



Multidimensional Global Energy Pathways

53rd IEEJ Global Energy Webinar

October 28, 2026

S&P Global



S&P Global Energy, in collaboration with the IEEJ, has created and published three alternative global energy and emissions pathways to 2060

The fast-growing emerging and developing economies formed the starting point

EMDE demand assumptions

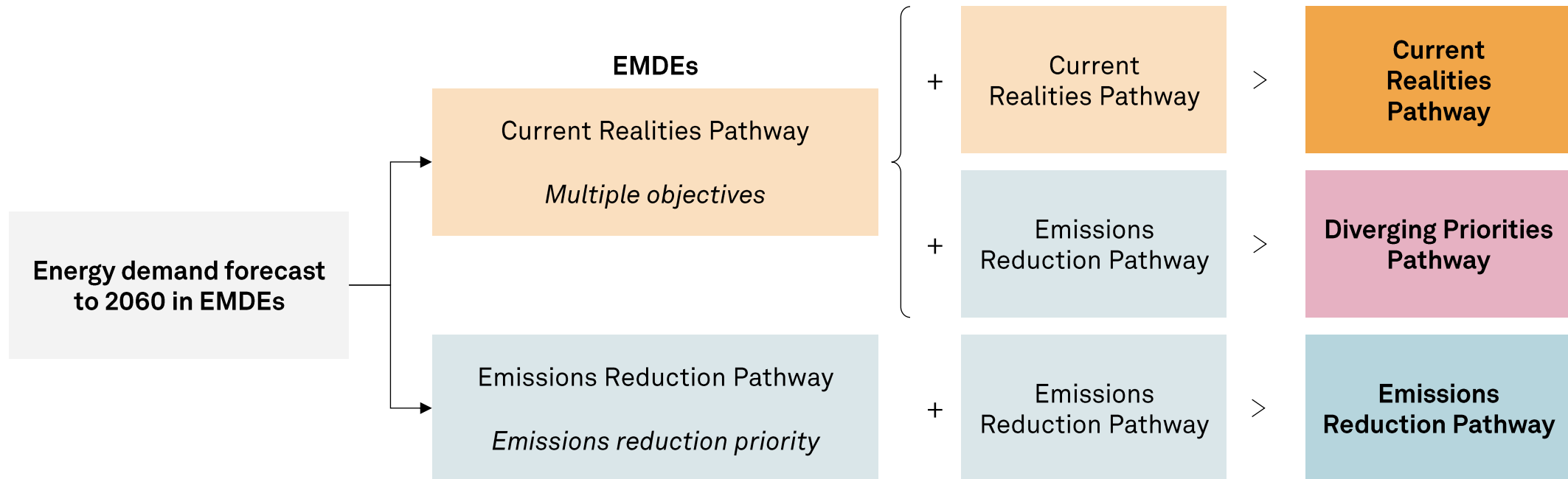
GDP growth and other demand drivers in major EMDEs

EMDE energy pathways

Two pathways to 2060 with different objectives

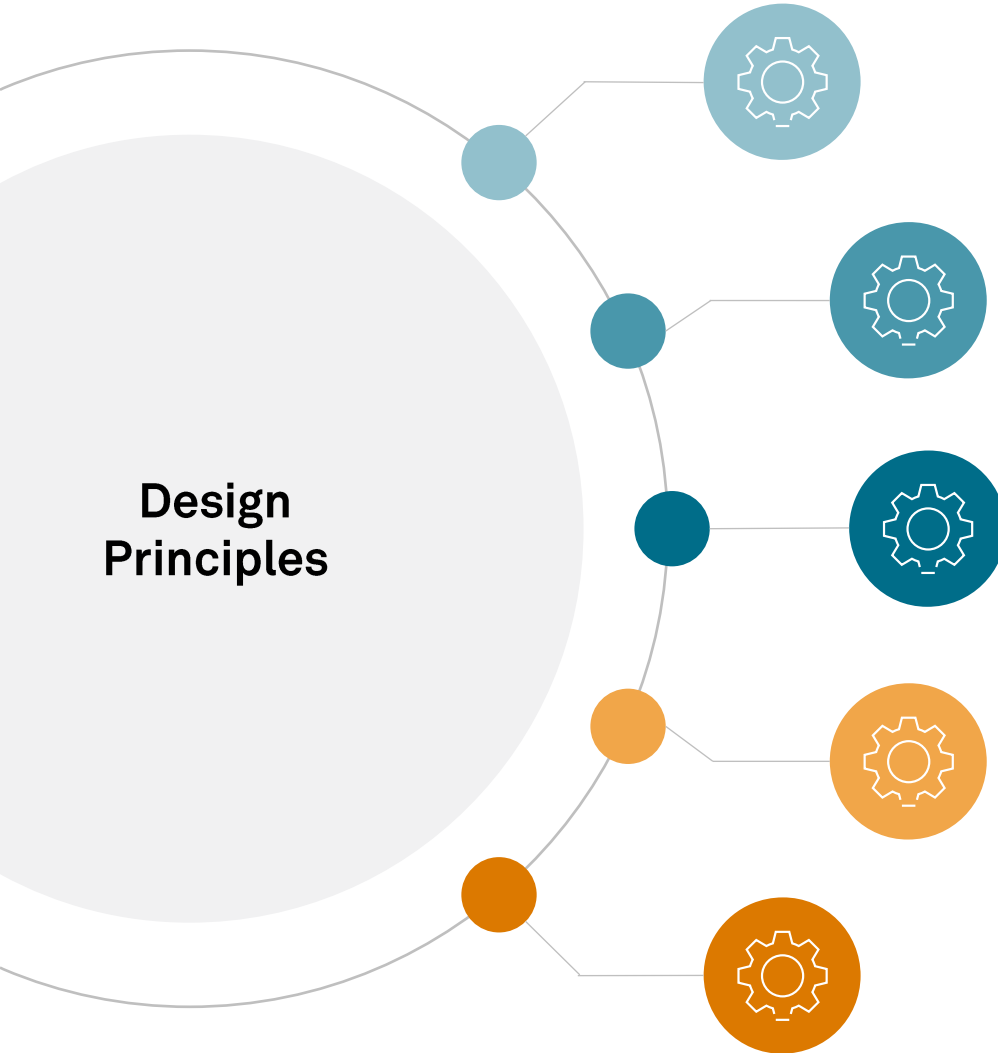
Global energy pathways

Combine EMDE pathways with those for advanced economies and China



Design principles: What makes these pathways different?

Design Principles



'Pathways' rather than 'scenarios'

- Global geopolitical, macroeconomic and technology environment assumed the same across all pathways.

Demand-led, with particular focus on the EMDEs

- No predetermined emissions or temperature outcome, or projections based on national policy targets.
- Greater focus on demand growth in emerging and developing economies.

Grounded in EMDE country-level analysis

- Detailed bottom-up energy system modeling of the major EMDEs, which are often under-represented in global scenario studies.

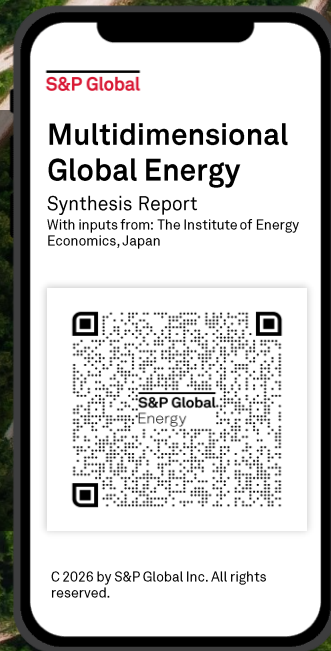
Constrained by delivery realities

- Realistic constraints on finance, infrastructure, supply chains, land availability, institutional capacity and the pace of technology adoption.
- Keeps the analysis grounded in what can plausibly be built, financed and operated.

Multiple objectives

- Assesses energy policy not only in terms of emissions reduction, but also in terms of affordability, reliability, energy security and broader energy prosperity.

The 'Multidimensional Global Energy Pathways' report was published in mid September and gained significant media attention



“A Pragmatic Approach to the Energy Transition

A new report from S&P Global says energy and climate discourse needs a ‘path back to pragmatism’ that recognises the different perspectives between advanced and developing countries.”

Financial Times, September 17, 2026

“Energy Reality Overtakes The Transition Narrative In S&P Global Study

The fundamental fact is that the largest source of long-term energy demand growth will come from emerging markets and developing economies where energy needs are driven by economic development, industrialization, urbanization and rising incomes. We hope that this study will contribute to a deeper dialogue about the realities and challenges of the energy transition.”

Forbes, September 23, 2026

The report suggests a return to pragmatism: realistic, nationally differentiated and multidimensional long-term outlooks for energy and emissions

Key Findings from the Study



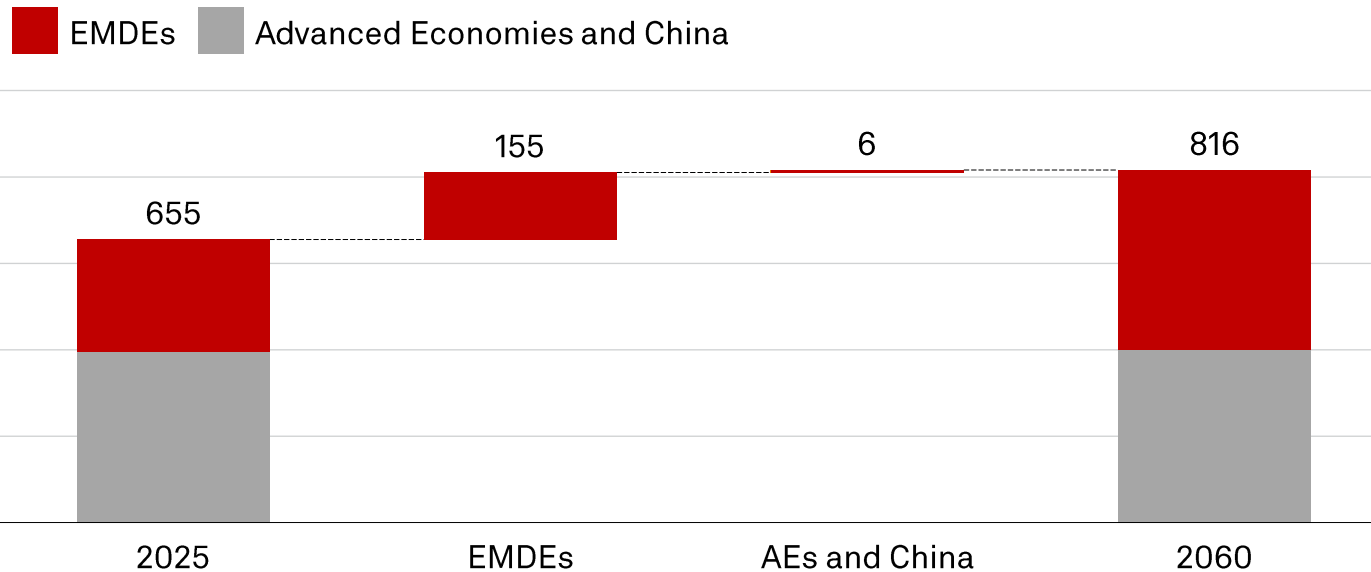


1 Future growth in energy demand will come from EMDEs

By 2060, energy demand growth in the Emerging Markets and Developing Economies (EMDEs) could add another China to global demand, despite major energy efficiency gains

Global primary energy demand changes to 2060, Current Realities Pathway (CRP)

EJ



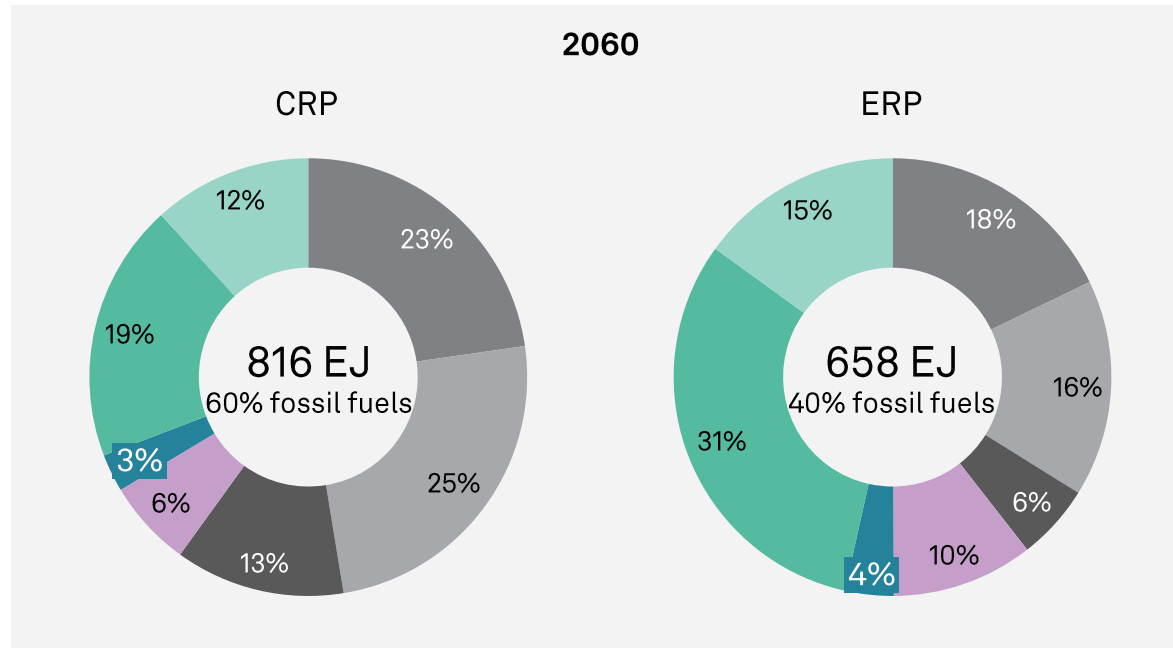
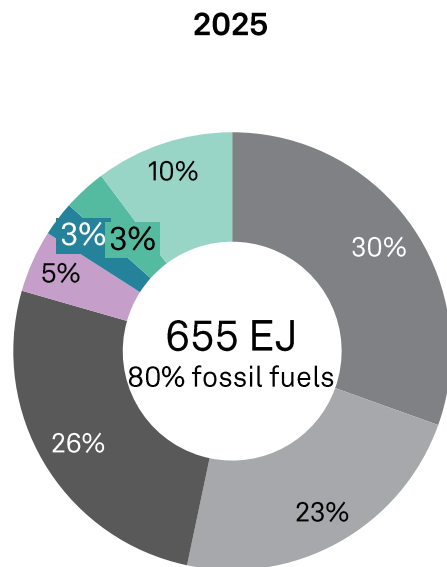
Note: In the Emissions Reduction Pathway, higher energy efficiencies lead to a flatter long term global demand forecast, with demand growth in EMDEs balanced by declines in AEs and China

Source: S&P Global Energy



2 The future energy system will be defined by coexistence of multiple fuels

The evolution of the global energy system is likely to be additive as much as substitutive, especially in the EMDEs, requiring all fuel sources to meet growing demand



Notes: "Other renewables" Includes: Biomass, Tidal, Geothermal

Source: S&P Global Energy

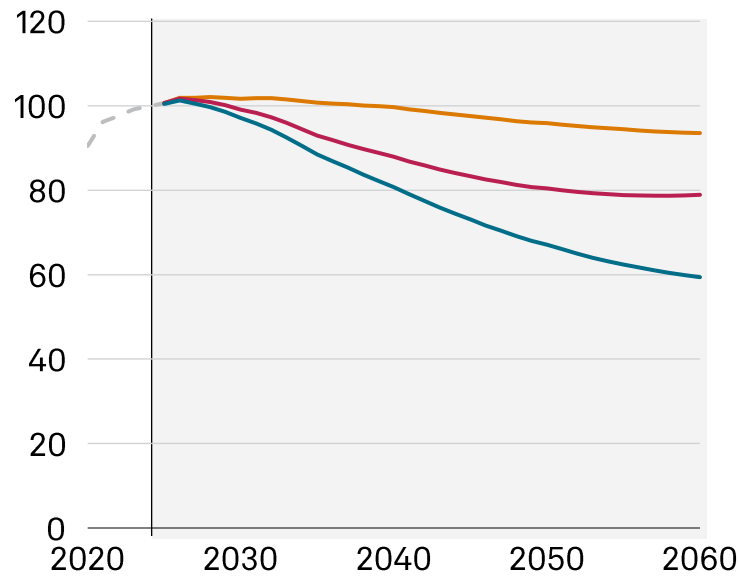


Despite rapid growth in renewables, oil and gas continue to play important roles in all pathways

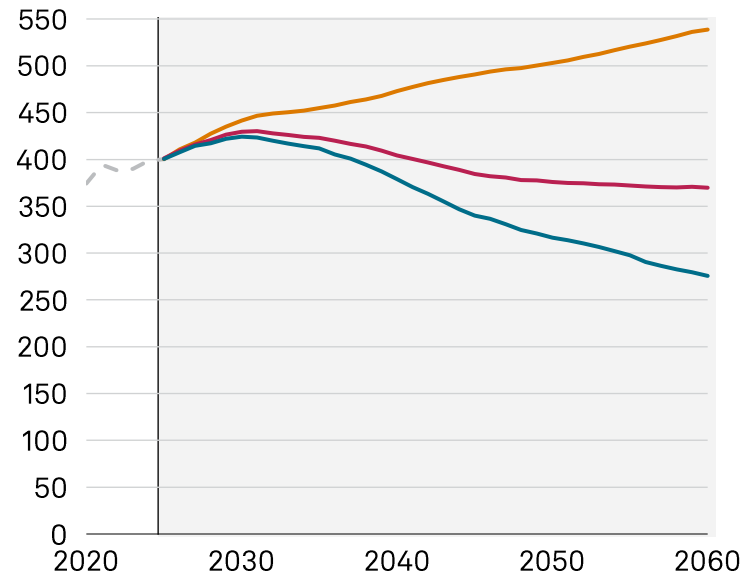
Requires upstream investment of \$11 trillion - \$14 trillion through 2060

— CRP — DPP — ERP

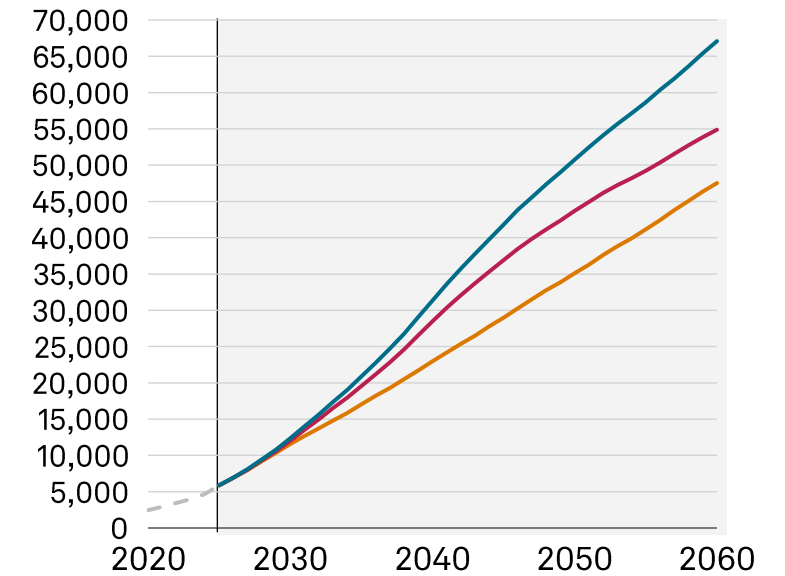
Oil consumption by pathway
Mbbbl/d



Gas consumption by pathway
Bcf/d



Wind and Solar Generation by pathway
TWh



Source: S&P Global Energy



3 Electrification based on renewable energy sources is key to emissions reduction – but faces limitations

Transportation is the most difficult to electrify, only rising to <30% of total sectoral energy use by 2060

Global electrification rates by sector

/// Electrification ranges across pathways



Industry



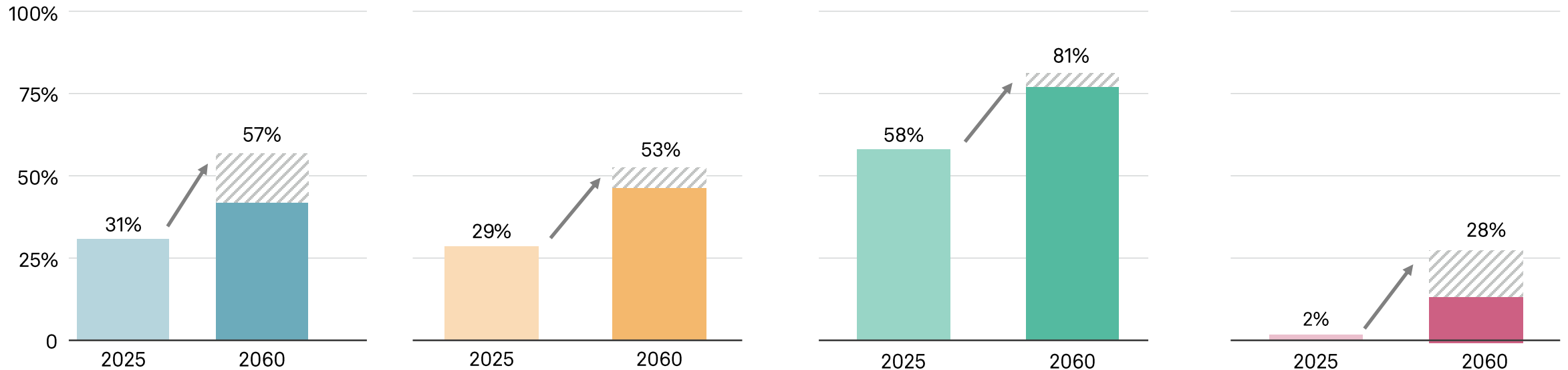
Residential



Commercial



Transport



Source: S&P Global Energy



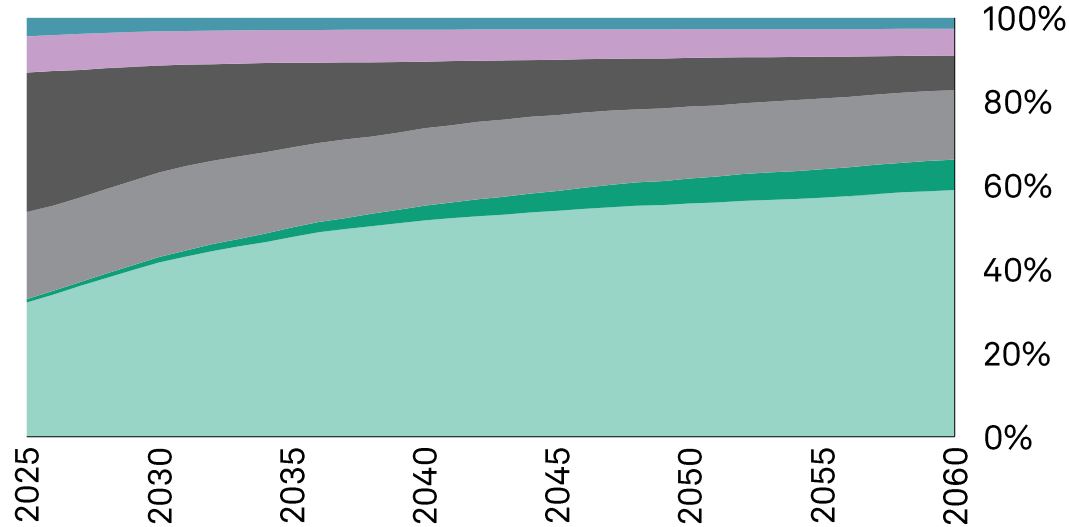
Renewables will play an increasing role in electricity generation – but will start to hit technical and cost limitations as market share increases

Power supply grid by source

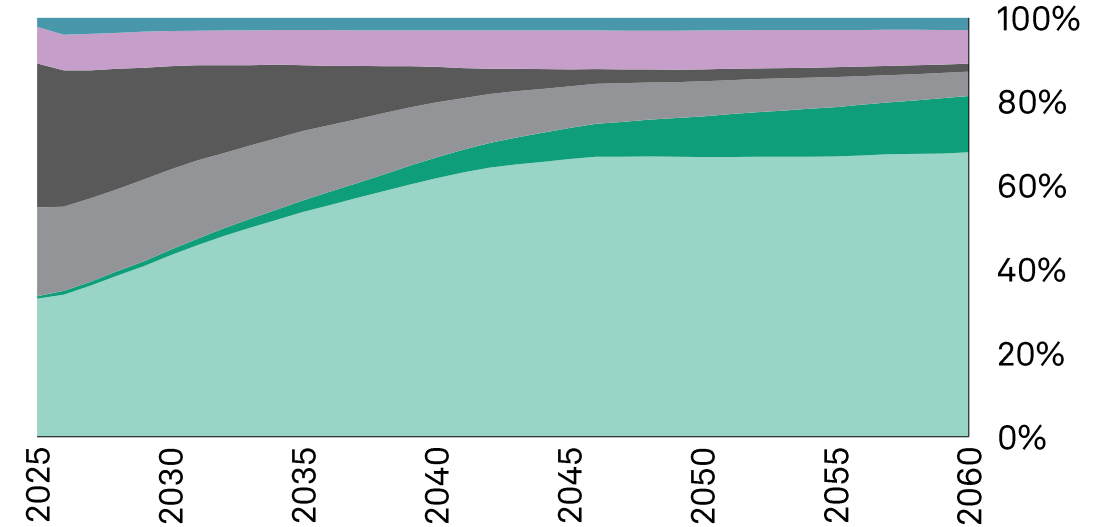
%

Renewables Battery Natural Gas Coal Nuclear Others

Current Realities Pathway (CRP)



Emissions Reduction Pathway (ERP)



Notes: Renewables include solar, wind, geothermal, tidal and hydro. 'Others' comprises oil and biomass. Battery supply typically generated by solar and wind

Source: S&P Global Energy

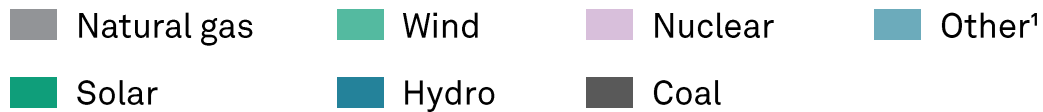


Many countries will need both gas and renewables for power generation

Example: in Indonesia, gas generation more than triples by 2060 alongside a surge in wind and solar, as the two together replace coal in an aggressive decarbonization pathway

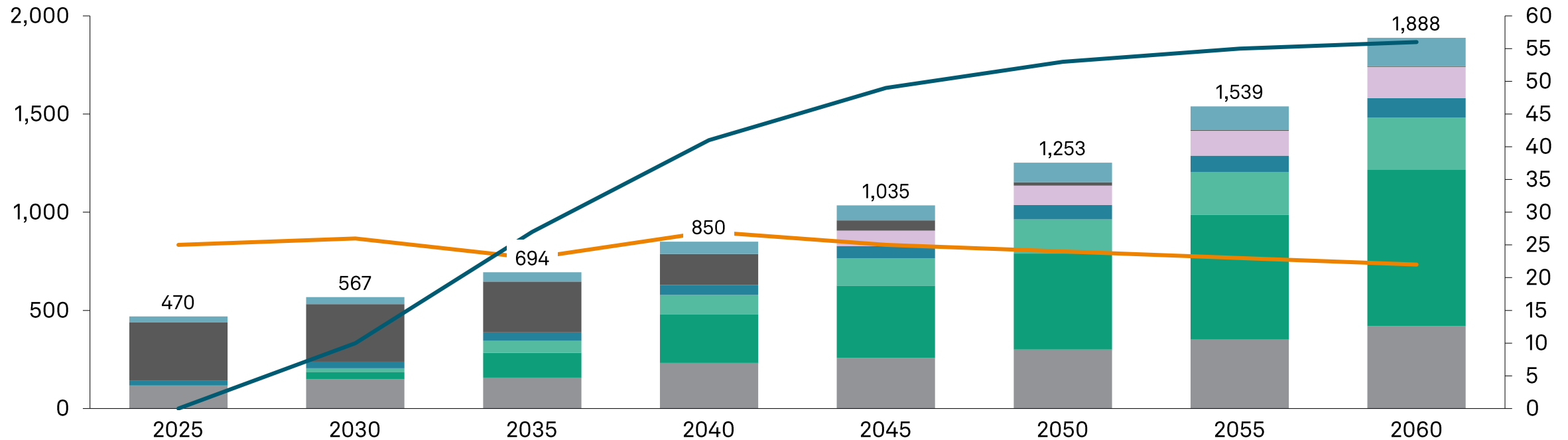
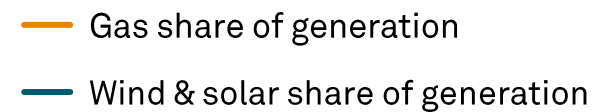
Indonesia power generation by source, ERP

TWh



Share of power generation (gas & renewables)

%



1. Other = oil, biomass and waste, geothermal and hydrogen.

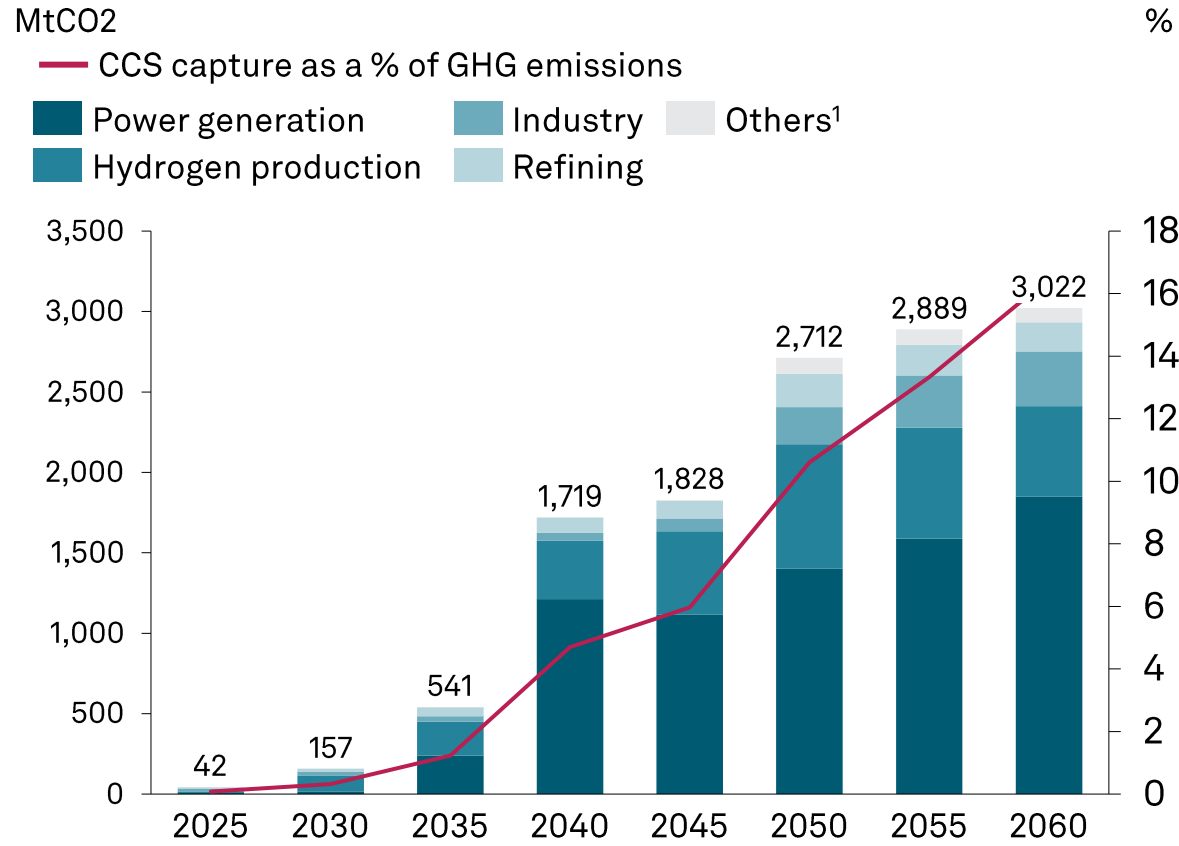
Source: S&P Global Energy



CCS could be a significant decarbonization technology for electricity

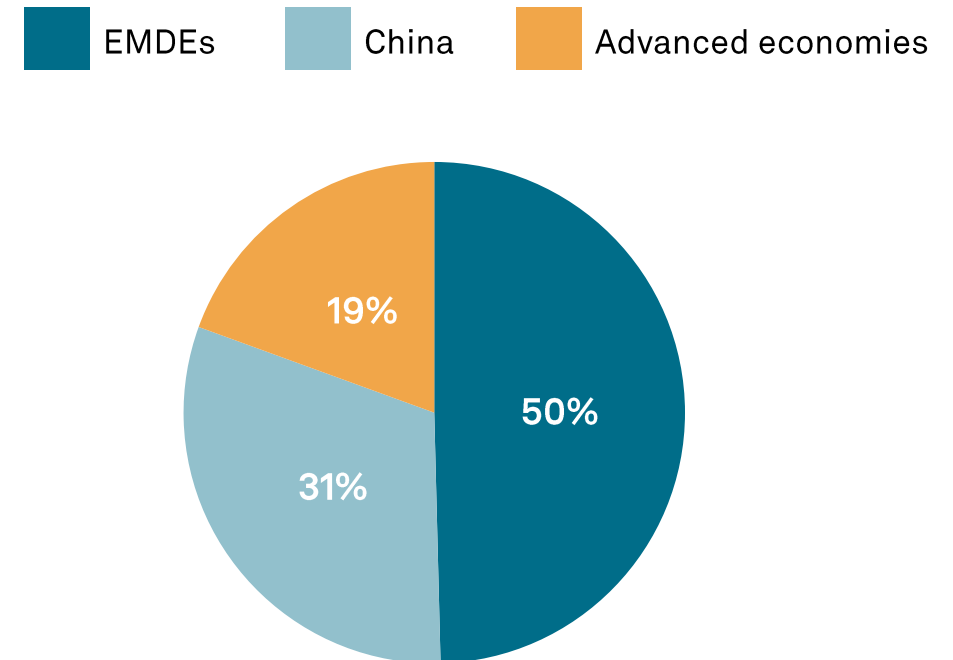
Around 3 Gt of CO₂ is captured per year by 2060 in the Emissions Reduction Pathway (ERP)

CO₂ capture by sector, Emissions Reduction Pathway



1. Others include district heating and coke ovens
Source: S&P Global Energy

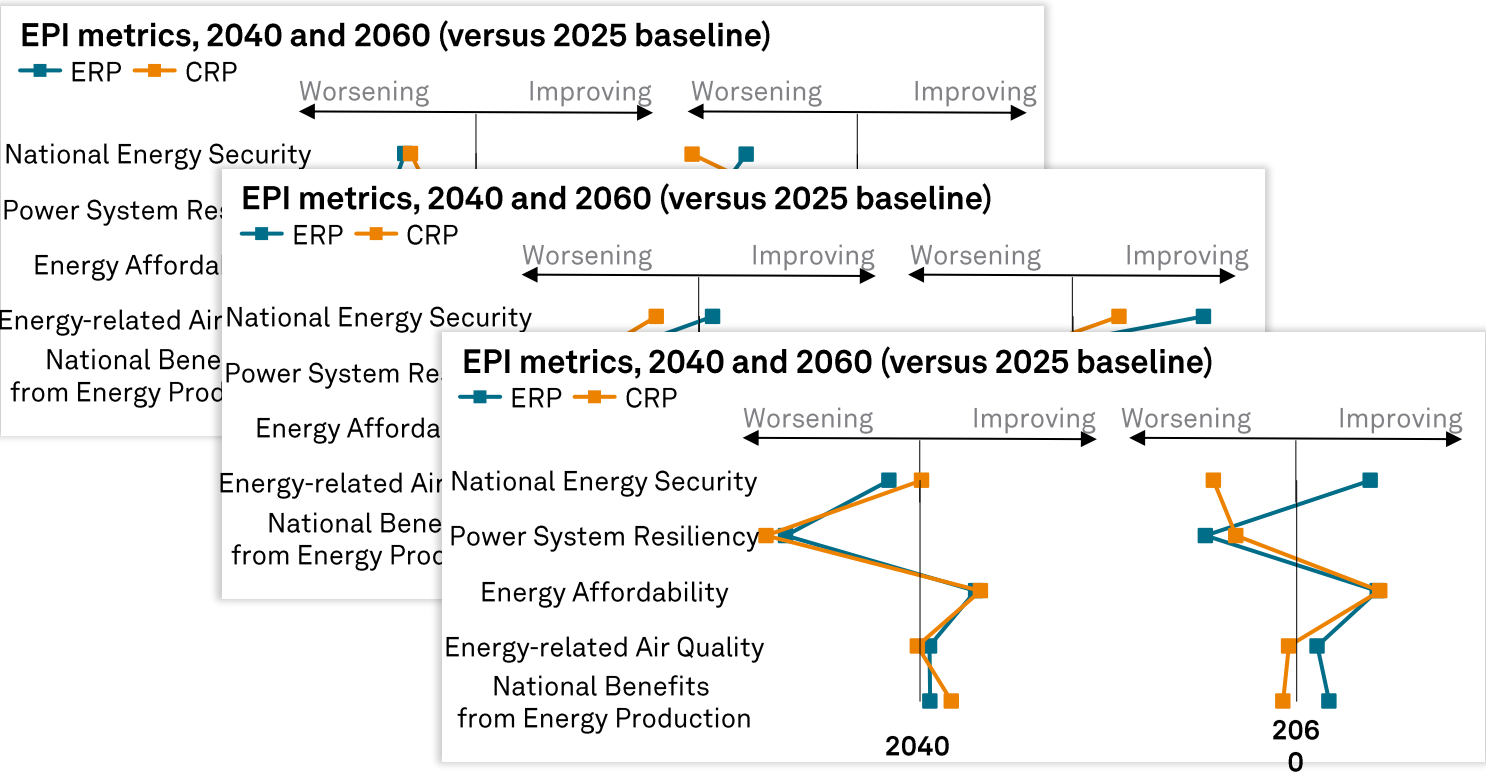
CO₂ capture by region, ERP 2060



The power sector alone will require ~\$1.3 trillion of cumulative investment to 2060 in carbon capture (excl. transport and storage)

4 A new Energy Prosperity Indicator (EPI) highlights the unique trade-offs facing each country

A forward-looking assessment of trade-offs across 12 major EMDEs through 2060



Source: S&P Global Energy

The EPI examines the trade-offs individual countries will face in providing reliable and affordable energy to support socio-economic development while seeking to reduce global greenhouse gas emissions.

- Primary EPI components:**
- National energy security
 - Power system resiliency
 - Energy affordability
 - Energy-related air quality
 - National benefits from energy production



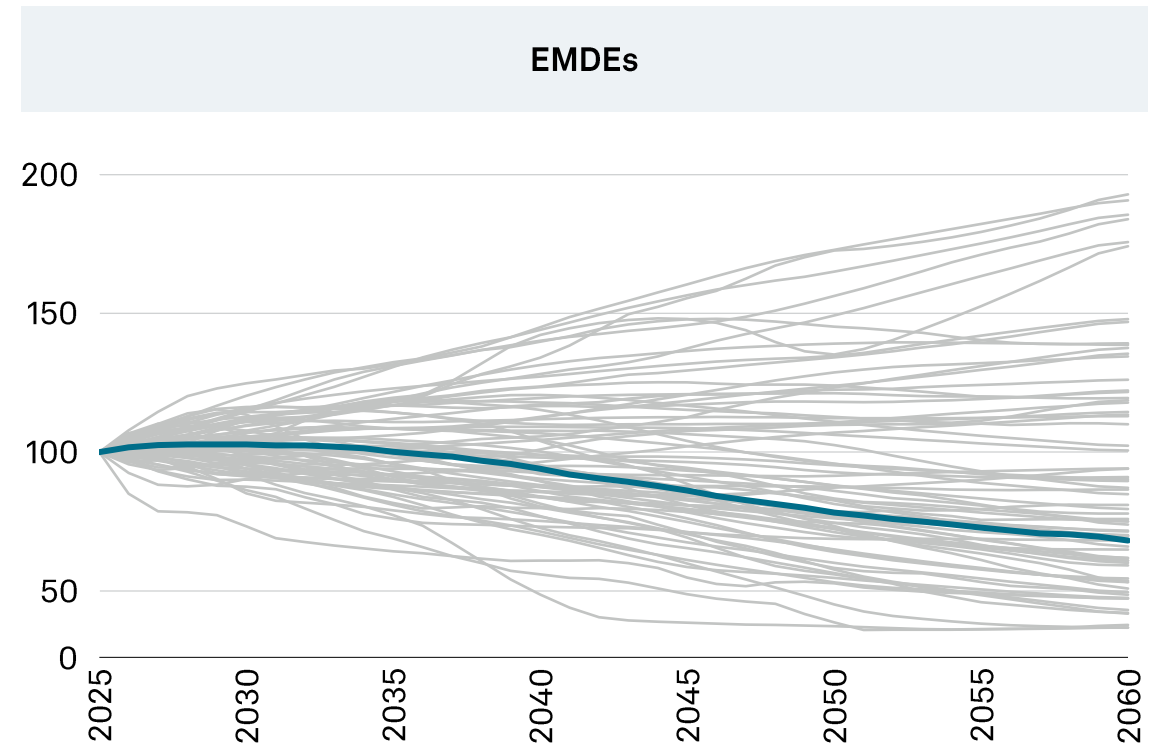
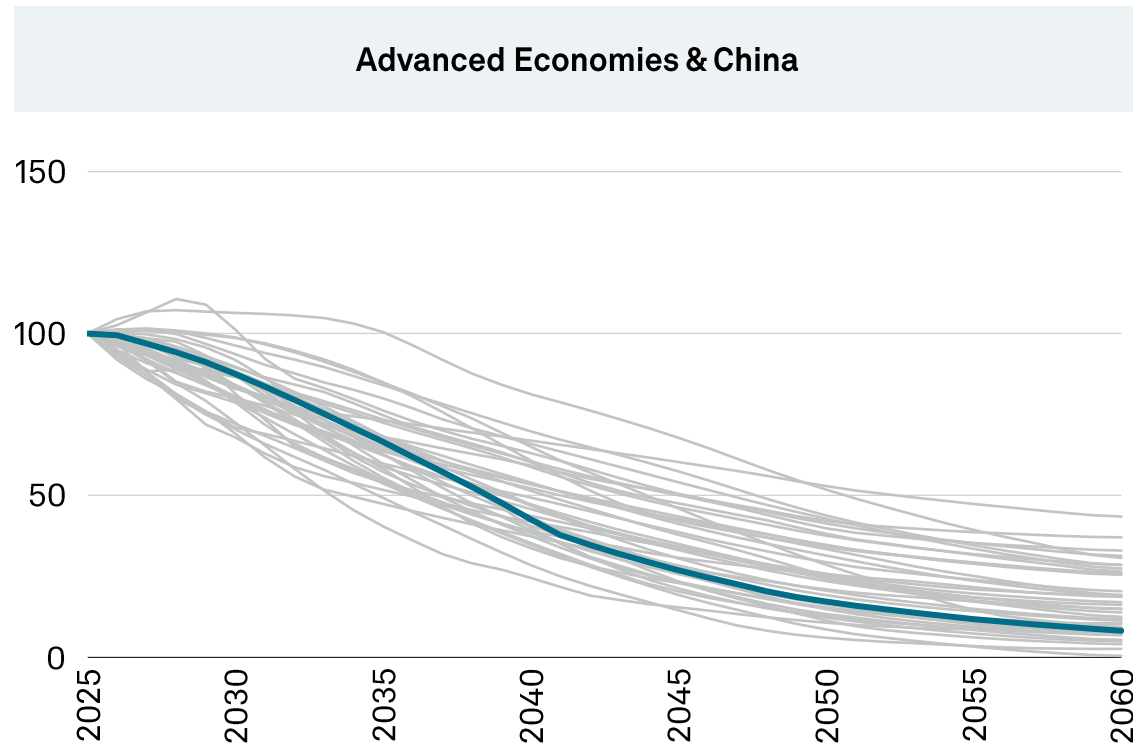
There is no “one size fits all” transition pathway

Pathways will be determined by individual national circumstances – income levels, natural resource endowments and legacy energy systems

Total Energy-Related GHG emissions (normalized), Emissions Reduction Pathway

Index (2025 = 100)

— Individual Countries — Average (weighted)



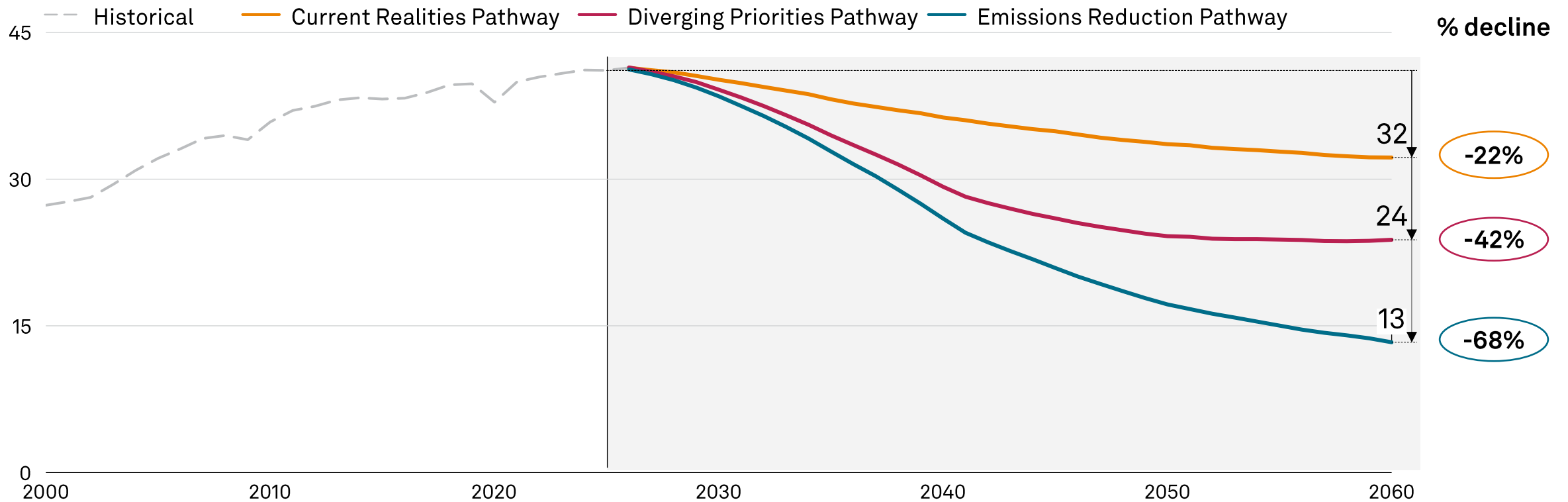
Source: S&P Global Energy



5 Achieving net zero globally this century will be a major challenge

Energy-related emissions by pathway (CO₂ plus methane)

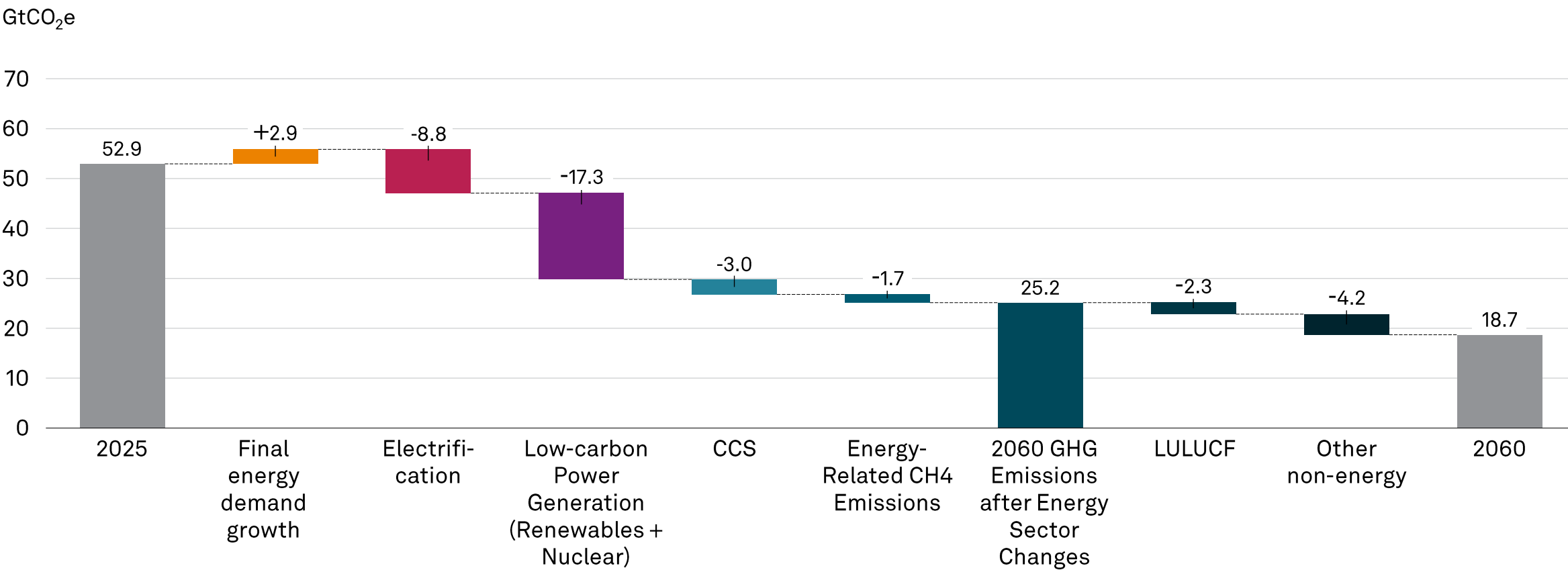
GtCO₂e



Source: S&P Global Energy. Historical data from IEA <https://www.iea.org/data-and-statistics>, all rights reserved, as modified by S&P Global

Multiple technologies and approaches will be needed to reduce total GHG emissions, including actions on non-energy emissions

Key drivers of global emissions change, 2025 – 2060 (Emissions Reduction Pathway)



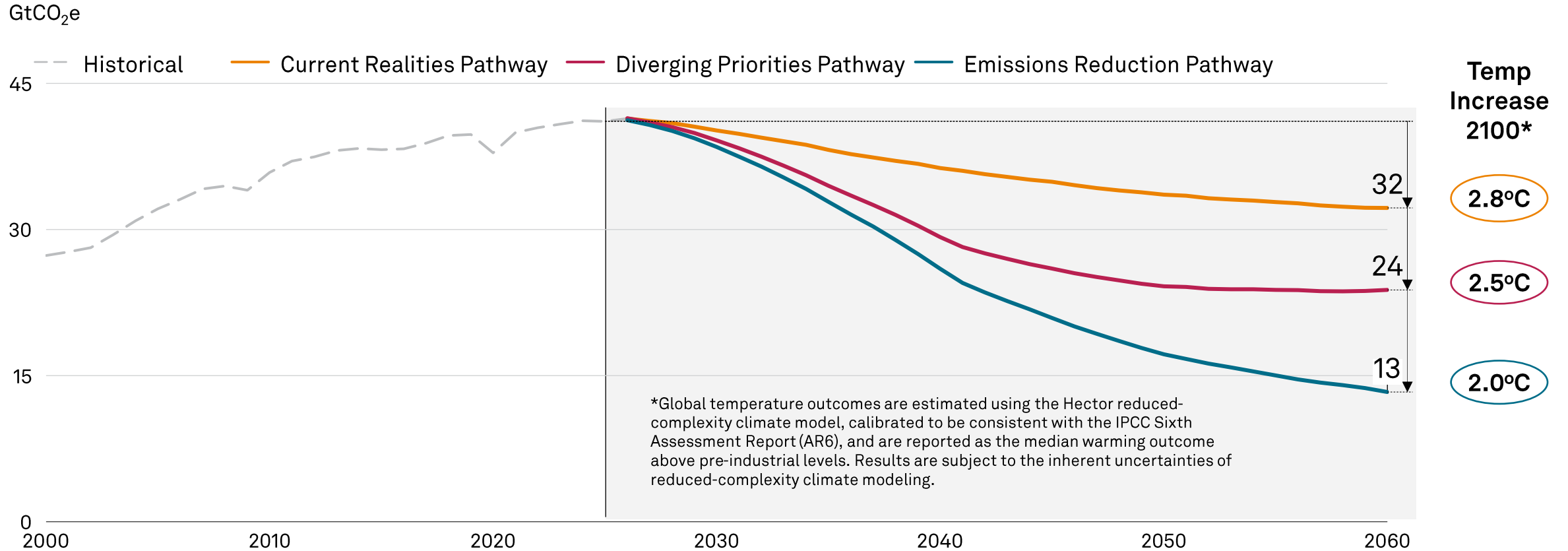
Source: S&P Global Energy



6 2°C target is achievable but becoming increasingly difficult

1.5°C is no longer achievable under realistic assumptions, even in an 'overshoot' scenario

Energy-related emissions by pathway (CO₂ plus methane)



Source: S&P Global Energy. Historical data from IEA <https://www.iea.org/data-and-statistics>, all rights reserved, as modified by S&P Global

Getting the world back to 1.5°C ?

- The ***Emissions Reduction Pathway*** represents an ambitious roadmap for reducing emissions through to 2060.
- In this pathway global warming exceeds 1.8°C by mid century. To reduce warming to 1.5°C by end of century will require large scale ‘negative emissions’ (CO₂ removal).
- This would require average annual removal of over 25 GtCO₂ over the period 2060 to 2100: **approximately 60% of current annual global energy-related emissions**.
 - Deploying novel technologies such as direct air capture (DAC) and bioenergy with carbon capture and storage (BECCS) to achieve half of this removal could cost >US\$6 trillion per year, **around 5% of current global GDP**, and would involve insurmountable supply chain and CO₂ storage challenges.
 - If the other half was achieved through afforestation / reforestation, a net new forested area the **size of the Amazon rainforest** would be required by the end of the century.



While CO₂ removal offers some potential to limit end-of-century warming to below 2°C, getting back to 1.5°C by 2100 is not feasible - in the absence of unforeseen technology breakthroughs or extreme multi-decade global economic recession.



Thank you



**Multidimensional Energy
Pathways Study**

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