), *New Energy Outlook*

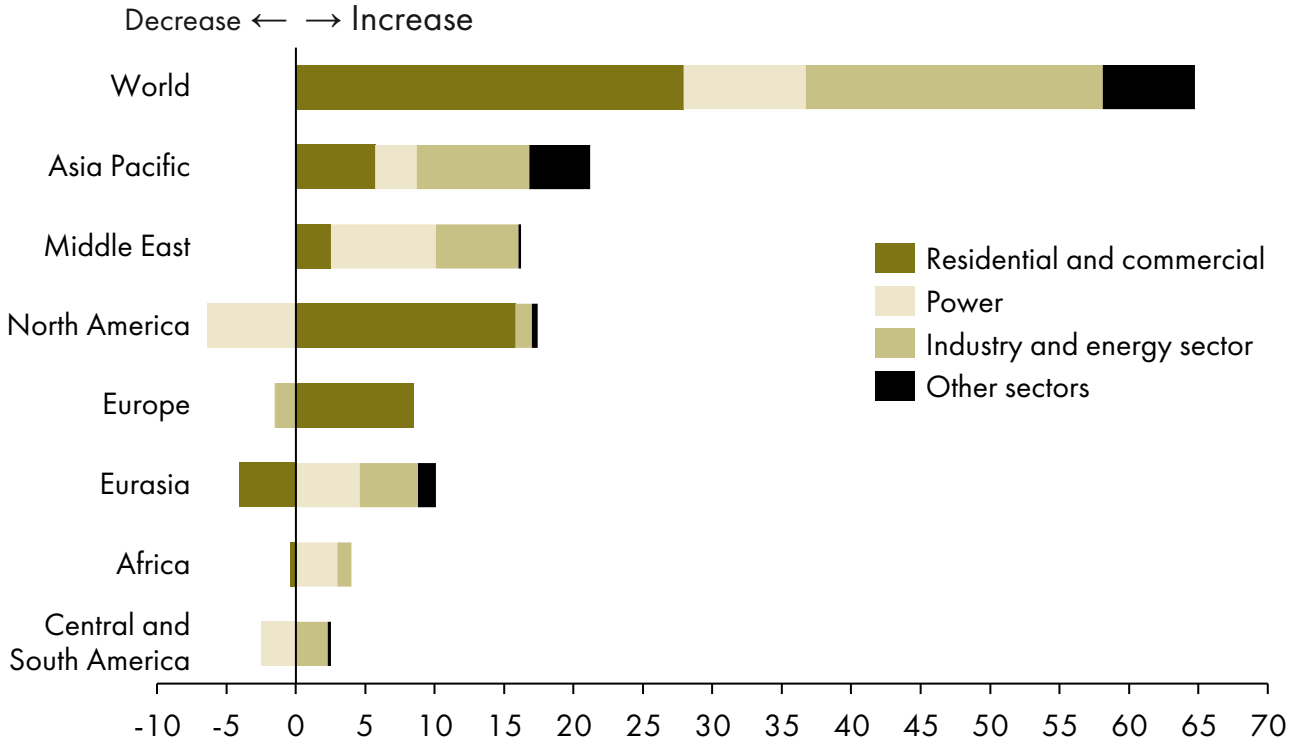
# Gas demand growth is expected to slow in 2025, with Asia Pacific driving the modest growth

Global gas consumption, 2021-2025 [bcm]




Rate of growth in global gas consumption forecast to slow to 1.5% in 2025

Forecast for gas consumption by region and sector, 2024 vs. 2025 [bcm]

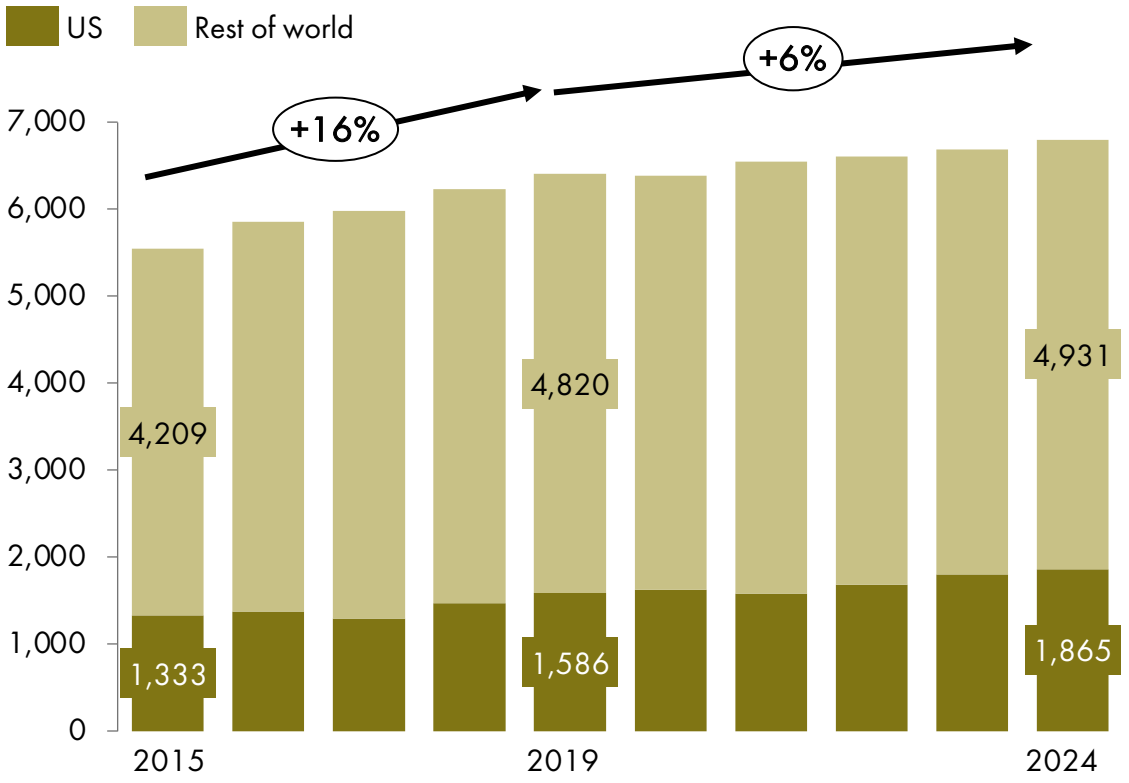



2025 increases largely from industry in developing countries and residential and commercial heating in USA/Europe

Source: IEA (2025), *Gas Market Report, Q2-2025,* License: CC BY 4.0

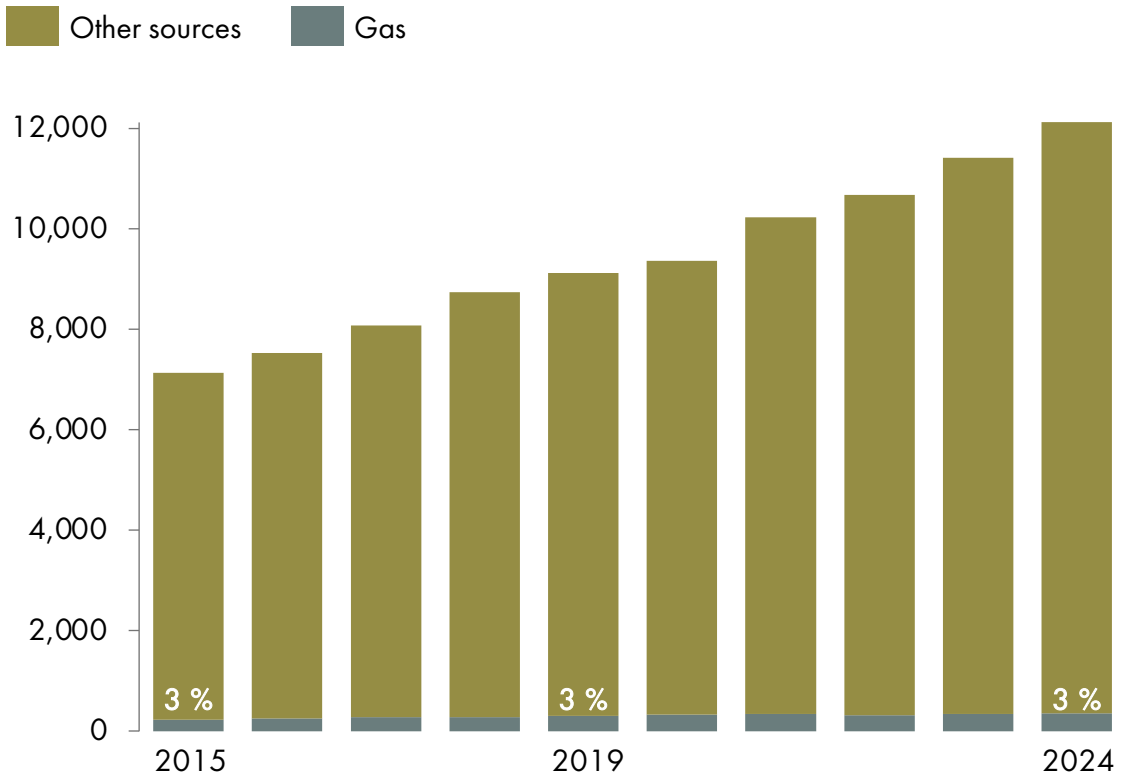
# Global gas generation growth has slowed and is potentially peaking, with no substantial growth coming from China or India

Gas-powered electricity generation 2015-2024 (TWh)




**43%** of rise in gas power generation since 2015 originated from the US; future demand (e.g. data center demand) may be limited by gas turbine availability

Electricity generation 2015-2024 China + India (TWh; %)

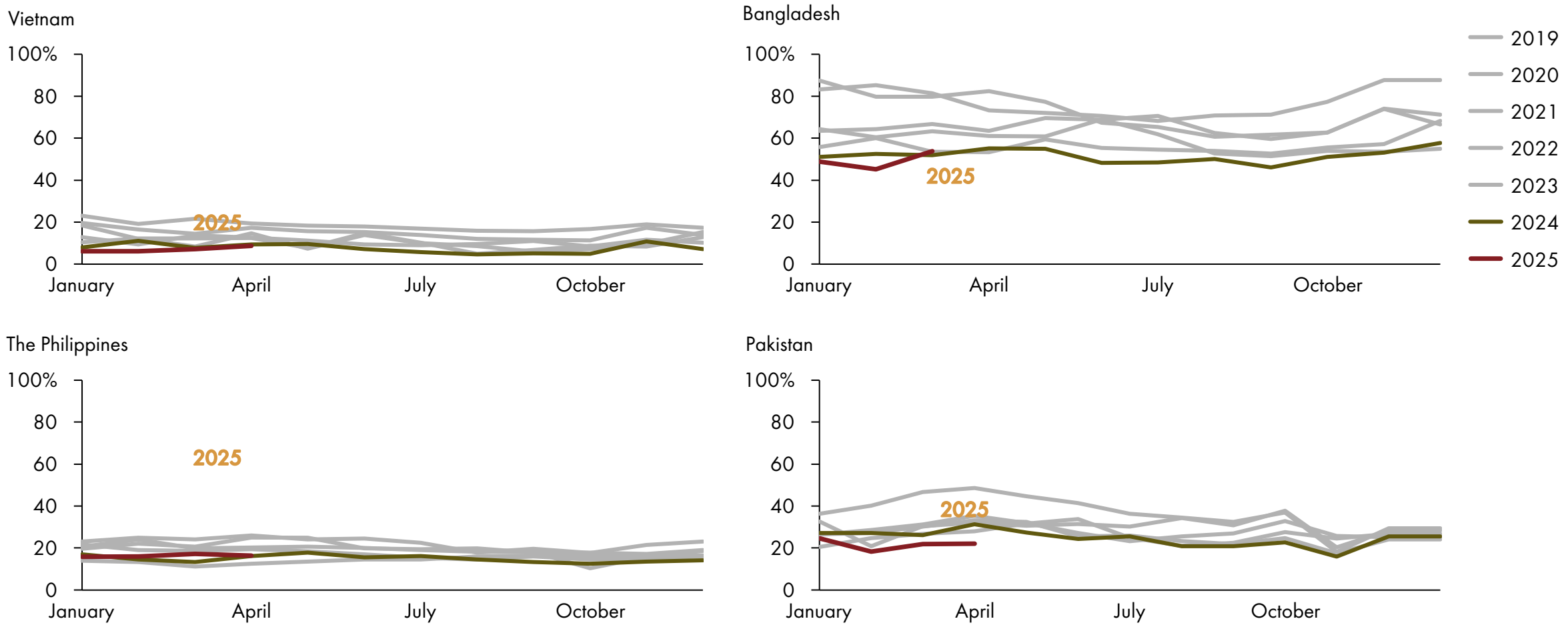



Only 3% of China and India's electricity comes from gas generation — and the share is not growing

Source: Ember (Accessed June 2025) *Electricity data explorer*

# Most other developing economies are using less gas for power than in previous years

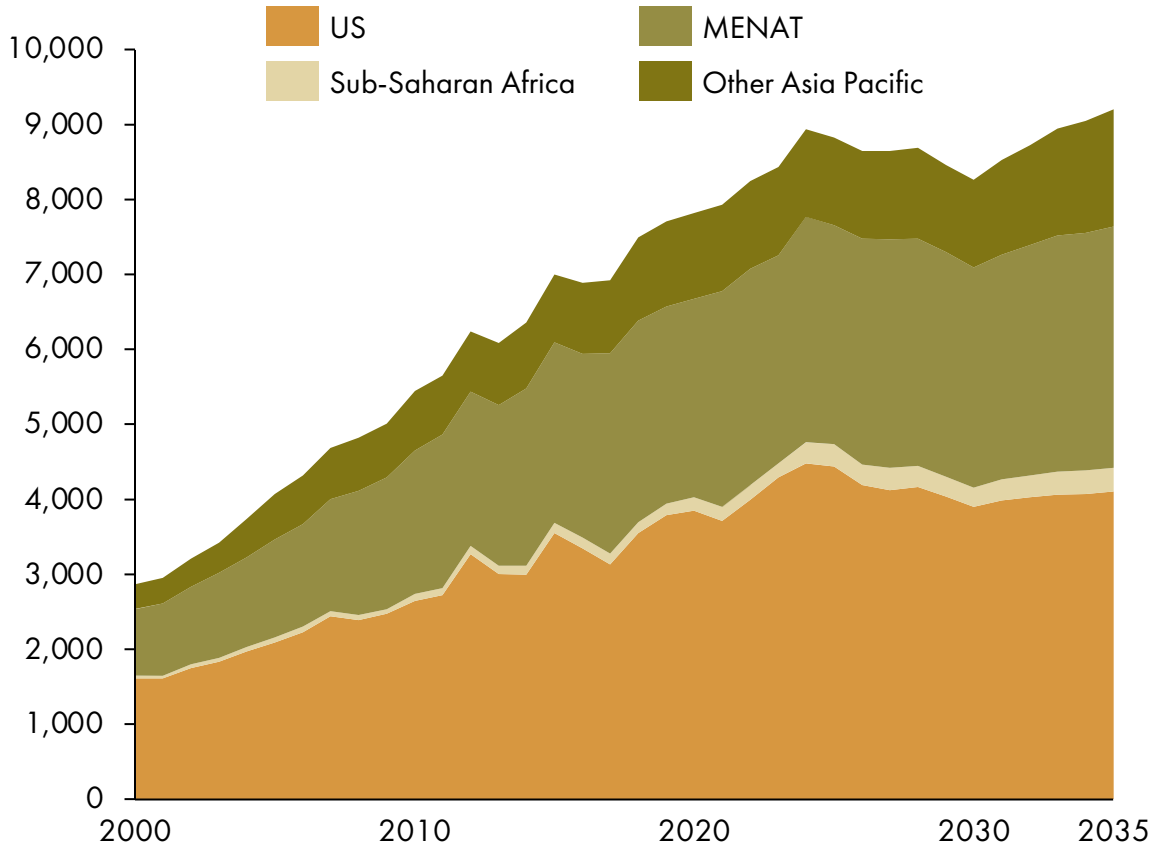
Share of electricity generation from gas by month [% share]



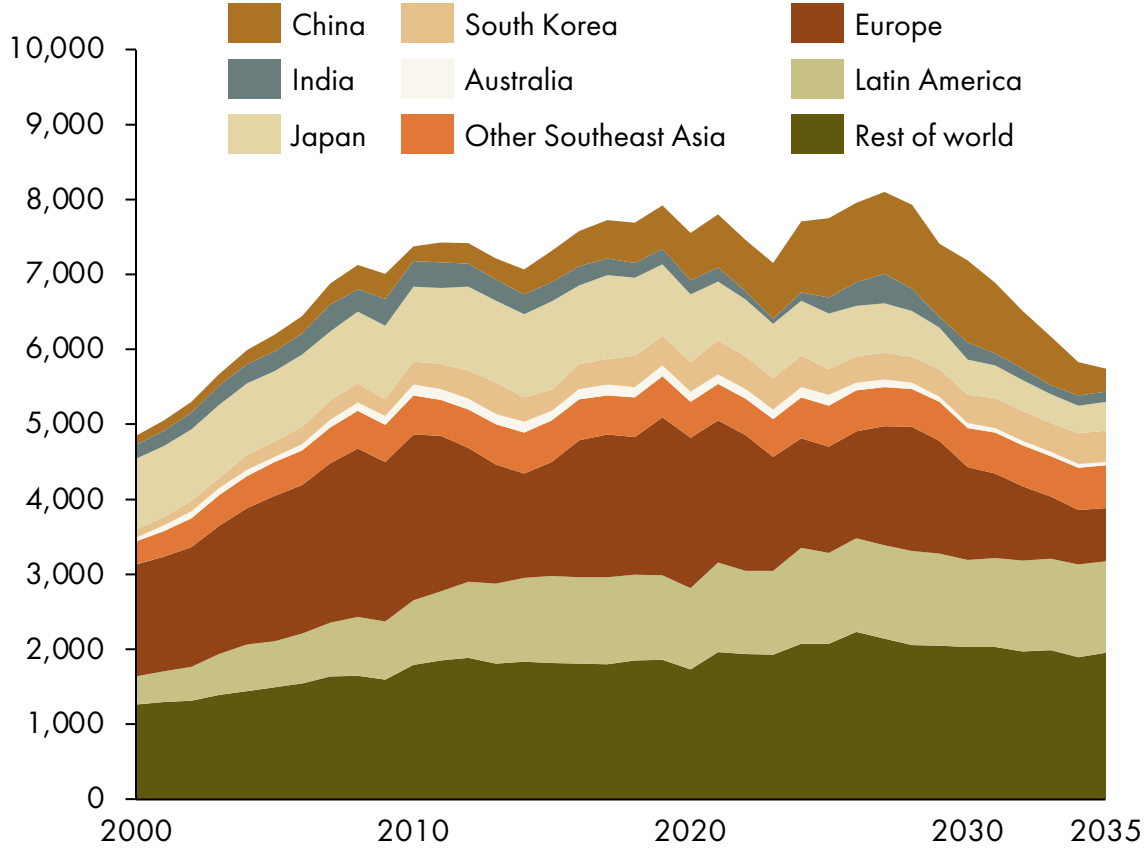

Source: *Ember Data Electricity Explorer*

# While gas for power is likely to increase in regions with cheap domestic production, in regions dependent on LNG it is flat or declines

Gas demand for power where domestic production is cheap and available, BNEF ETS regional gas projections [bcm]



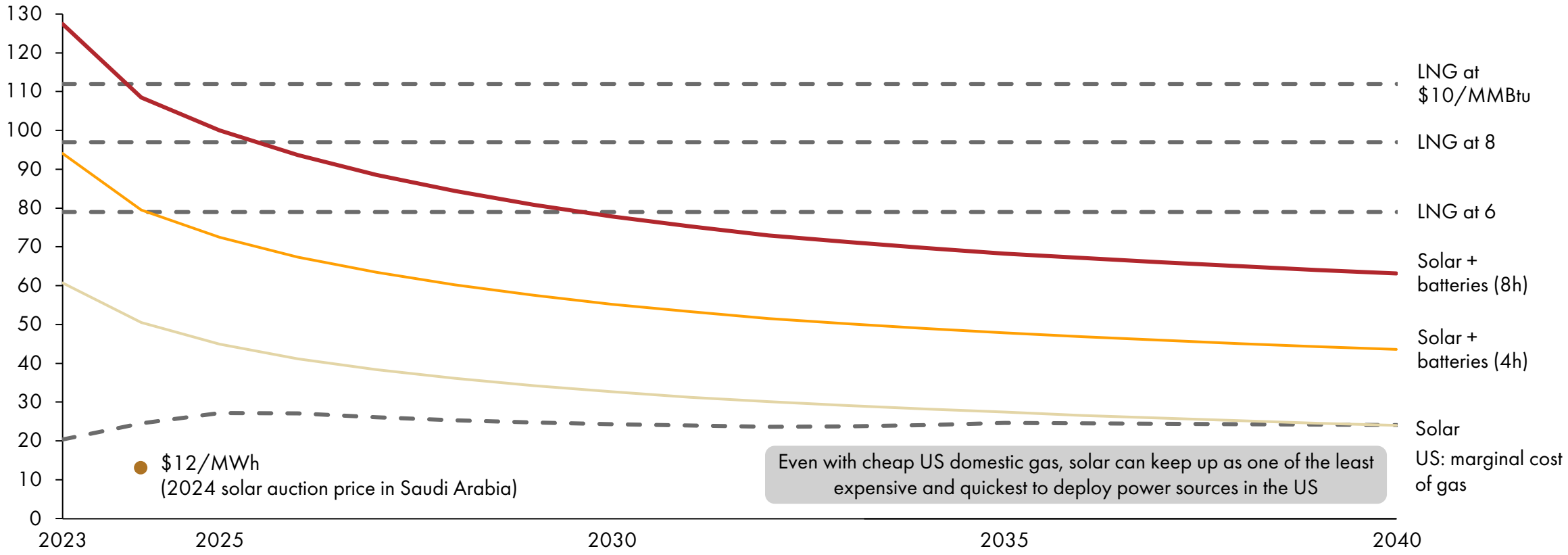

Gas demand for power where importing LNG is largely required, BNEF ETS regional gas projections [bcm]




Notes: BNEF Economic Transition Scenario provides a projection of what is likely to happen to gas demand under current trends and policies.
Source: BNEF (2025), *New Energy Outlook*

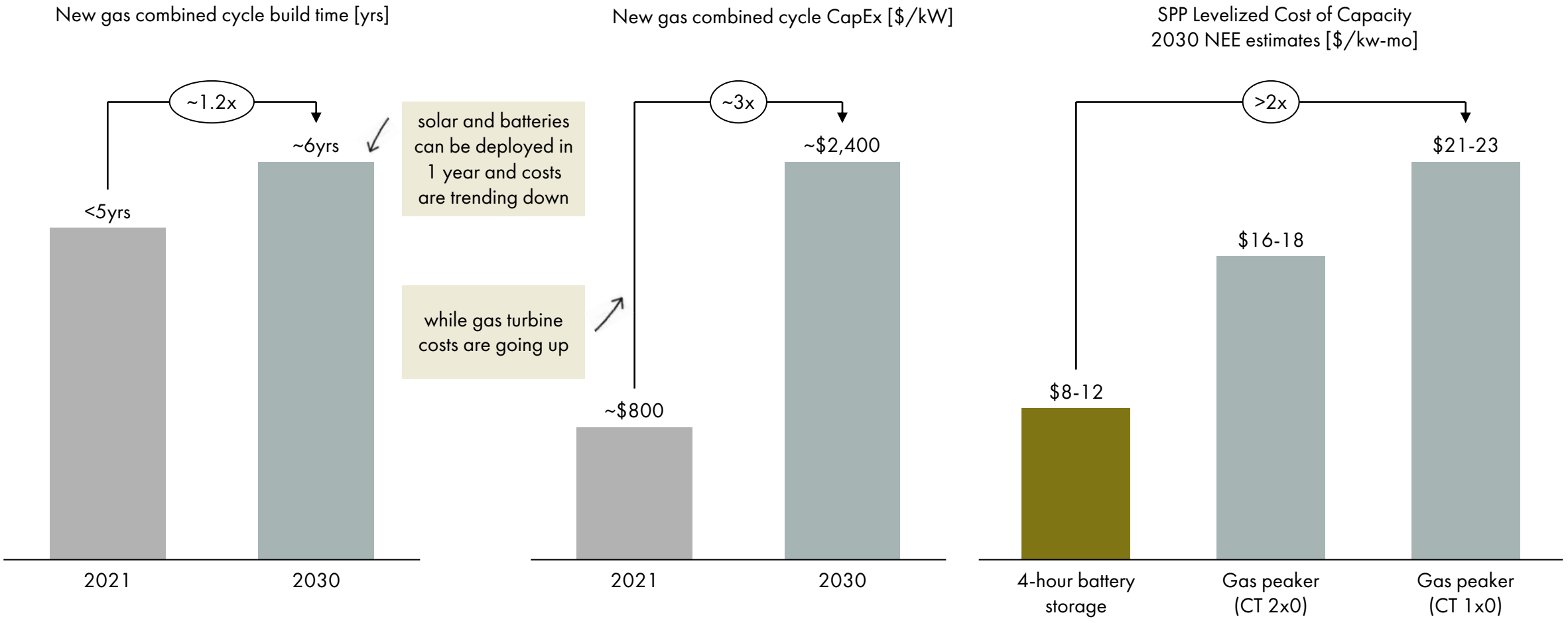
# As cost of solar and batteries continue to decline, gas for power is increasingly uncompetitive, especially in countries reliant on LNG

LNG far more expensive than solar and batteries [$/MWh]




Notes: RMI estimates at different gas prices per MMBTU. Estimates for solar based on Vietnam. Battery cost estimates for China.
Source: LNG prices from RMI (2024); Solar, solar + battery, CCGT from BNEF (2023), *LCOE 2H 2023;* RMI (2024) *Powering up the global south,* PV Magazine (2024), *Saudi Arabia's 3.7 GW solar tender attracts lowest bid of $0.0129/kWh*

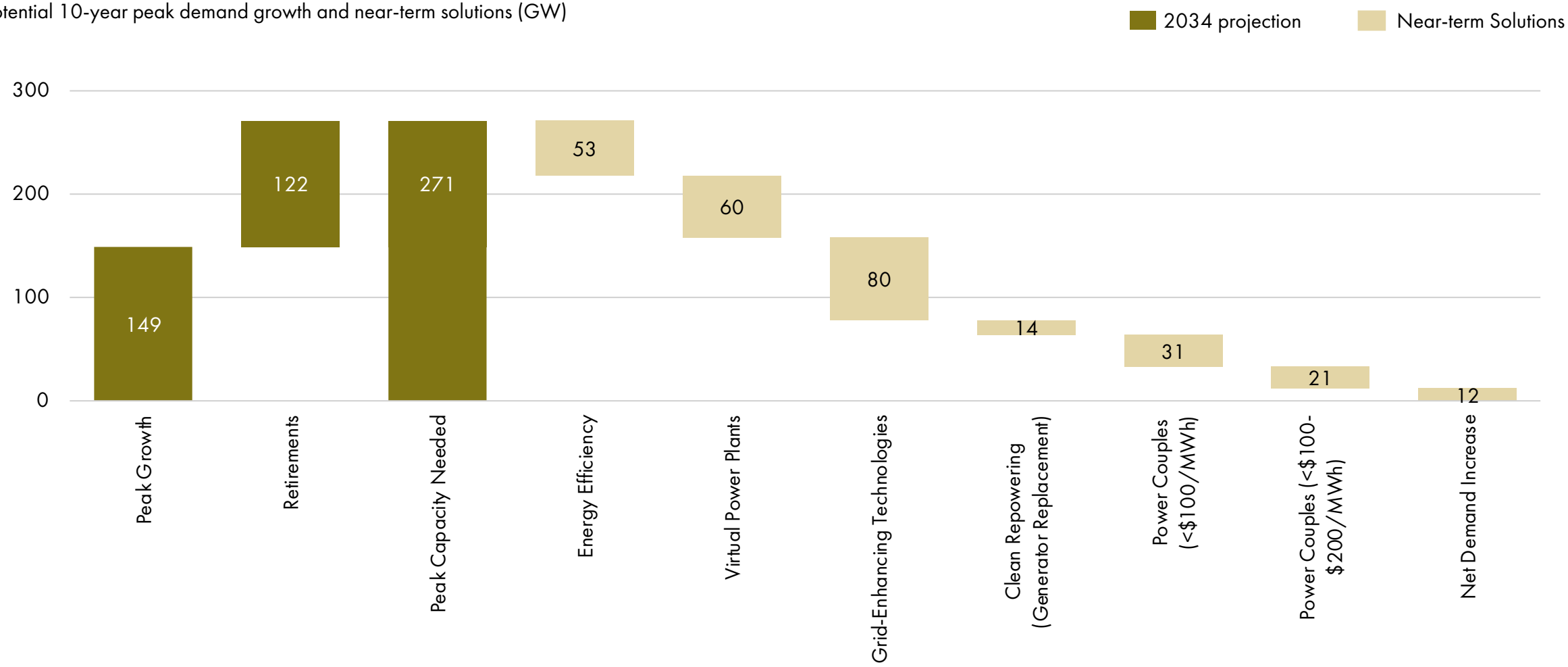
# Gas turbines are taking longer to deploy and are more expensive than solar and batteries in the US




Note: CT 2x0 and CT 1x0 refer to 2 or 1 combustion turbines and 0 steam turbines, common simple-cycle gas peaker configurations in the US.
Source: NextEra Energy 2025 March Investor Deck

# Beyond just renewables and storage, there are other clean, cost-effective solutions that can help meet rising electricity demand quickly

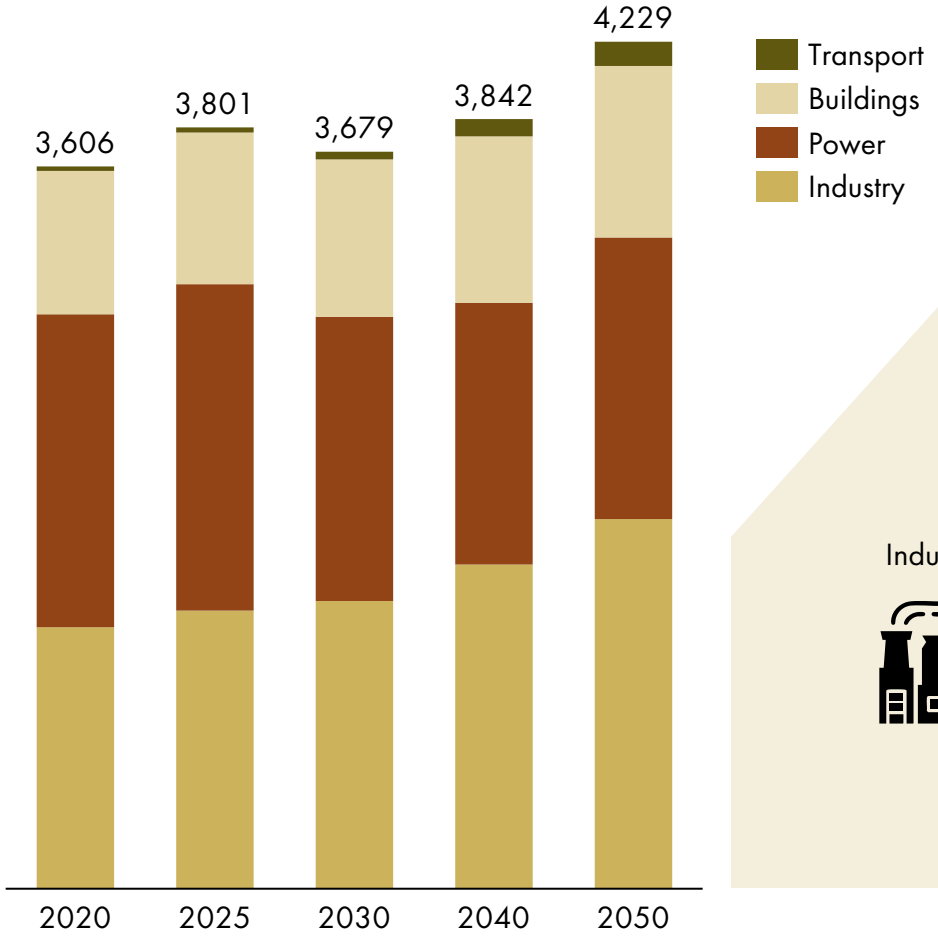
Potential 10-year peak demand growth and near-term solutions (GW)




Source: *2024 Long-Term Reliability Assessment* (NERC, Dec 2024); *A National Roadmap for Grid-Interactive Efficient Buildings* (DOE, May 2021); *Virtual Power Plants, Real Benefits* (RMI, Jan 2023); *Pathways to Commercial Liftoff: Innovative Grid Deployment* (DOE, Apr 2024); *Clean Repowering Opportunities by Plant* (RMI, Jan 2024); *How "Power Couples" Can Help the United States Win the Global AI Race* (RMI, Feb 2025)

# Chemicals, manufacturing and metals drive future industrial gas demand

Global gas demand by sector [bcm]




Industry

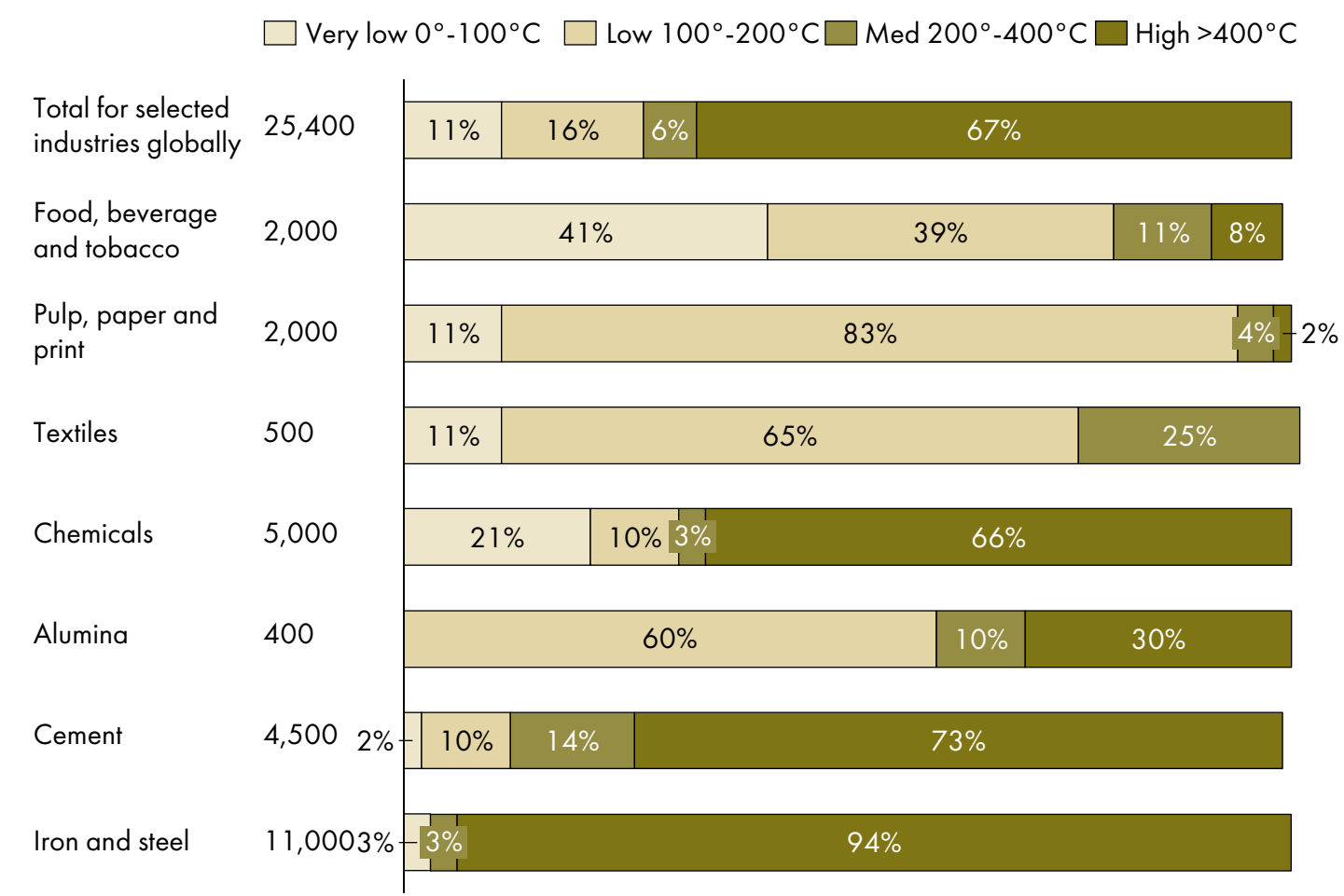
Use of gas in key industry sectors

| | | |
|---|---|---|
| Petrochemical and chemicals | ~40-45% | Gas is used as feedstock for producing chemicals like ammonia, methanol or hydrogen, as well as fertilizers and refining |
| Manufacturing | ~30-35% | Gas is used as a source of energy for process heating, powering industrial equipment, and sometimes as a raw material for producing products like glass, pulp and paper, textiles or ceramics |
| Steel and metals | ~20-25% | Gas is used as a fuel for furnaces in processes like melting, heating and annealing, as well as a reducing agent in direct reduction of iron (DRI) to produce steel |
| Other industries | ~5-10% | Gas is used at smaller scale in various industrial processes — such as pharmaceutical production, food processing, textiles and pulp and paper —and for precise heating, drying and other processes |

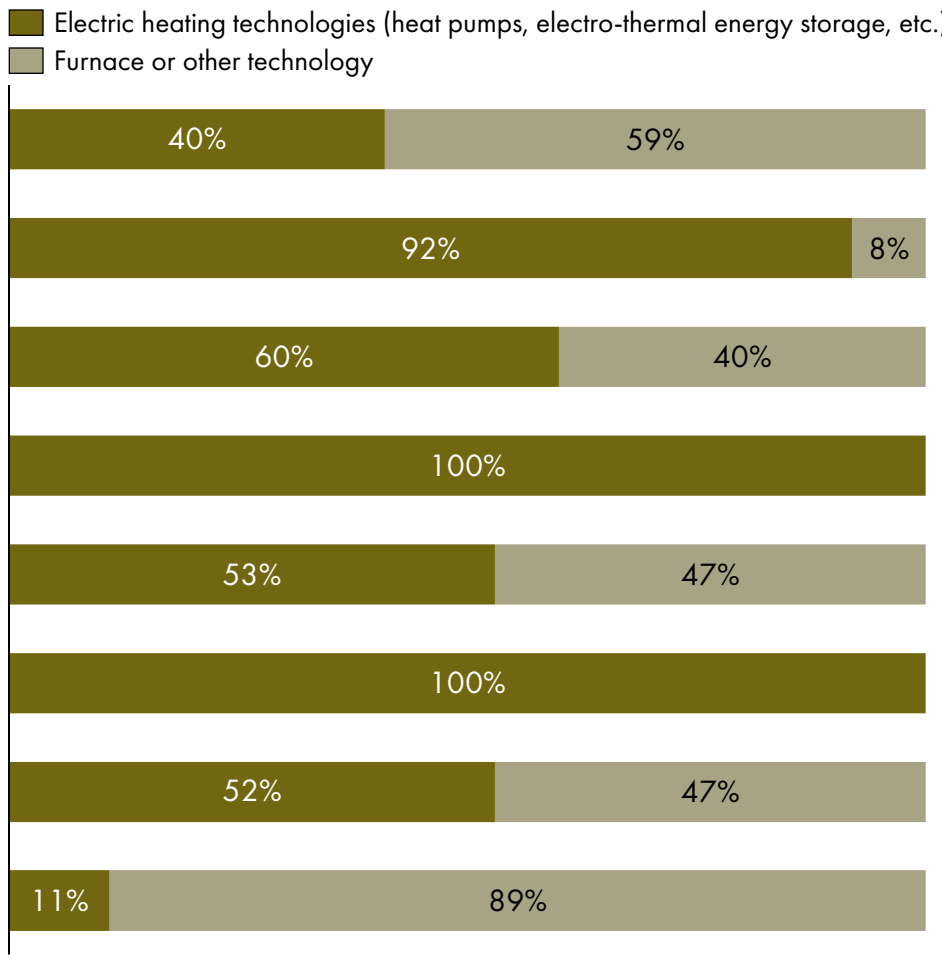
Source: Shell (2024), *Shell Energy Transition Strategy 2024;* International Council of Chemical Associations *(n.a.), 2022 Report;* U.S. Energy Information Administration (2022)

# Electrified heat could replace large portions of industrial gas heating, especially in the low-to-medium temperature heat applications

Global combustion energy usage in selected industries and heat range, 2030 [TWh/ year]



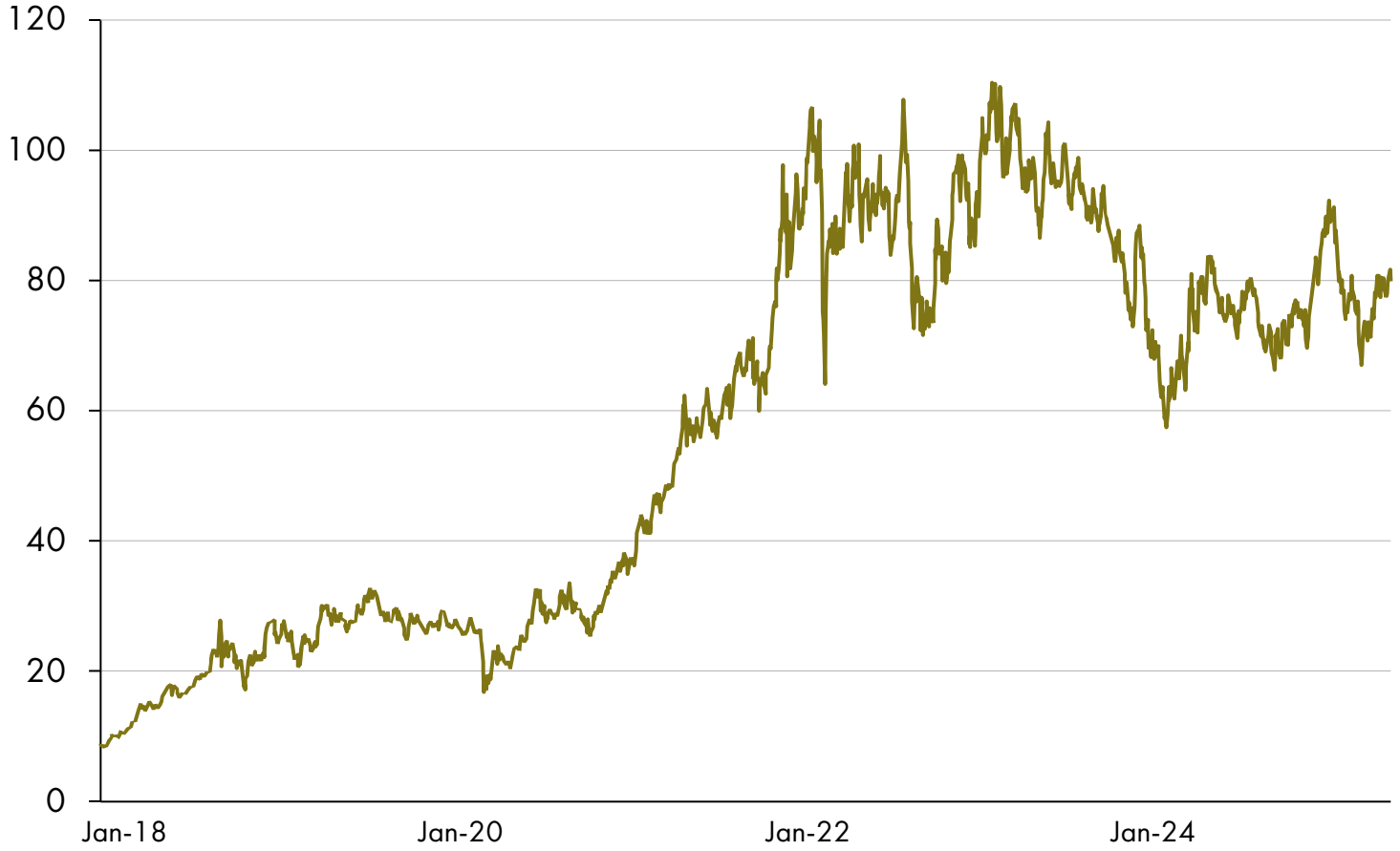

Global market potential for electric heating [% of market share]




Source: Systemiq (2023), *Catalysing the global opportunity for electrothermal energy storage*

# Sustained increases in carbon prices will make low carbon fuel options more viable

Cost per tonne of carbon dioxide produced under European Emissions Trading System [$/t]




EU carbon pricing is having global impact through implementation of Carbon Border Adjustment Mechanism

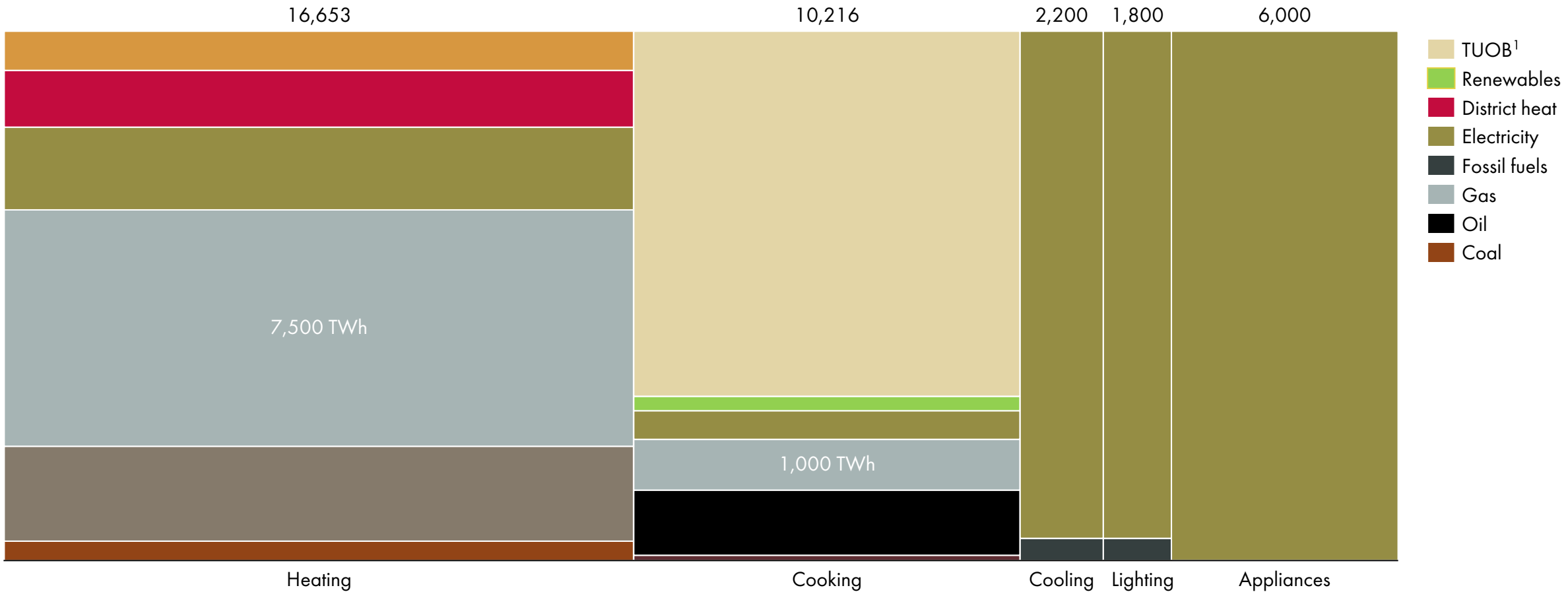
China, India, Turkey and others are strengthening their carbon pricing in response

At a carbon price of ~$100/tCO2, hydrogen at $2/kg becomes competitive

Notes: Converted Euro / Dollar using 1.1 conversion factor.
Source: Ember (2025) *European electricity prices and costs*

# A significant share of the energy consumption in buildings is for heating and cooking, with much of this met by gas

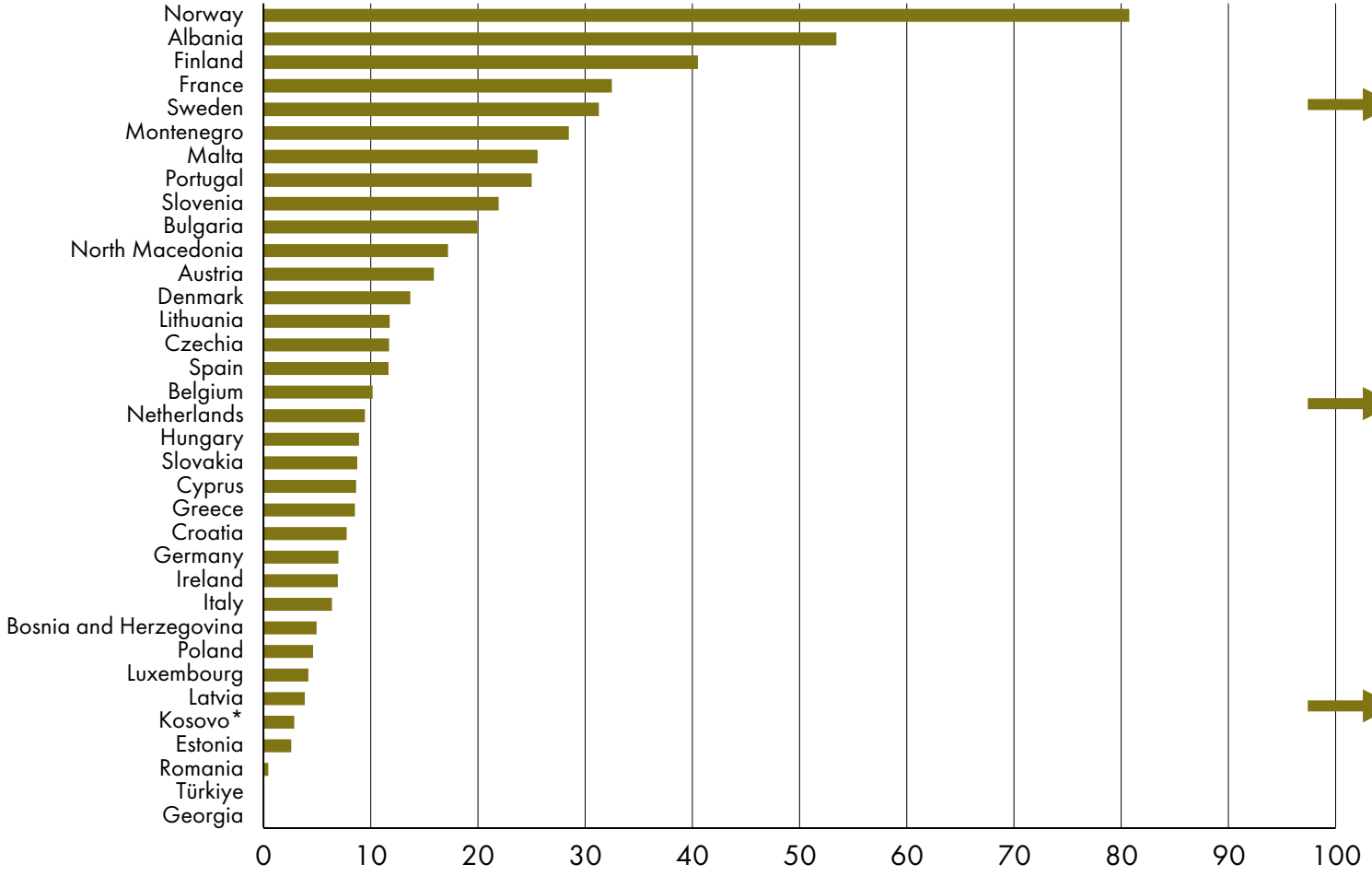
Global buildings operational energy use by end-use and fuel, 2022 [TWh]




Notes: [1]Traditional Use Of Biomass. Shares of building energy by end use from 2021 applied to 2022 actuals. Heating includes both space and water heating.
Source: IEA (2022), *World Energy Outlook 2021;* IEA (2023), *World Energy Outlook 2022,* accessed via ETC (2025), *Achieving Zero-Carbon Buildings: Electric, Efficient and Flexible*

# Where electricity is cheaper than gas, the uptake of heat pumps is higher, even in the coldest countries

Share of heat from renewable electricity and ambient heat for residential heating, EU 2023 [% of final energy consumption]




New residential heating systems installed in Germany must minimally use 65% renewable energy. Similar requirements have been put on the table in France, UK and Netherlands.

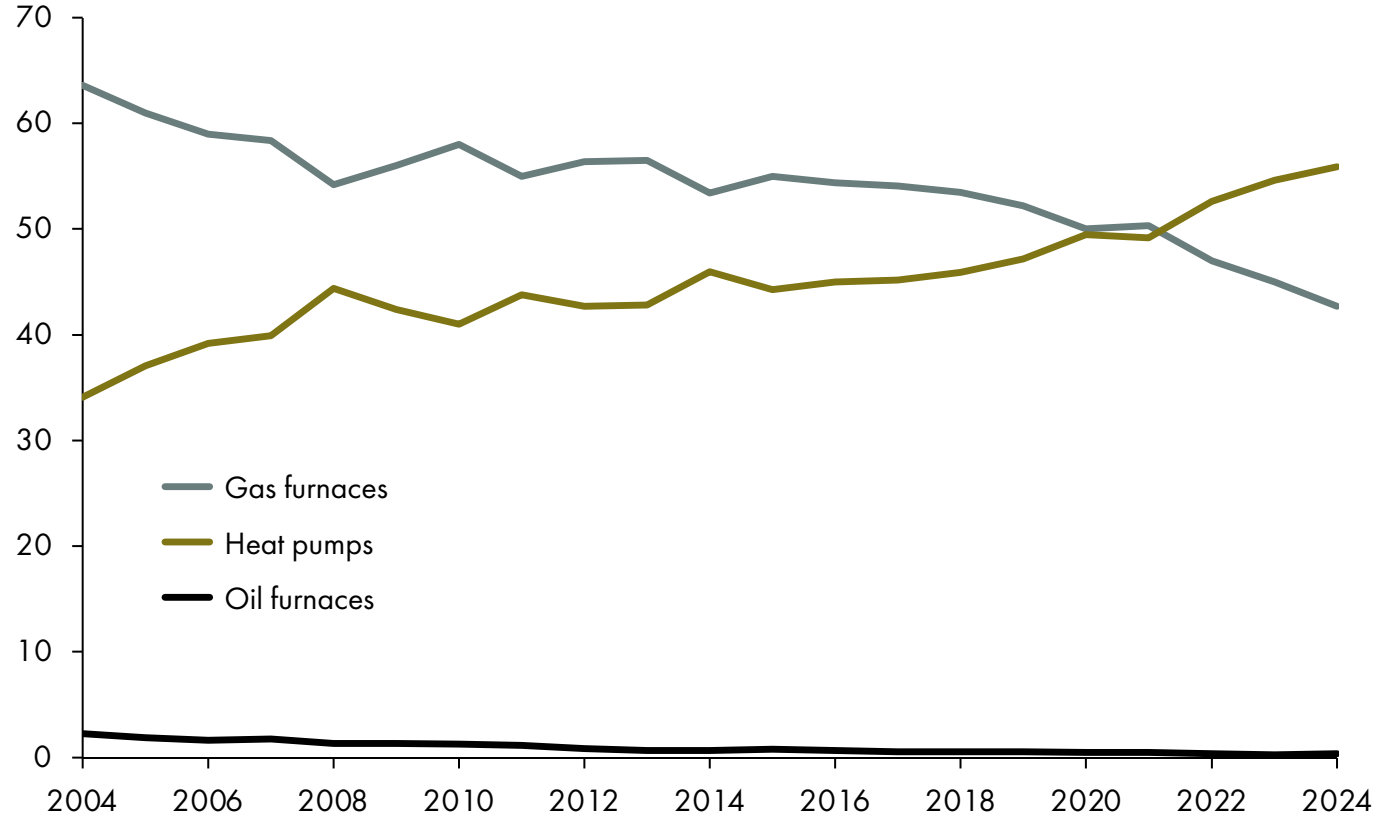
Starting 2025, EU Member States are prohibited from providing public subsidies for the installation of stand-alone fossil fuel boilers, following the EPB Directive

The EPB Directive targets a complete phase-out of fossil fuel boilers by 2040 across the European Union. Member States are obliged to set out measures to achieve this goal.

Notes: Excludes heat from district heating, some of which may be from electrified sources. EPB Directive = Energy Performance of Buildings Directive.
Source: Eurostat (accessed 2025), *Disaggregated final energy consumption in households*

# Even in the US where gas is cheaper than electricity, heat pumps are outselling gas boilers

Heat pumps now outsell gas furnaces in the US [share of sales (%)]



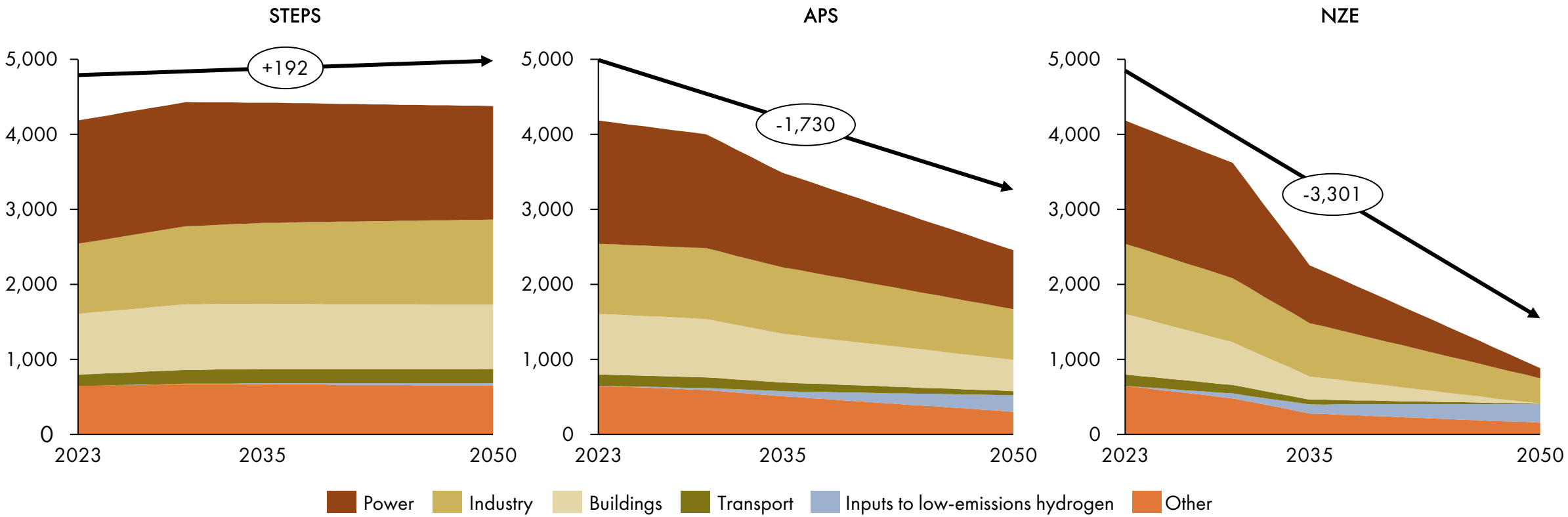

| 2024 | Industrial | Residential | Commercial |
|---|---|---|---|
| Gas price[1] ($/kWh) | 1.3 | 5.0 | 3.5 |
| Electricity price ($/kWh) | 8.2 | 16.5 | 12.9 |
| Ratio | 6.1 | 3.3 | 3.7 |

Heat pumps can provide two to four times more heat than the electricity they use, while gas furnaces waste energy by giving back less than they consume. In industrial use, new high-temperature heat pumps can reach about 200 °C, making them far more efficient than traditional gas boilers.

Notes: [1]Applied 291.1 kWh/ thousand cf gas conversion factor to $/cf prices.
Source: Ember (2025), *US Electricity 2025;* EIA (Accessed May 2025), *Natural Gas prices;* EIA (Accessed May 2025), *Electricity Data Browser*

# Future gas demand is uncertain — under current trends it could plateau; if announced policies are realized, demand could drop considerably

IEA Gas demand by sector and scenario, 2023-2050 [Mb/d]




If stated policies are not improved upon, 2050 gas demand may be higher than current levels

If announced net-zero pledges are realized, 2050 demand will be ~60% of today's levels

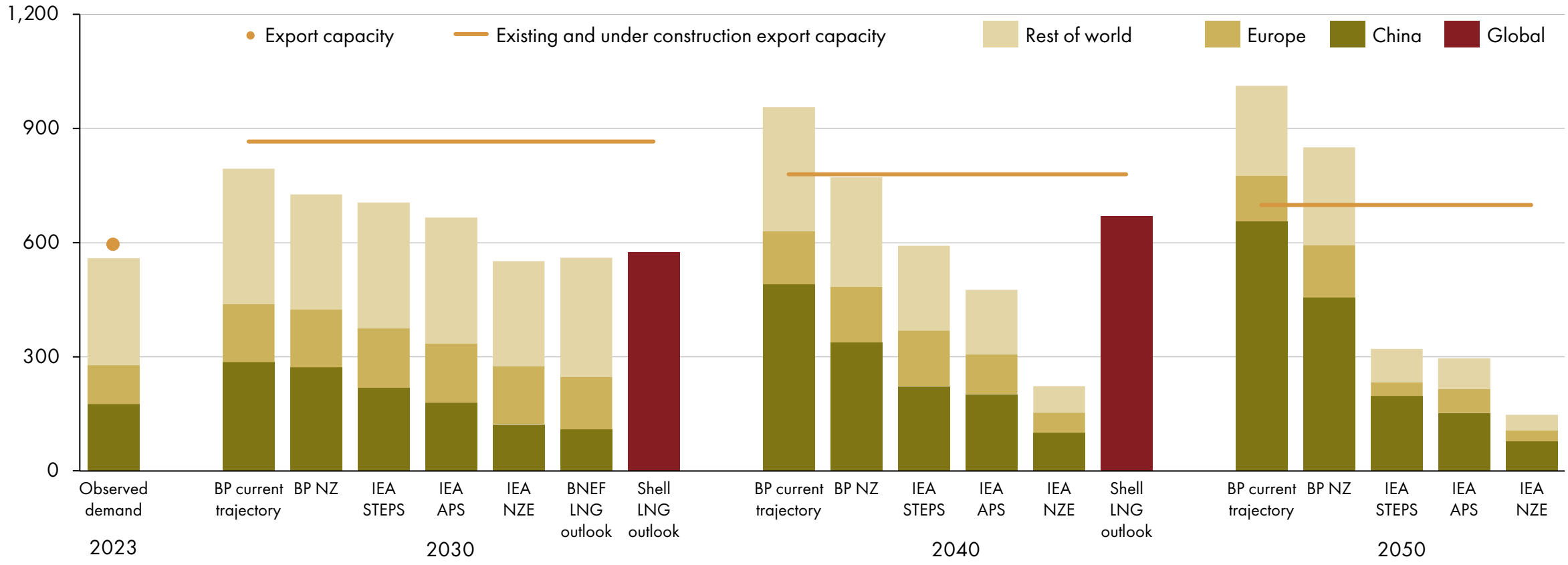
If warming is limited to 1.5°C consistent levels, over 75% of 2050 demand can be reduced

Notes: IEA STEPS scenario projects what will happen under current stated policies and trends; APS projects what will happen under all announced policies and net-zero commitments; NZS describes what needs to happen to limit warming to levels consistent with 1.5°C of warming.

Source: IEA (2024), *World Energy Outlook 2024*, License: CC BY 4.0

# There is a disconnect between anticipated LNG capacity and future gas demand- risking overcapacity and stranded LNG assets

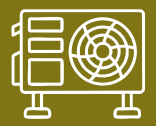
Projected LNG Demand and Export Capacity [bcm]




Notes: Shell LNG Outlook is not available in consistent data format; Historical data from IEA. Export capacity based on IEA estimates. Future export capacity includes only existing and under construction projects. New LNG export capacity primarily comes from the United States and Qatar.

Source: Chart modified from RFF (2025), *Global Energy Outlook 2025: Headwinds and tailwinds in the energy transition,* by adding in data from BNEF (2022) *Global LNG Market Outlook 2030,* Shell (2024), *LNG Outlook 2024*

# What does this mean for future gas demand?

| | |
|---|---|
|  | Overall: Uncertainties around future gas demand growth raise questions about the viability of plans for new gas production and LNG export facilities. |
|  | Gas for power will decrease more than expected. Gas turbines are becoming more expensive and taking longer to deliver. And the relentless decrease in cost and increase in availability of solar and batteries will increasingly outcompete gas for power. Investment in and modernization of grids will be critical to ensuring renewables are able to rapidly displace gas. |
|  | Gas for industry will likely rise. Electrified heat, especially in the low-to-medium temperature applications and effective carbon pricing, could cap the extent of this increase by displacing gas demand and by making low-carbon alternatives to gas more viable. |
|  | Gas for heat could decline faster than expected. Heat pumps are taking off across the globe and getting more efficient. If non-fossil boiler mandates or efforts are taken to rebalance gas and electricity prices, gas for heating could rapidly decline. |

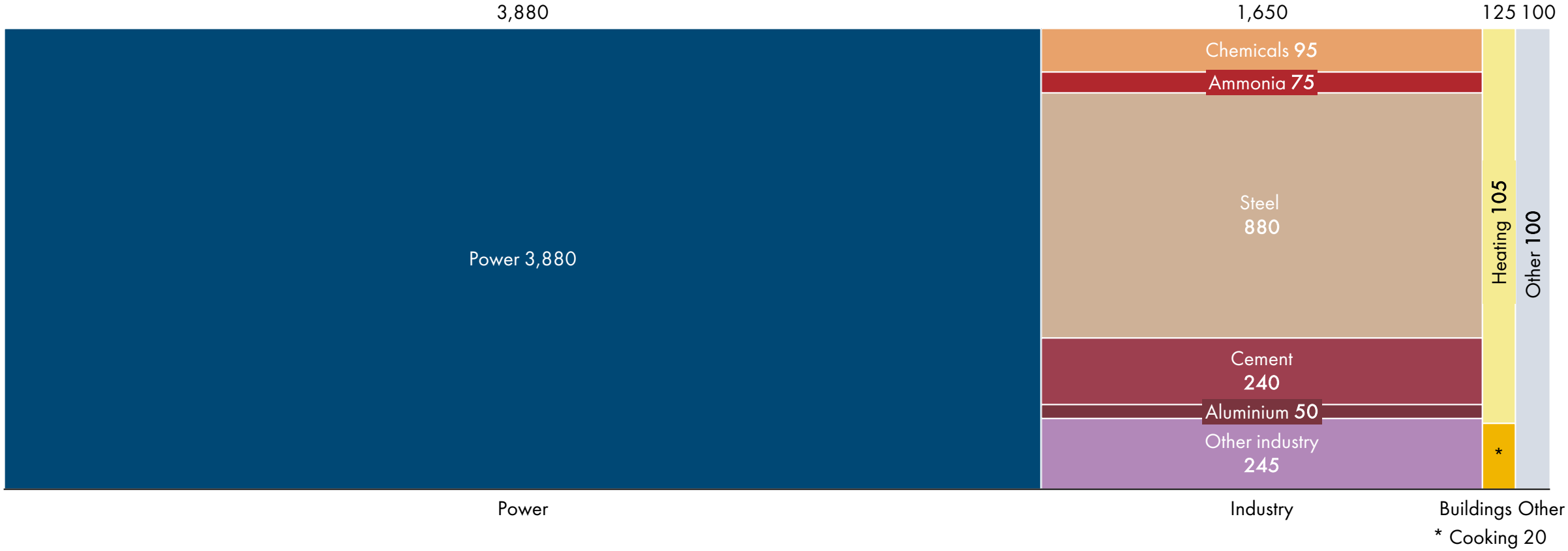
# Key questions

| | |
|---|---|
|  | Does the world really need gas for power given the falling costs of solar and batteries and thermal storage? What happens to gas demand if other nations start electrifying at the rate of China? |
|  | Do uncertainties around gas demand growth conflict with expansion plans for new gas production and export facilities? Is there a risk for LNG overcapacity? If so, what are the implications? |
|  | What happens if other geographies replicate the EU regulatory pathway? When will carbon price strengthening (incl. Carbon Border Adjustment Mechanisms) materially limit unabated industrial gas use? |
|  | What happens if the timelines for new gas turbines does not improve in the next few years? |

# Coal demand

# Around two thirds of coal is consumed to generate electricity, with heavy industries using up much of the rest

Sectoral breakdown of coal consumption for 2022 [Mtce]



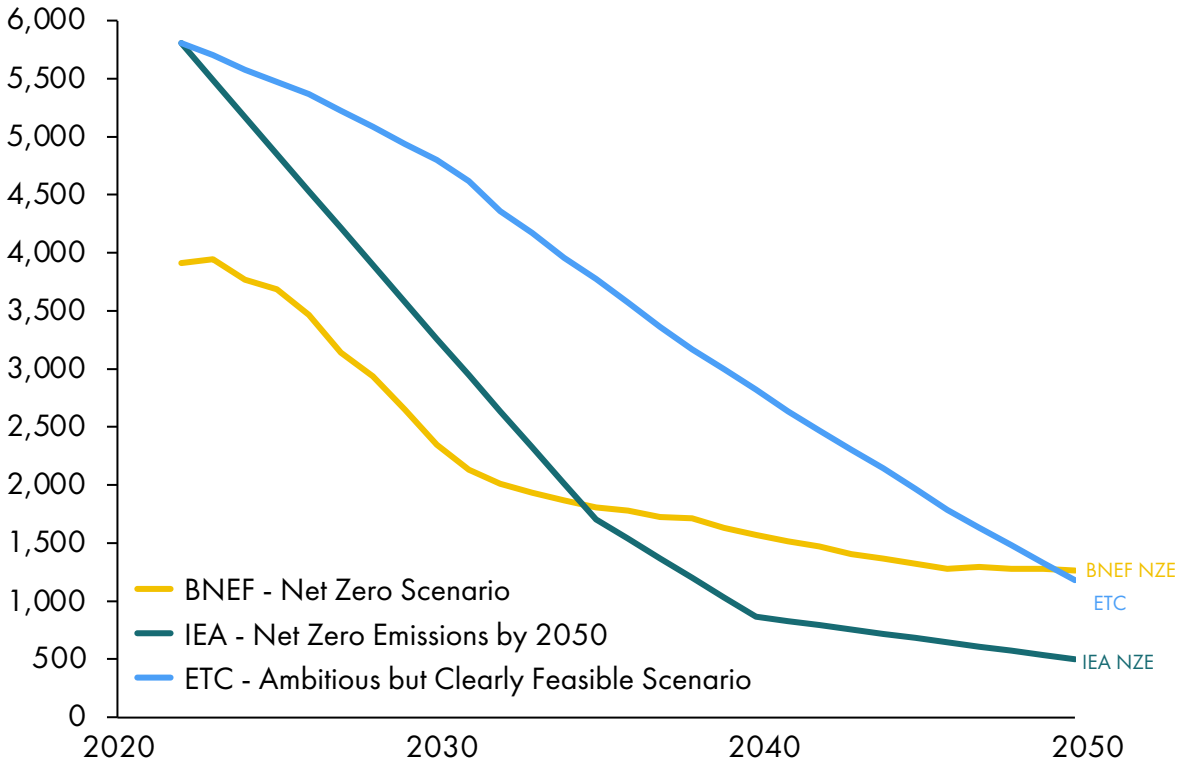

Allocating energy transformation and hydrogen to final energy end-uses

Notes: Final Energy Demand showed, units for coal consumption are shown in million tons of coal equivalent, with 1 EJ = 34.12 Mtce, and is a unit of energy that accounts for the various coal grades used in end-use applications. Another frequently used unit is the volumetric million tons of coal, with 1 EJ = 49.1 Mt, which results in ~8,400 Mt of coal being used today.

Source: Chart *from ETC Fossil Fuels in Transition* (2023), data from BNEF (2023), *New Energy Outlook 2022;* IEA (2022), *World Energy Outlook 2022.*

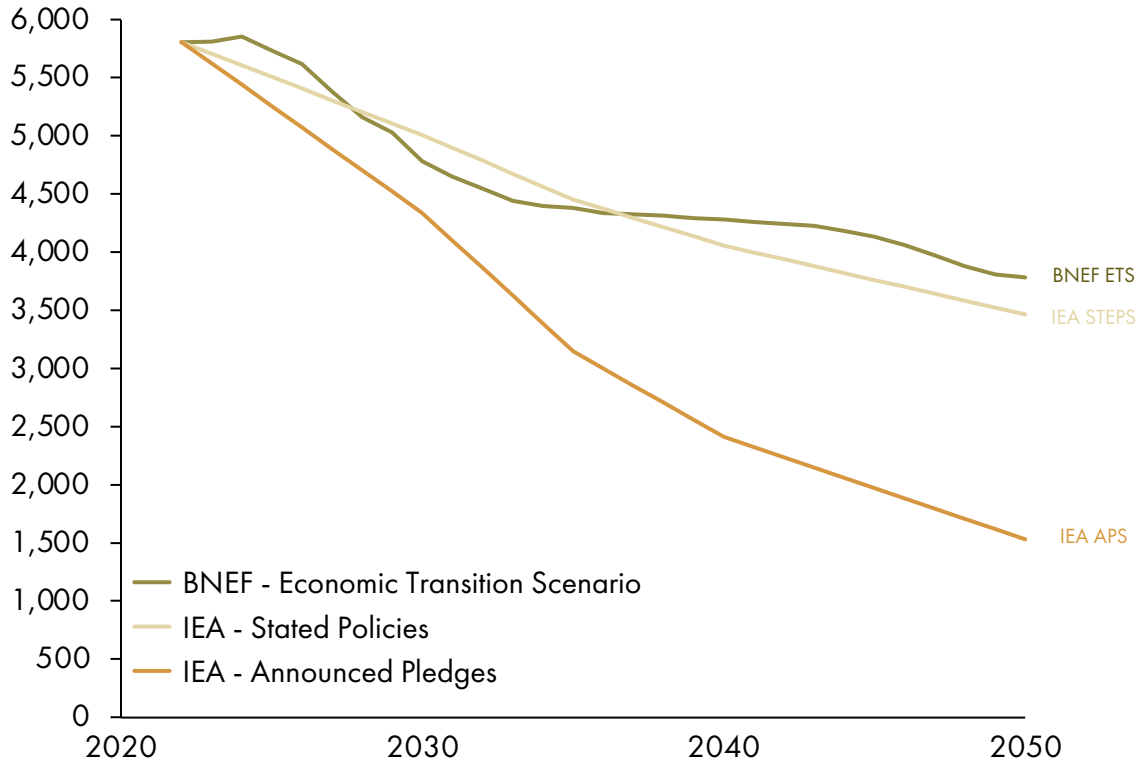
# The transition away from coal power to cleaner alternatives is clear; the question is only over the pace of the transition

Global net-zero coal demand trajectories [Mtce]




**Net-zero scenarios** describe desired or ideal future outcomes (e.g., net-zero by 2050) and outline pathways to achieve them

Global current trends coal demand trajectories [Mtce]



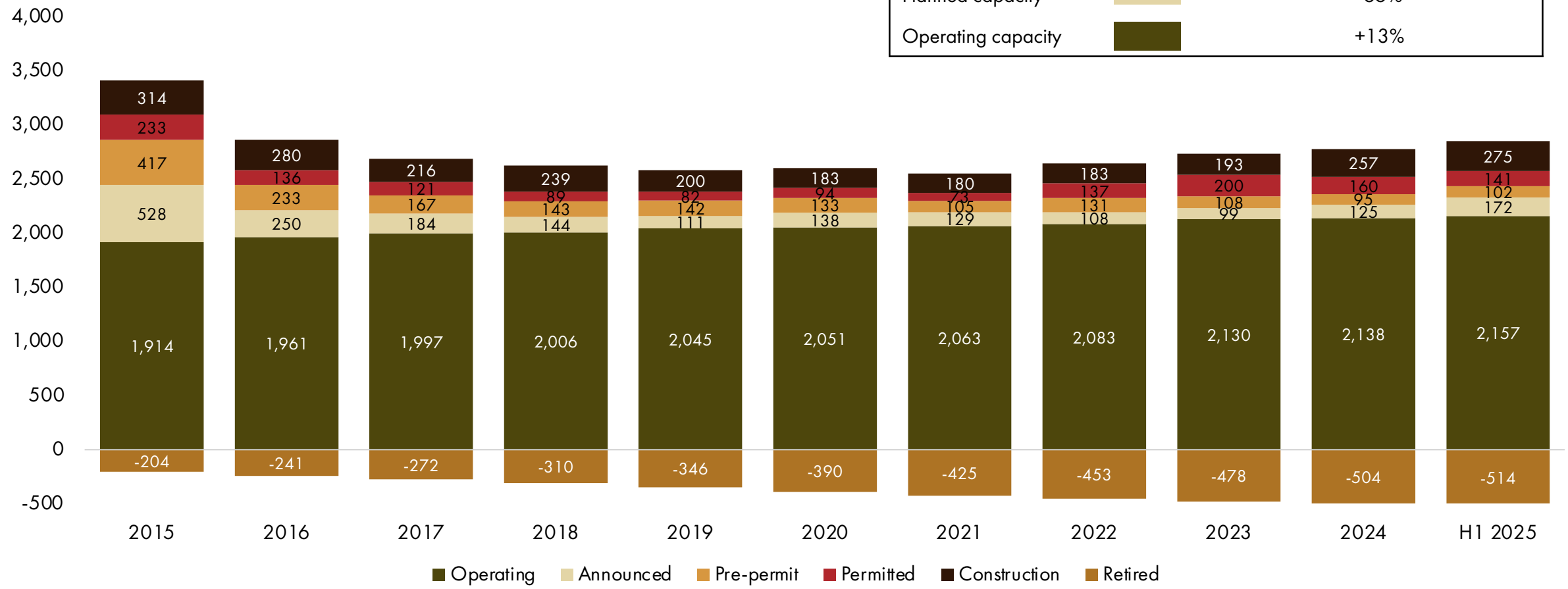

**Current trends scenarios** reflect projections of future developments based on current trends, technologies and policies

Note: 2022 values for all scenarios fixed using the IEA's 2022 data. Only BNEF data is on year-on-year basis, e.g. Other data points are decade to decade and interpolated. BNEF ETS coal converted to Mtce from 6,000kcal/kg.
Source: ETC (2023), Fossil Fuels in Transition; BNEF (2025), New Energy Outlook 2025; IEA (2024), World Energy Outlook 2024

# Coal power generation capacity growth has stagnated, and planned capacity has declined by 65% in the past decade

Global coal power generation capacity [GW]

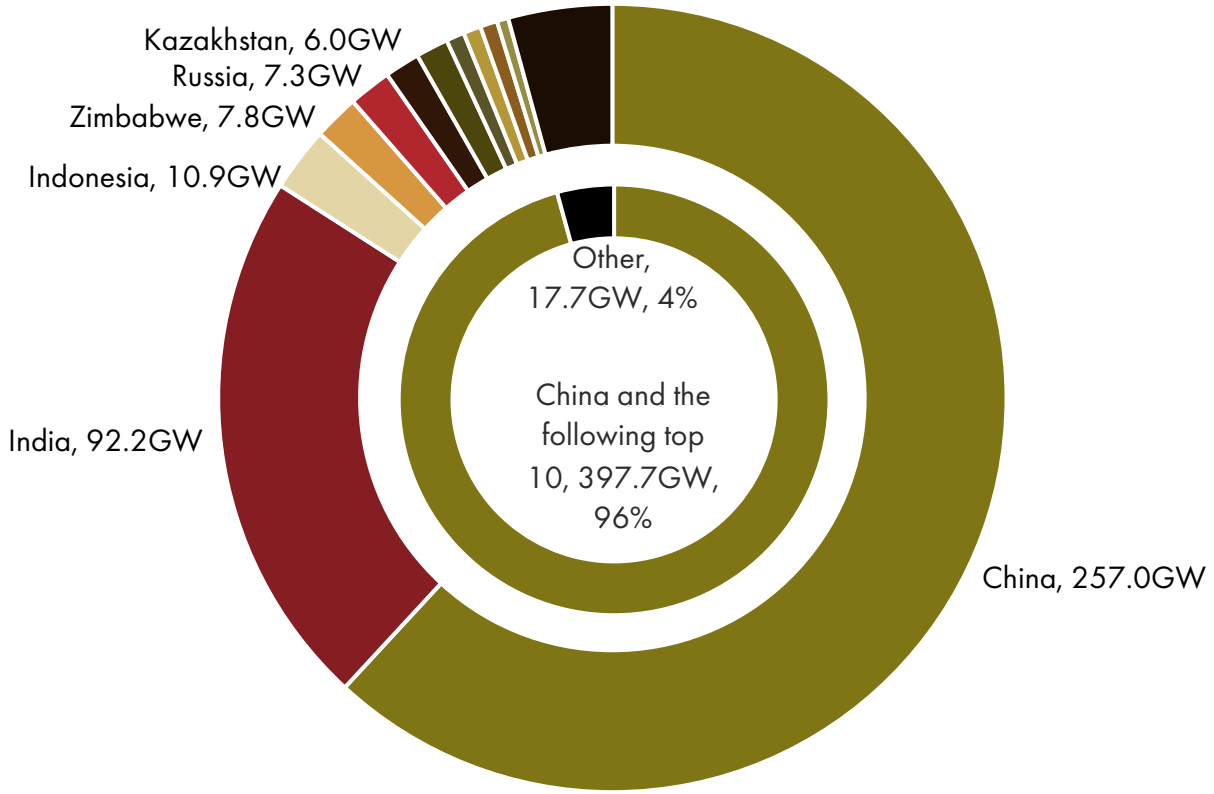
| Category | Change 2015 – H1/2025 |
|---|---|
| Planned capacity | -65% |
| Operating capacity | +13% |




Note: Planned capacity includes 'Announced', 'Pre-permit', and 'Permitted' phases.
Source: E3G analysis of Global Energy Monitor Global Coal Plant Tracker dataset, as of July 2025

# Just 10 countries make up 96% of planned coal power capacity; China and India represent a combined 84%

Pre-construction coal power capacity still under development globally as of July 2025 [GW]





Based on a recent survey[1] of 1400+ business leaders (103 from India and 105 from Indonesia), business leaders are calling for a transition to fossil-free power generation in the next decade

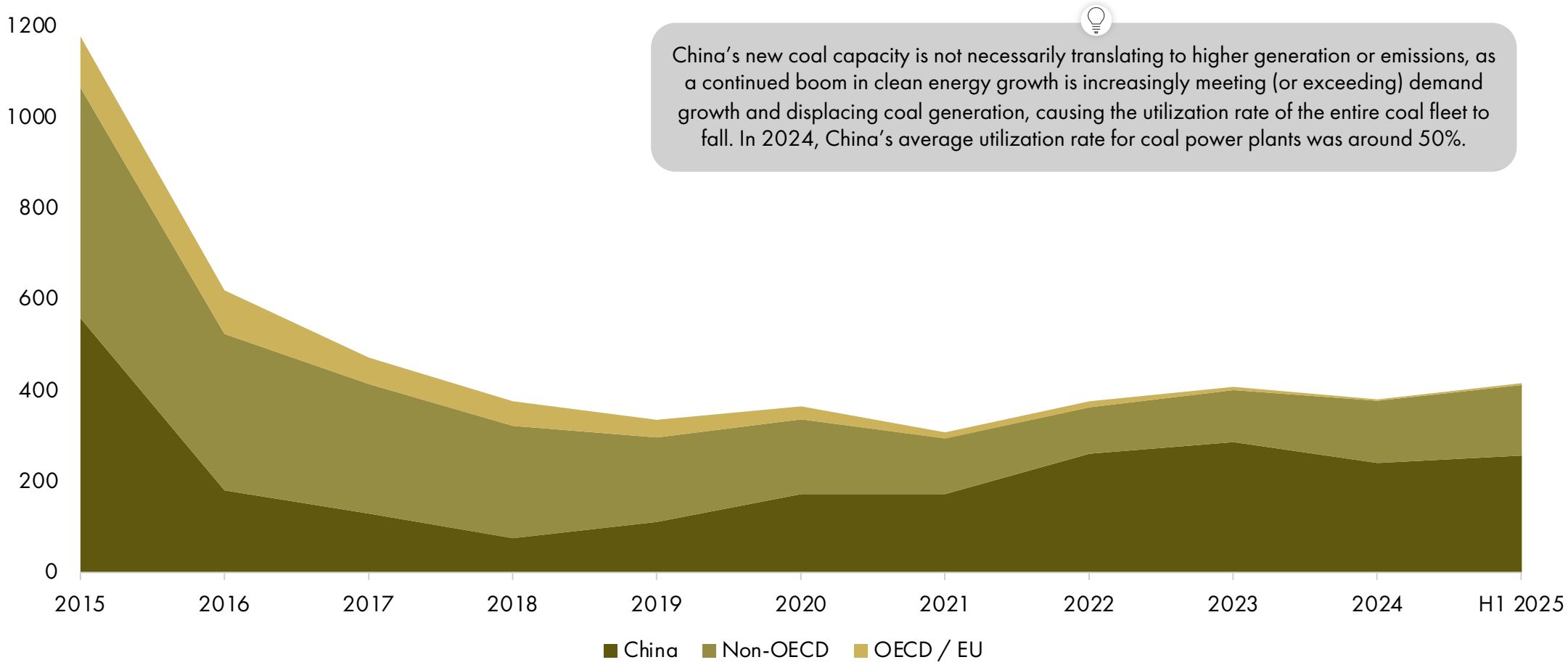
In India, 99% of senior executives surveyed support a transition from fossil fuels to renewables-based electricity generation, with most (84%) wanting such a move within the next decade

Nearly nine in ten (88%) of Indonesian business leaders polled want to see the country's electricity supply shift toward renewables and away from coal and other fossil fuels by 2035

Notes:Countries ranked after Kazakhstan and their capacities: Bangladesh (5.6GW; Laos 3.1GW; Mongolia 3.0GW; The Philippines 2.9GW).
Source: E3G analysis of Global Energy Monitor Global Coal Plant Tracker dataset, as of July 2025. 1. Business survey by E3G, Beyond Fossil Fuels and WMBC (2025) *Global Business Poll: Powering Up*.

# While China's share of global planned coal capacity is over 60%, its coal fleet is not running at full capacity

Planned coal power generation capacity [GW]

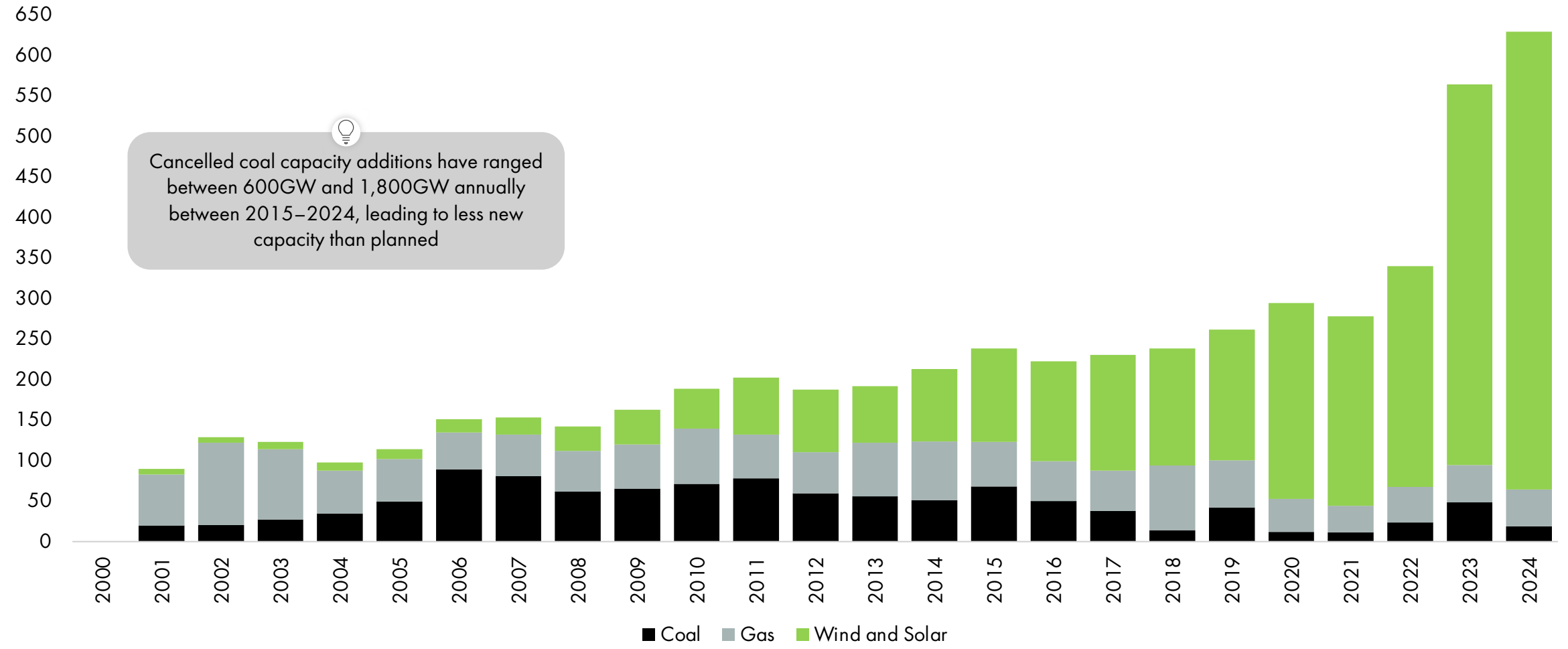



China's new coal capacity is not necessarily translating to higher generation or emissions, as a continued boom in clean energy growth is increasingly meeting (or exceeding) demand growth and displacing coal generation, causing the utilization rate of the entire coal fleet to fall. In 2024, China's average utilization rate for coal power plants was around 50%.

Note: Planned capacity includes 'Announced', 'Pre-permit', and 'Permitted' capacity.
Source: E3G analysis of Global Energy Monitor Global Coal Plant Tracker dataset, as of July 2025. China's average utilization rate comes from CarbonBrief (2025): *Why China is still building new coal – and when it might stop.*

# Coal accounted for just 3% of total new global electricity generation capacity in 2024, while wind and solar made up over 90%

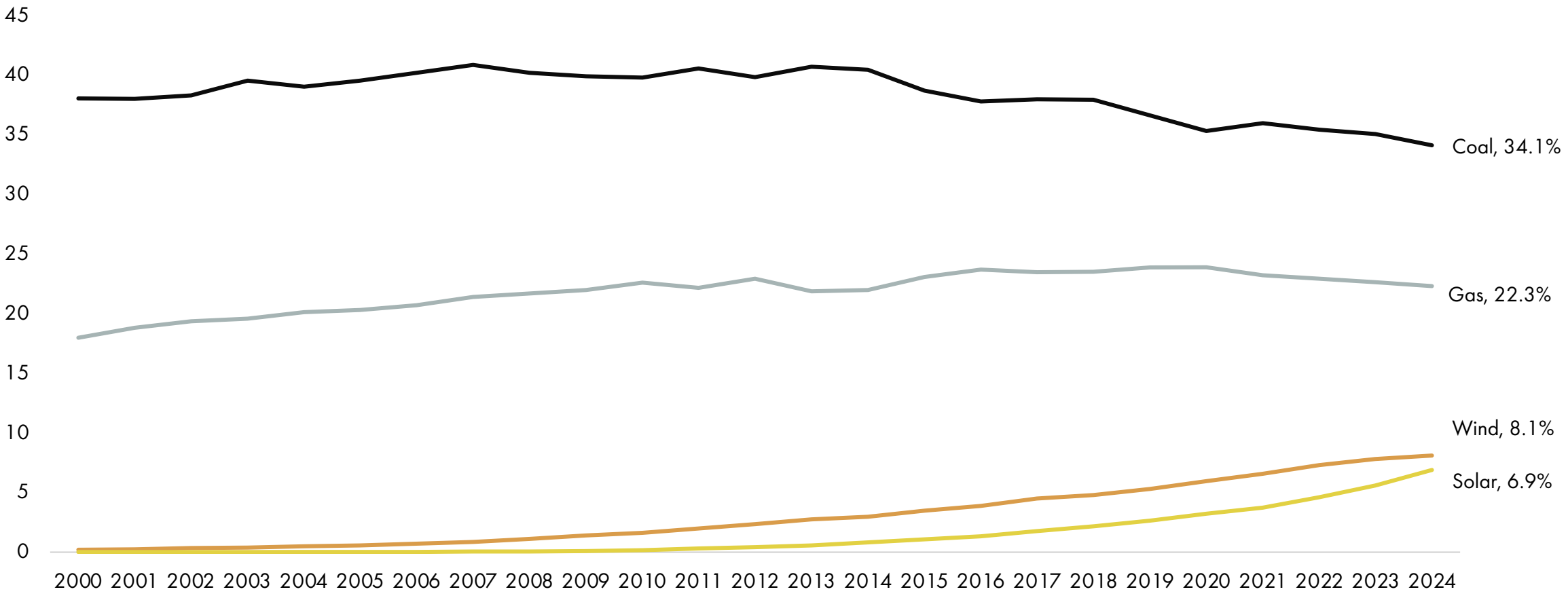
Newly added global power generation capacity [GW]




Source: E3G analysis of Global Energy Monitor Global Coal Plant Tracker dataset, as of July 2025

# Wind and solar are increasingly replacing coal in electricity generation globally

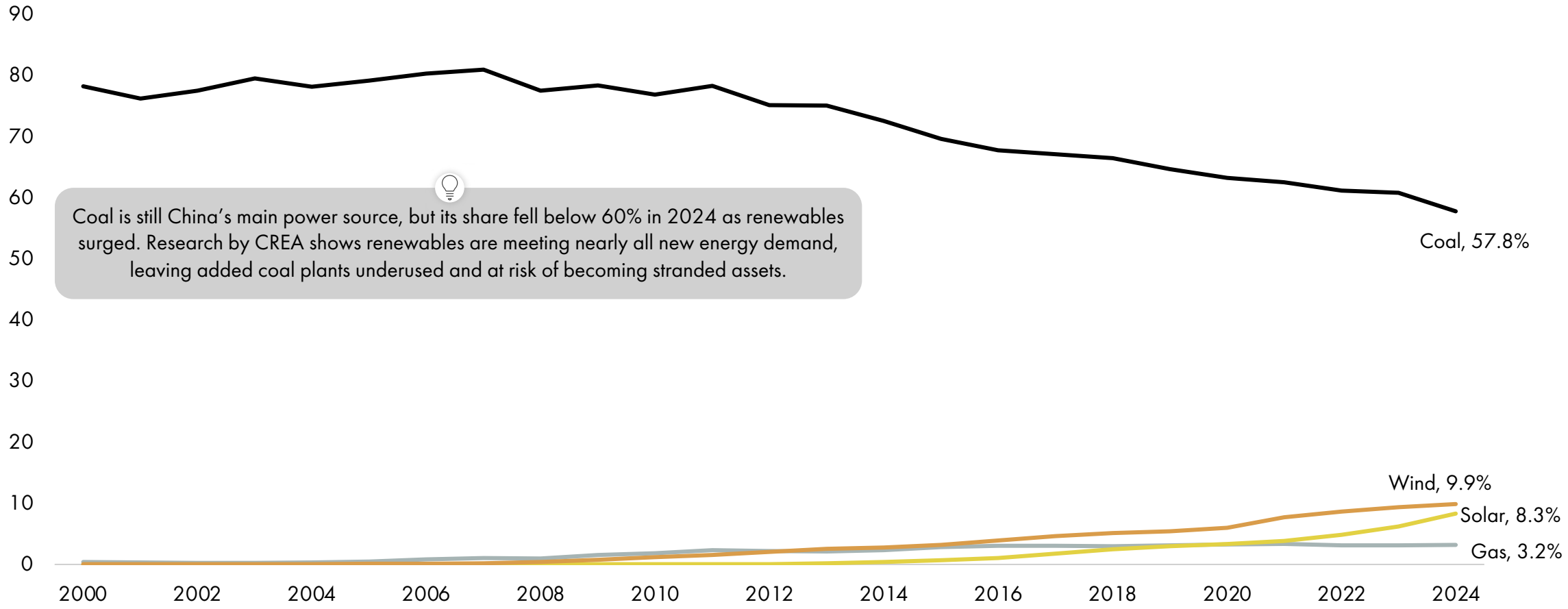
Share of global electricity generation by source (%)




Source: Ember Yeary Electricity Data

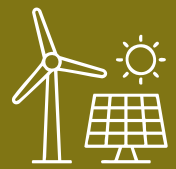
# In China, the decline of coal in electricity generation is even steeper than globally due to higher rates of wind and solar power generation

Share electricity generation by source in China (%)




Source: E3G analysis of Global Energy Monitor Global Coal Plant Tracker dataset, as of July 2025. CREA research published in CarbonBrief (2025): *Why China is still building new coal – and when it might stop.*

# What does this mean for future coal power demand?

| | |
|---|---|
|  | Coal's share of global power generation is slated to decline. New coal power capacity additions have dwindled, whereas renewables contribute the vast majority of both new capacity additions and new power generation. |
|  | Coal power becomes a solution for only a few economies, and even there, its future is smoggy. With almost all global planned capacity in China and India, future demand is centered in regions where solar and batteries are well-placed to respond to growing electricity demand. |
|  | Businesses are aiming to phase out coal power. A clear majority of businesses want governments to phase out coal for power and replace it exclusively with renewables, grids and storage, without locking in new gas infrastructure. |
|  | New coal plants risk low utilization rates and early retirement as clean energy expands. In places where renewables already meet much of the demand, coal fleets are increasingly operating at low capacity and could become stranded assets. Where solar and wind outpace electricity demand growth, these plants are likely to remain underused and financially unsustainable. |

# Key questions

| | |
|---|---|
|  | The direction is clear, and the question remains only over pace: When will we see the last coal power plant inaugurated? And when will coal's share of total global electricity generation fall below 20%, 10% and 5%? |
|  | How do we manage a just transition in regions where coal workers are at risk of losing their jobs due to the accelerating transition to renewables-based electricity systems? What are the future industries, clean tech or other, where these people should be reskilled? |
|  | How should coal power companies prepare for the risk of stranded assets? |

# Annex

# Acknowledgements


## ABOUT THE CONTRIBUTORS

**This analysis was led, designed and prepared by:** Molly Walton and Santeri Palomäki (We Mean Business Coalition); Shane O'Çonnor and Mike Hemsley (Energy Transitions Commission); Dave Jones and Kostantsa Rangelova (Ember); and Charlotte Liebrecht and Samora Levy (E3G).

**Communications for this work was led by:** Kristen King and Brandon Pytel (We Mean Business Coalition); Caroline Randle and Shane O'Çonnor (Energy Transitions Commission); Rashmi Mishra (Ember); and Nesta Smith (E3G).

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## ABOUT THE PARTNERS

**We Mean Business Coalition** works with the world's most influential businesses to take action on climate change. The Coalition is a group of seven nonprofit organizations: BSR, CDP, Ceres, Climate Group, CLG Europe, The B Team and WBCSD. Together, we catalyze business and policy action to halve emissions by 2030 and accelerate an inclusive transition to a net-zero economy.

**ETC (Energy Transitions Commission)** is a global coalition of leaders from across the energy landscape committed to achieving net-zero emissions by mid-century, in line with the Paris climate objective of limiting global warming to well below 2°C and ideally to 1.5°C.

**Ember** is an independent energy think tank that uses data and policy to accelerate the clean energy transition. It creates targeted data insights to advance policies that urgently shift the world to a clean, electrified energy future.

**E3G** is an independent climate change think tank with a global outlook. We work on the frontier of the climate landscape, tackling the barriers and advancing the solutions to a safe climate. Our goal is to translate climate politics, economics and policies into action.

## ABOUT FOSSIL TO CLEAN

Fossil to Clean is a multi-year campaign that is mobilizing businesses and policymakers for the decisive action needed to transition from fossil fuels to clean solutions. The campaign is led by the We Mean Business Coalition and supported by a global network of partners. Central to the campaign is a set of principles providing clear guidance and timelines on phasing fossil fuels down and out for businesses, investors and government.

# Glossary

| Term | Definition |
|---|---|
| APS | IEA's Announced Pledges Scenario |
| bcm | Billion Cubic Meter |
| BNEF | Bloomberg New Energy Finance |
| BP | British Petroleum |
| CCS | Carbon Capture and Storage |
| $CH_4$ | Methane |
| $CO_2$ | Carbon dioxide |
| CSP | Concentrated Solar Power |
| EJ | Exajoule |
| EMDE | Emerging Markets and Developing Economy |
| ETC | Energy Transmission Commission |
| EU | European Union |
| EV | Electric Vehicle |
| GW | Giga watt |
| IEA | International Energy Agency |
| IPCC | Intergovernmental Panel on Climate Change |
| kW | Kilo watt |
| kWh | Kilo watt hour |

| Term | Definition |
|---|---|
| LatAm | Latin America |
| LCOE | Levelized Cost of Electricity |
| LCV | Light Commercial Vehicles |
| LNG | Liquified Natural Gas |
| Mb/d | Million Barrel per Day |
| MCV | Medium Commercial Vehicles |
| ME | Middle East |
| Mtce | Million Tonnes of Coal Equivalent |
| $MtCO_2$ | Million tonnes of Carbon dioxide |
| MWh | Mega watt hour |
| NZE | Net Zero Emission |
| RMI | Rocky Mountain Institute |
| STEPS | IEA's Stated Policy Scenario |
| TWh | Ter watt hour |

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