Where are we in the global energy transition?

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MIT JOINT PROGRAM SCIENCE POLICY GLOBAL CHANGE

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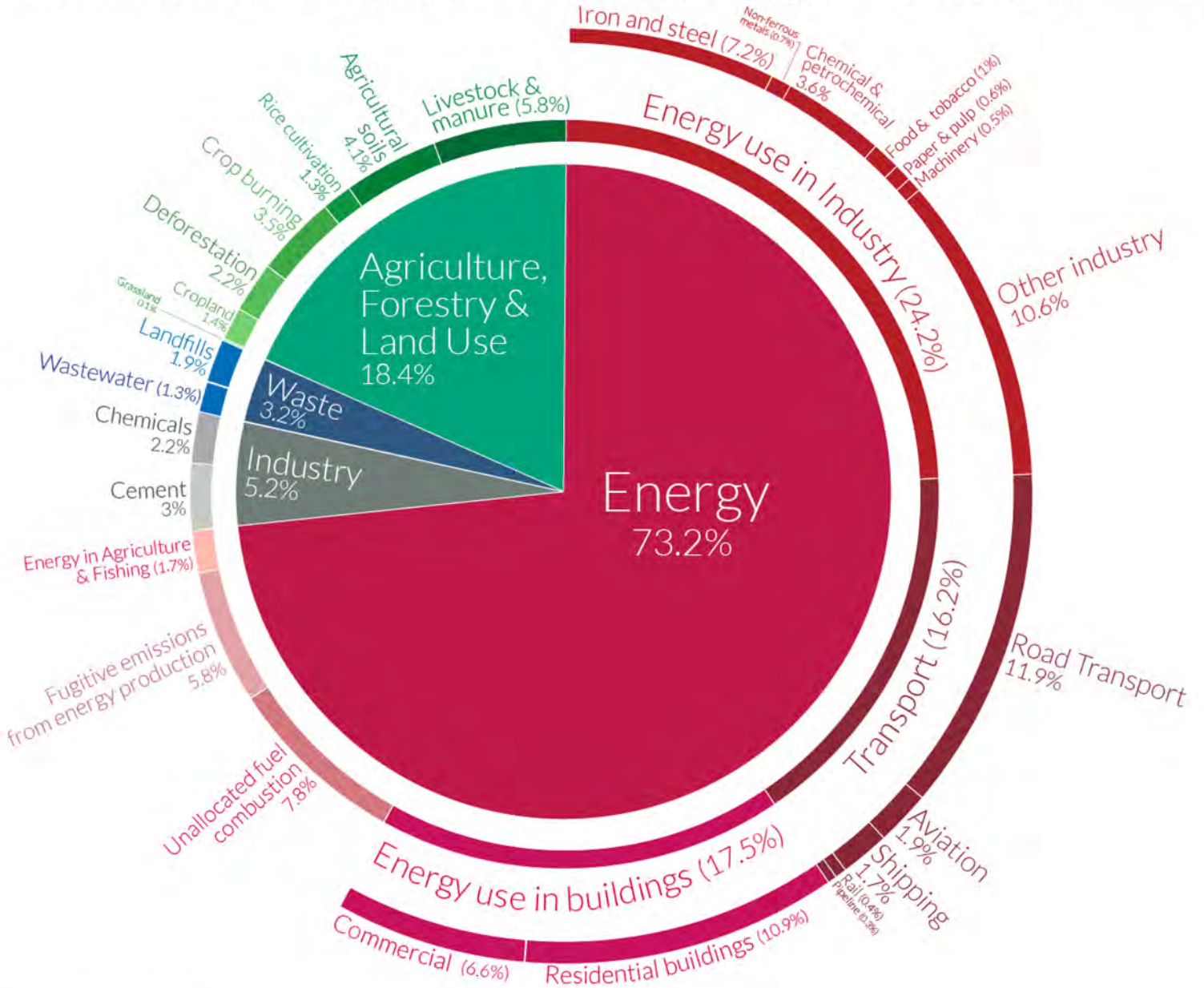
Global greenhouse gas emissions by sector

This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO_2eq.

Our World in Data



OurWorldinData.org – Research and data to make progress against the world's largest problems.
Source: Climate Watch, the World Resources Institute (2020).

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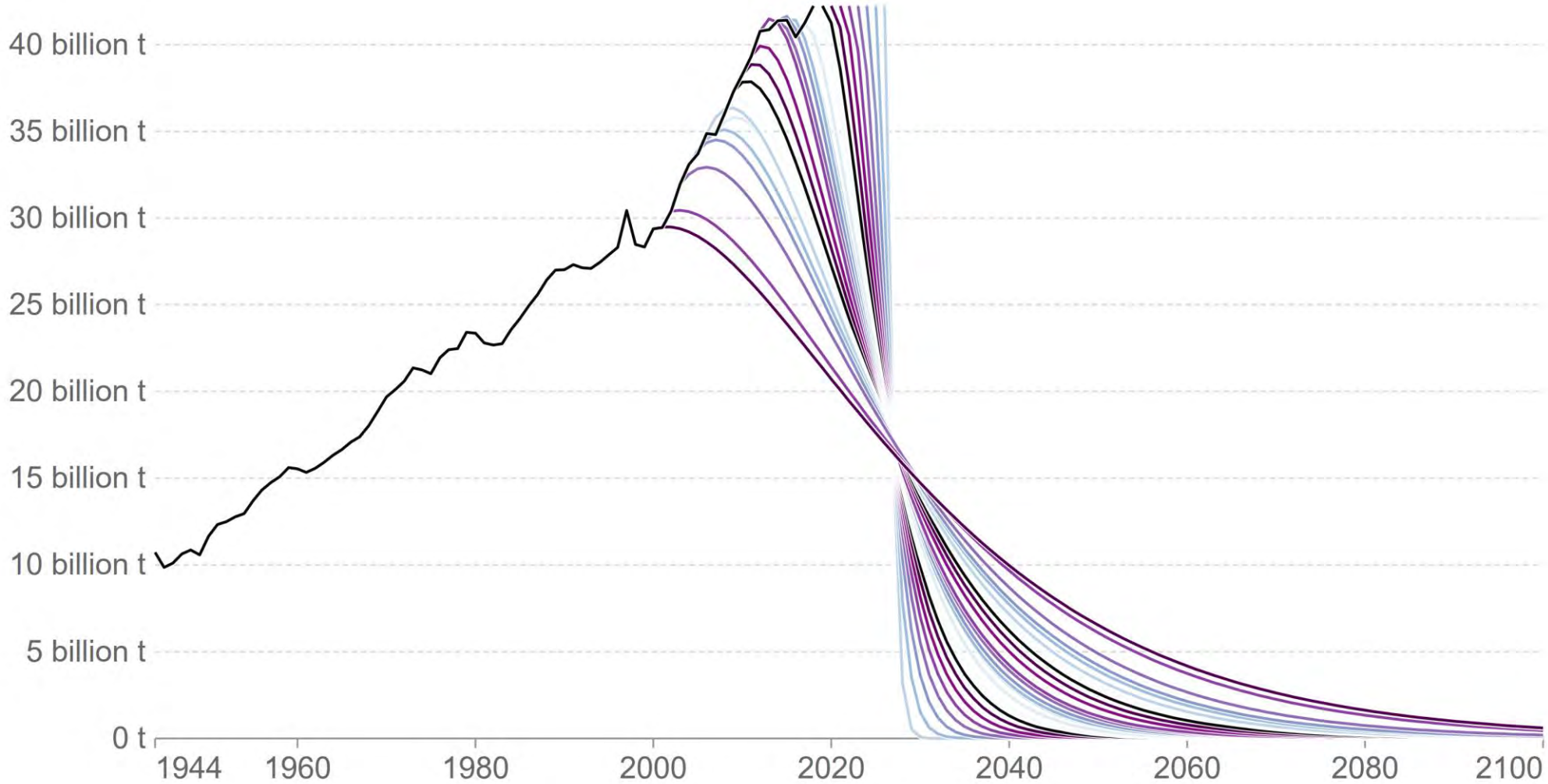
CO_2 reductions needed to keep global temperature rise below 1.5°C

Annual emissions of carbon dioxide under various mitigation scenarios to keep global average temperature rise below 1.5°C. Scenarios are based on the CO_2 reductions necessary if mitigation had started – with global emissions peaking and quickly reducing – in the given year.

Our World in Data



Source: Robbie Andrews (2019); based on Global Carbon Project & IPPC SR15
Note: Carbon budgets are based on a >66% chance of staying below 1.5°C from the IPCC's SR15 Report.
OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

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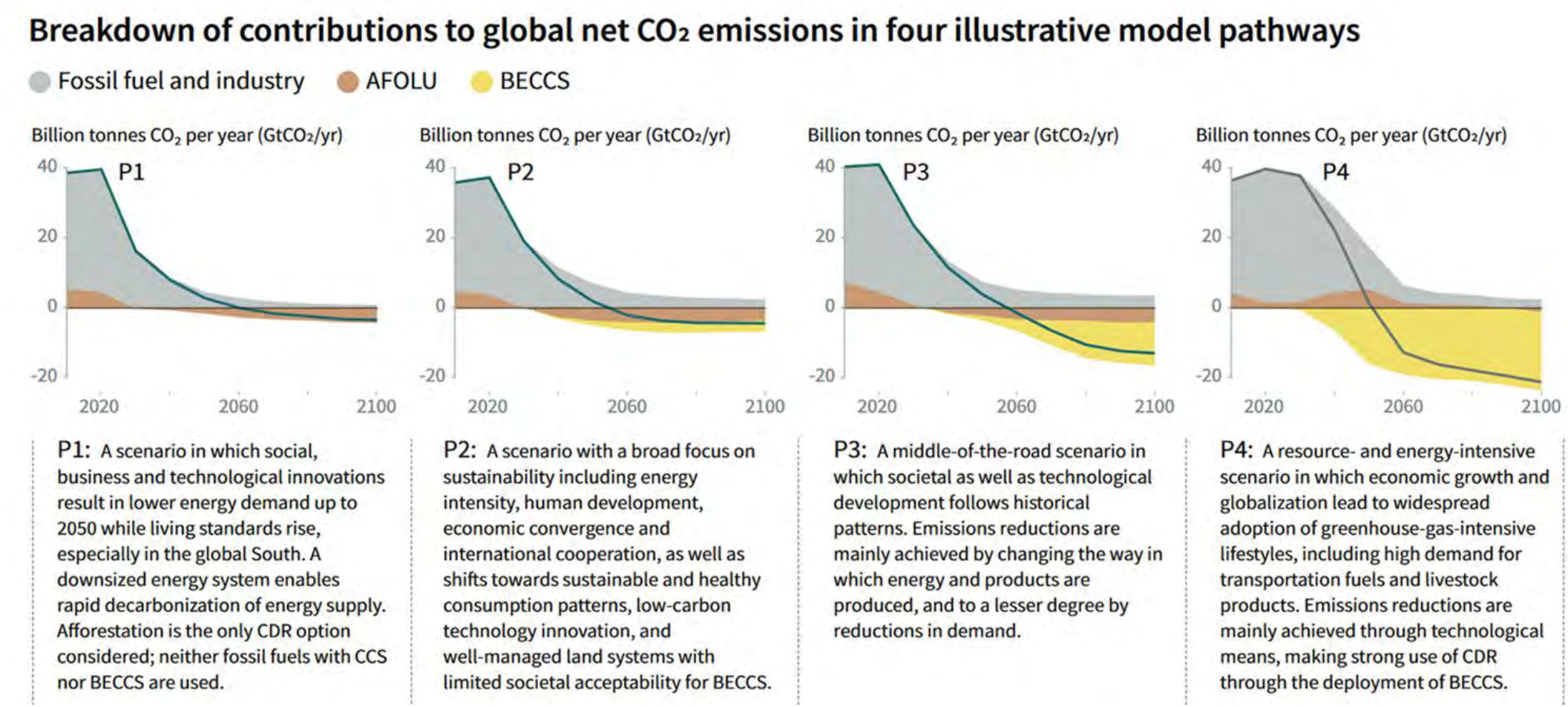
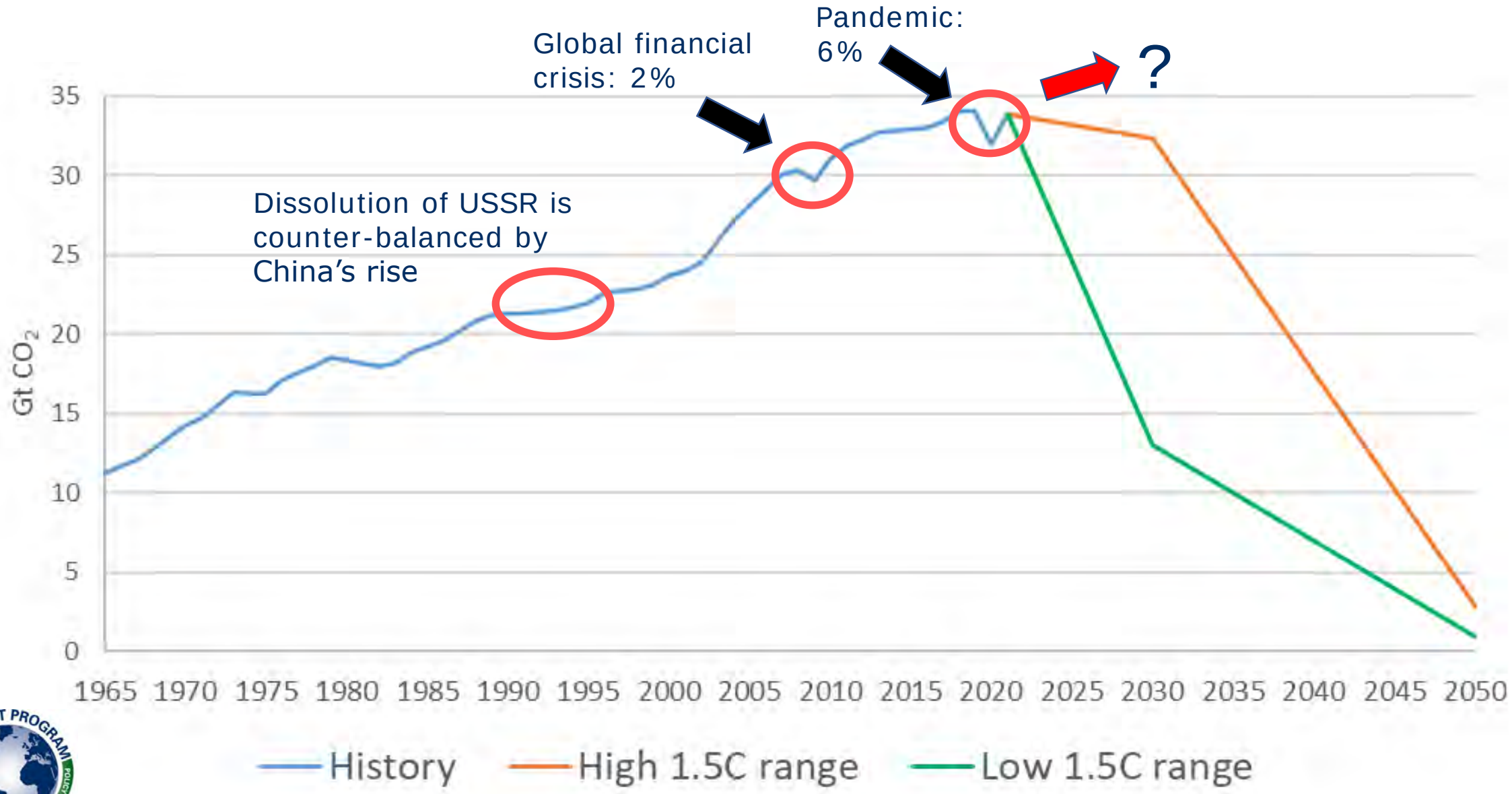
The world has to decarbonize…



Source: IPCC 1.5C Report (2018)

…at an unprecedented pace



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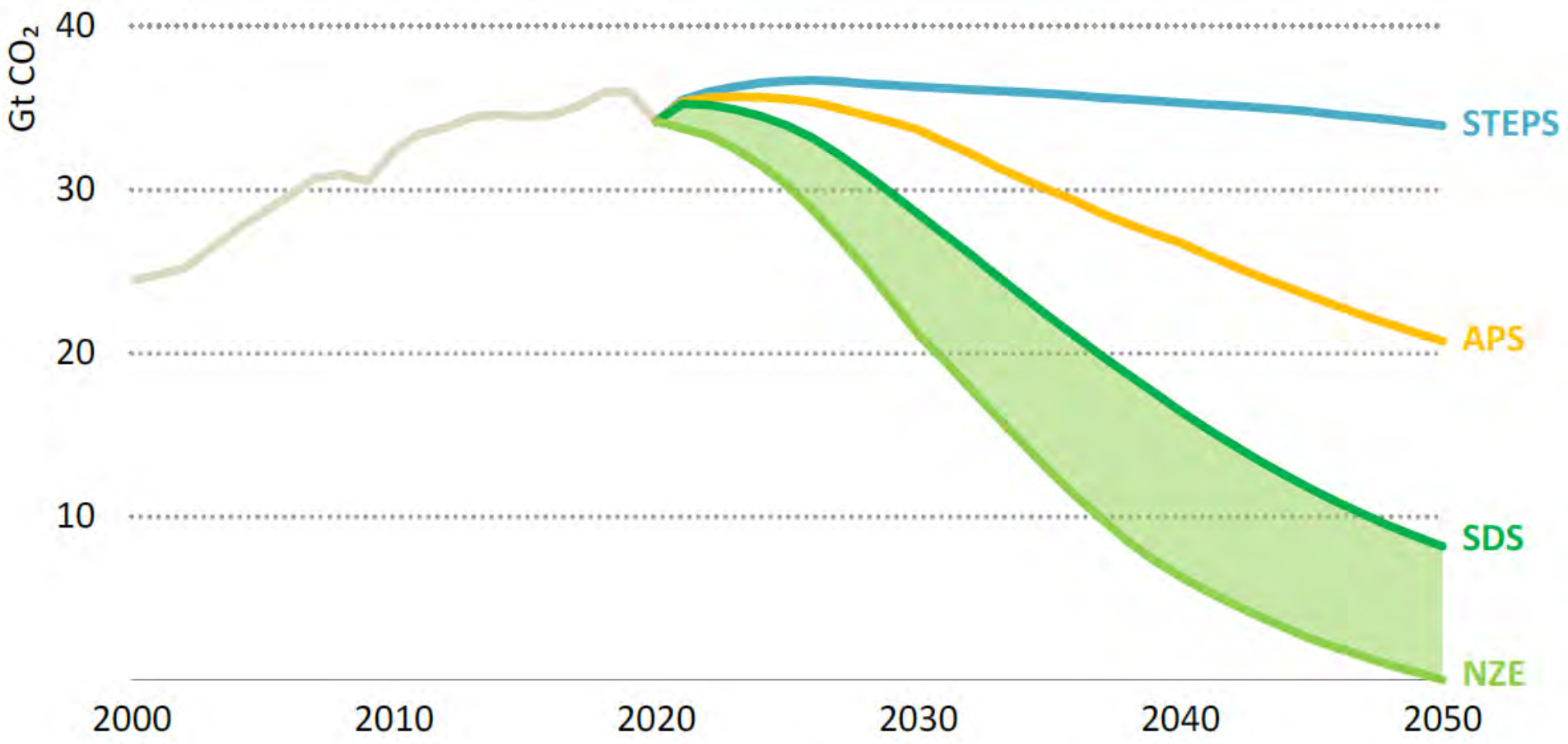
IEA 2021 World Energy Outlook: Goals vs Reality



STEPS (Stated Policies Scenario) reflects current policy settings

APS (Announced Pledges Scenario) assumes that all NDCs and longer term targets are met

SDS (Sustainable Development Scenario) meets UN SDGs

NZE (Net zero Emissions by 2050) for global energy sector

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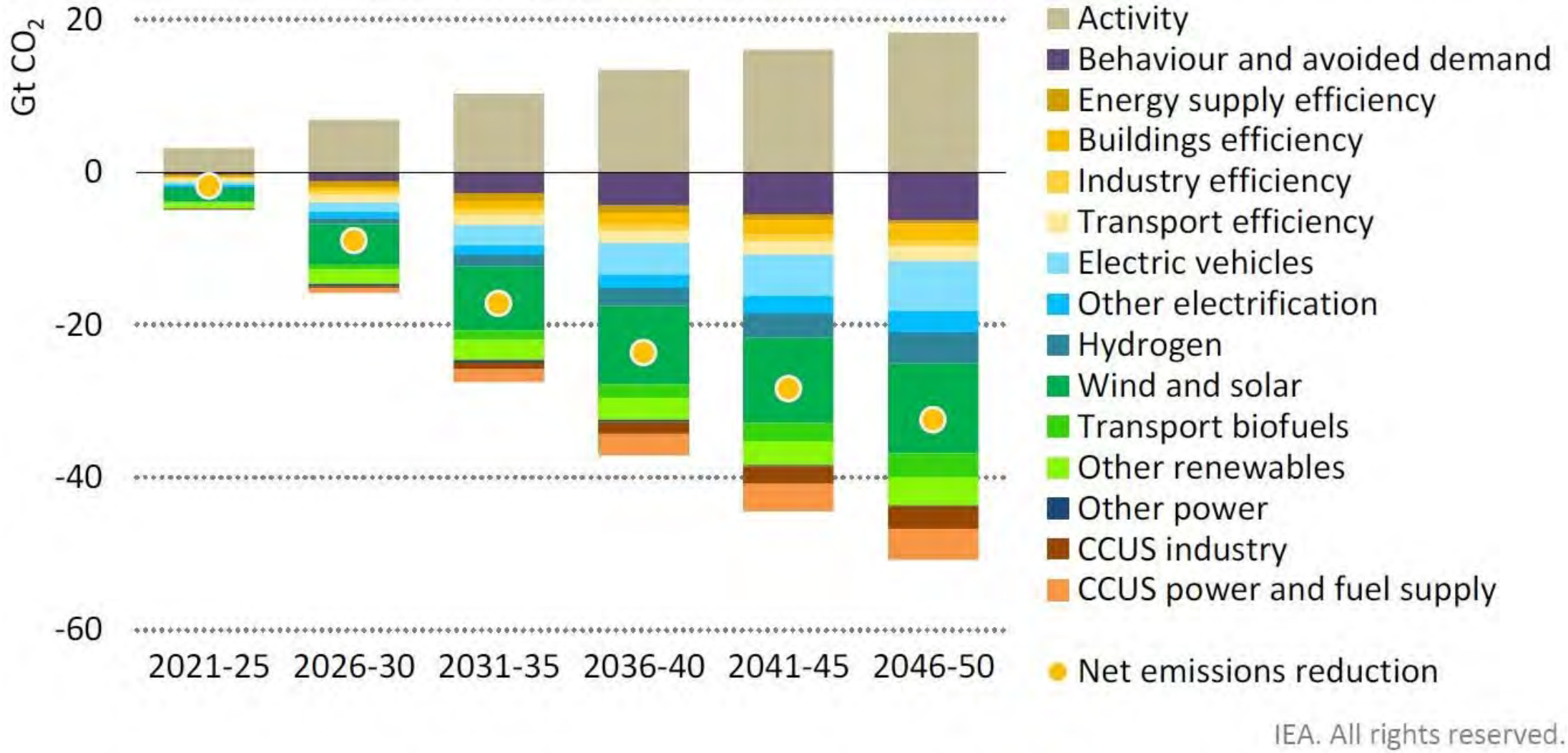
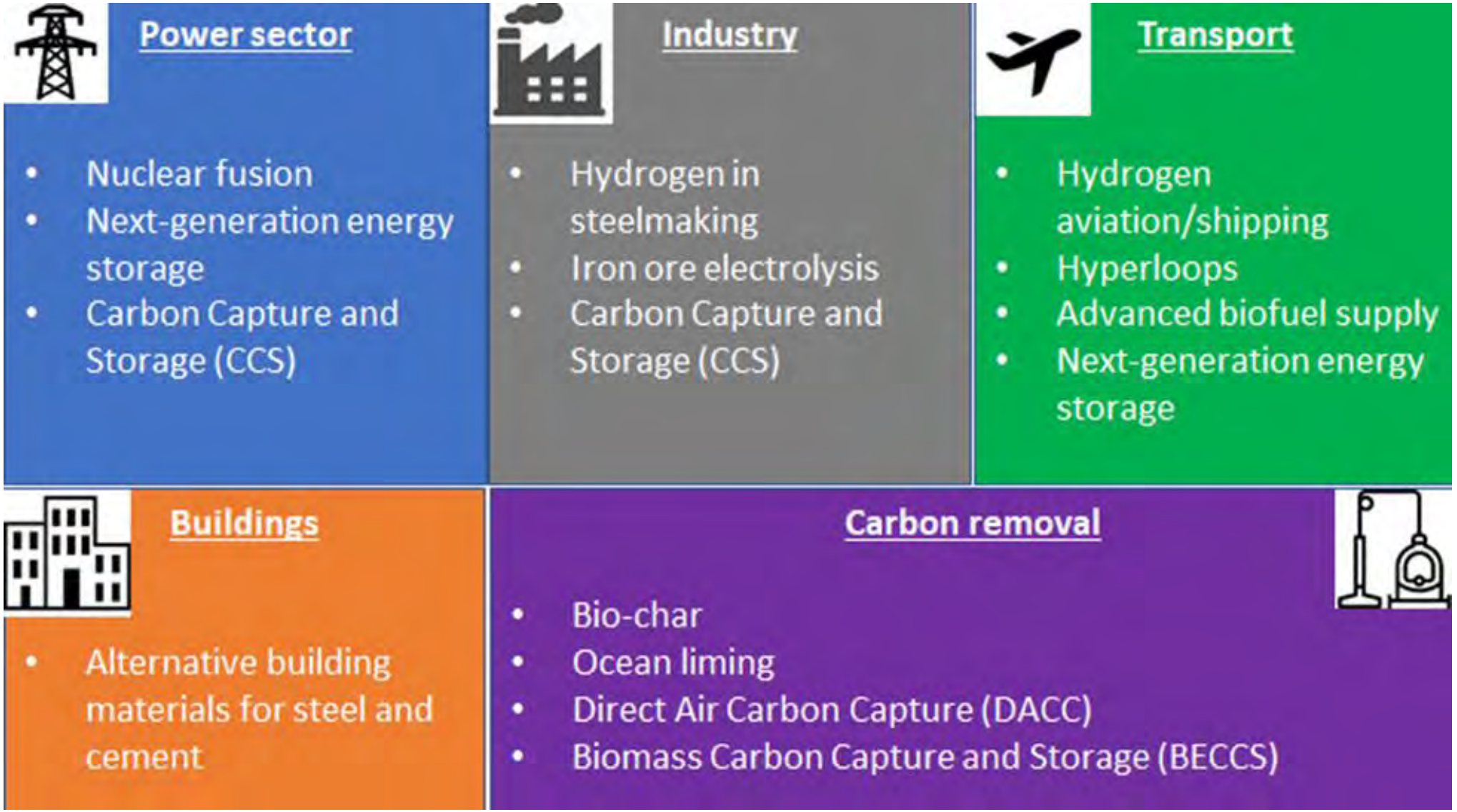
Wide range of measures and technologies are needed



Source: IEA Net Zero by 2050 (2021)

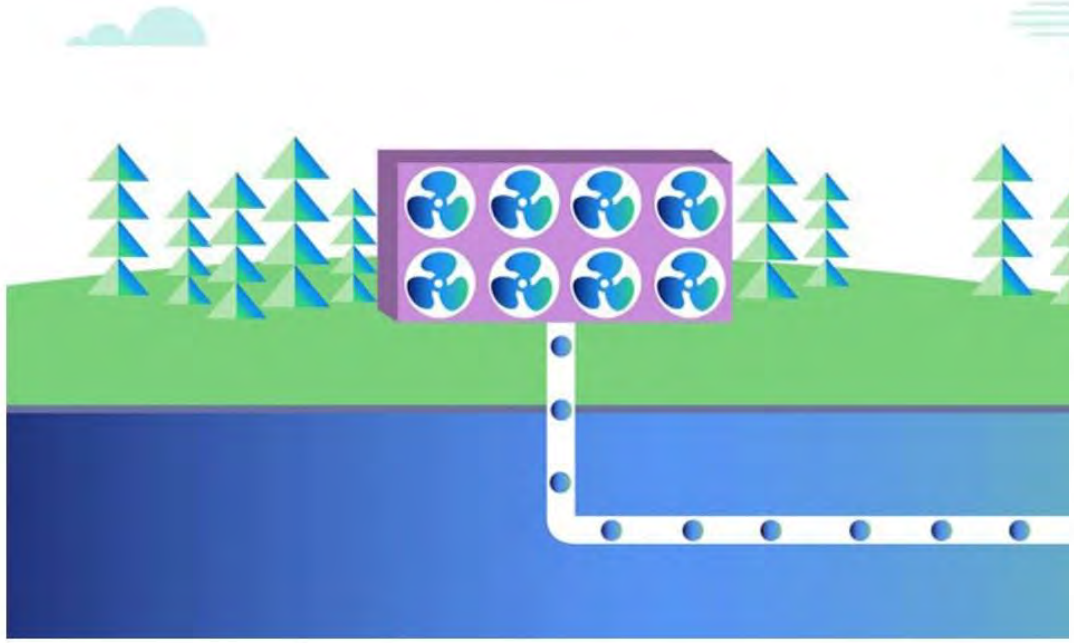


Graphics: EPFL

Also important: Demand Side Management

Technological readiness in net-zero scenarios?

https://globalchange.mit.edu/news-media/jp-news-outreach/affordable-direct-air-capture-myth-or-reality



Jun 08, 2022

Affordable direct air capture: myth or reality?

MIT seminar explores economic feasibility of technology that could play a key role in the energy transition

By Mark Dwortzan | MIT Joint Program on the Science and Policy of Global Change

Global Environmental Change 68 (2021) 102262

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The economics of bioenergy with carbon capture and storage (BECCS) deployment in a 1.5 °C or 2 °C world

Mathilde Fajardy [a,b], Jennifer Morris [c,d], Angelo Gurgel [c,d], Howard Herzog [d], Niall Mac Dowell [a,b], Sergey Paltsev [c,d,*]

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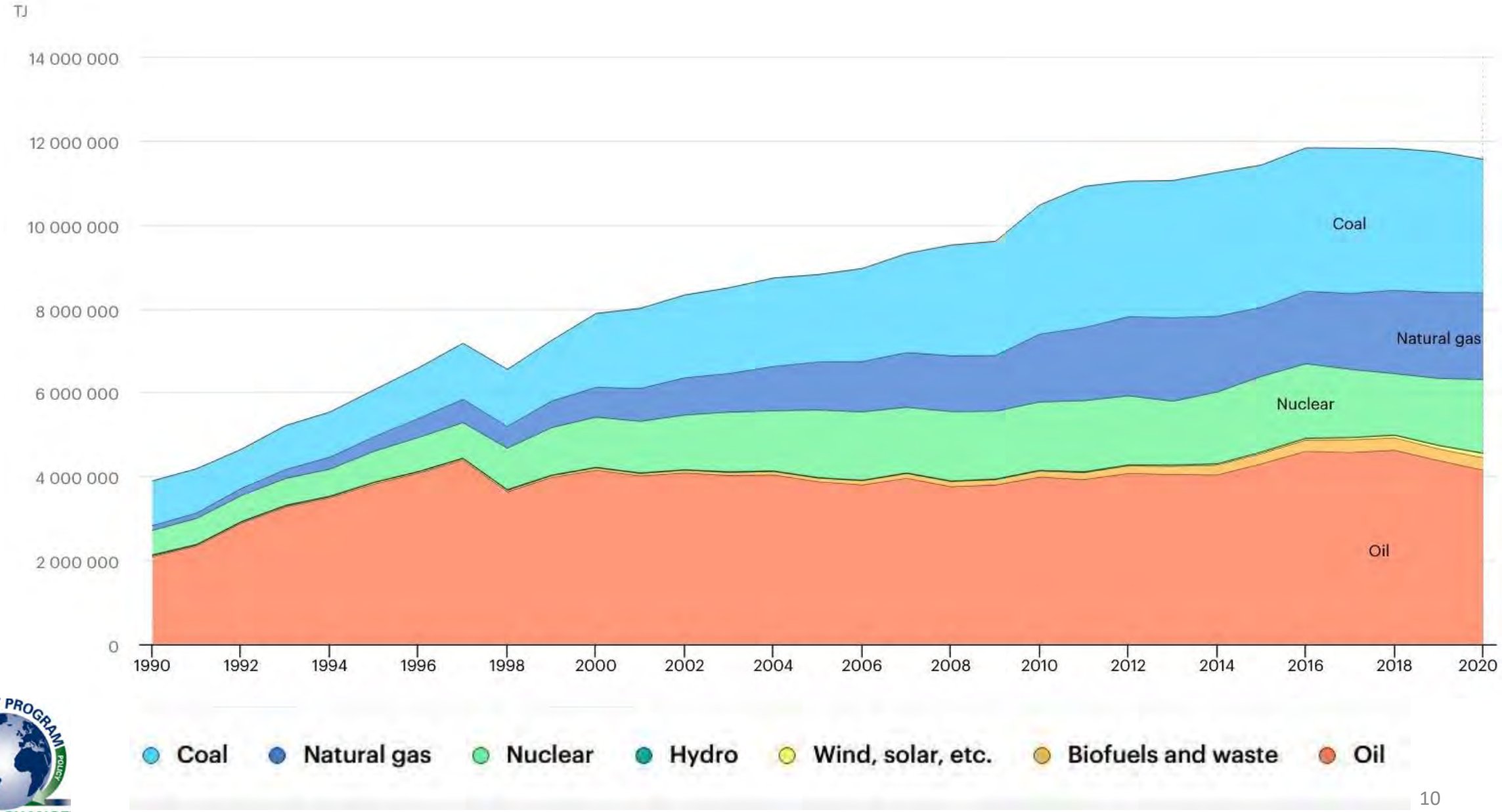
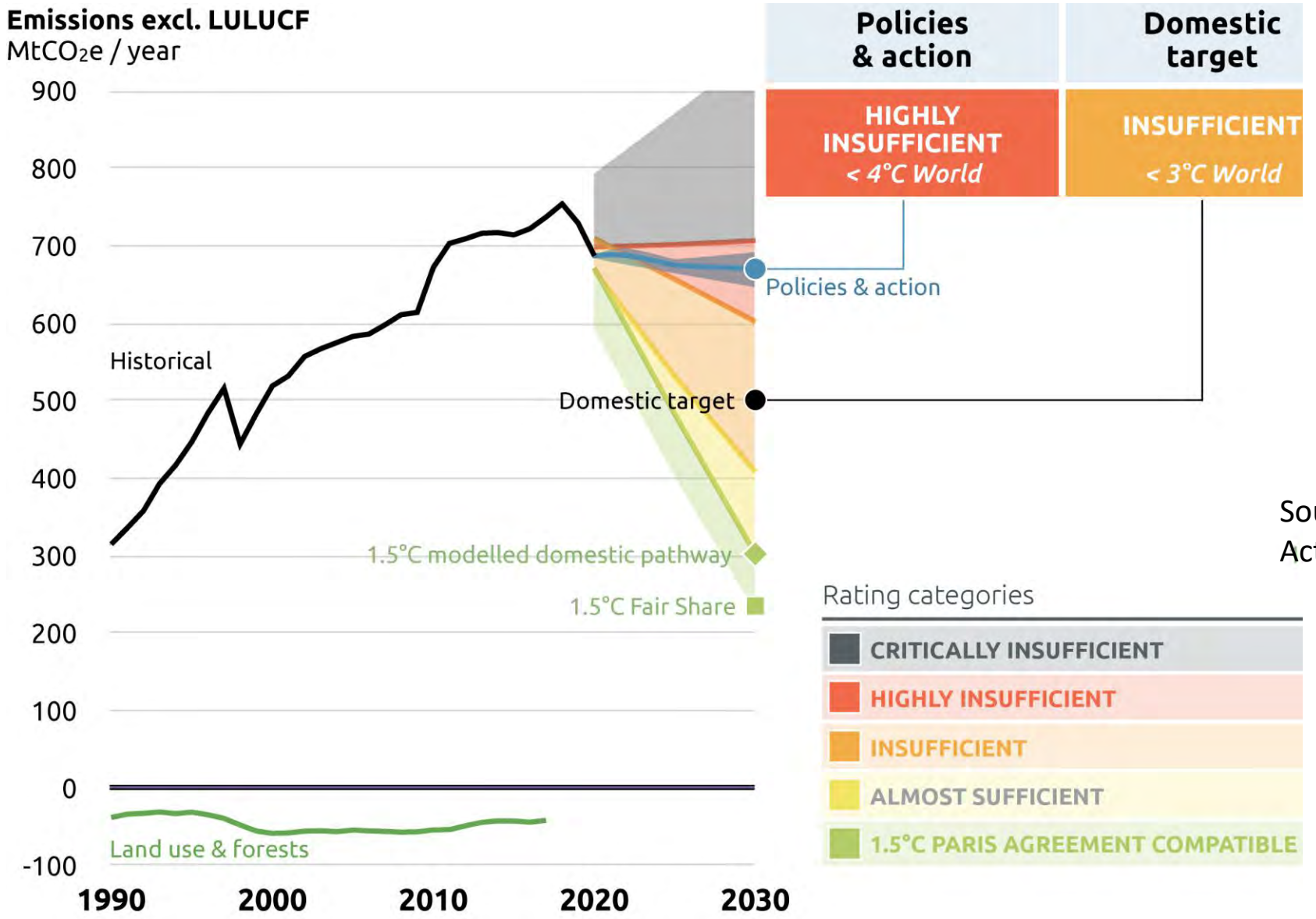
https://globalchange.mit.edu/news-media/jp-news-outreach/affordable-direct-air-capture-myth-or-reality

Korea's primary energy (1990-2020)

Source: IEA (2022)



Korea's targets: 2030 - 40% below 2018 levels; 2050 – net zero



Source: Climate Action Tracker (2022)

https://globalchange.mit.edu/publication/17279

Climate Change Economics, Vol. 10, No. 3 (2019) 1950010 (23 pages)

DOI: 10.1142/S2010007819500106

World Scientific
www.worldscientific.com

THE ECONOMIC, ENERGY, AND EMISSIONS IMPACTS OF CLIMATE POLICY IN SOUTH KOREA

While focusing on the pervious Korea's NDC targets for 2030, the paper finds that:

"From the perspective of the GHG price required, the South Korean NDC is among the most ambitious."

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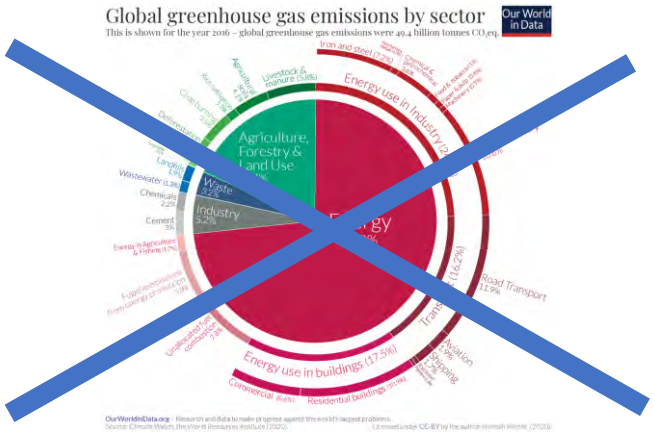
How do we get to net-zero emissions? How quickly?

Pledges by numerous governments and companies to reach **net-zero** greenhouse gas (**GHG**) emissions, **but Action Plans are needed**



Opportunities and challenges for **scalable** low-carbon energy options

Economic: Do we have technologies? Are they economically competitive? Do we have policies to support them? Lifestyle changes?

Geopolitical: Impacts of de-carbonization on other goals? COVID implications for a rise of protectionism? Stability of energy exporters? Impacts of Russia-Ukraine war?

Environmental: Physical risks from climate change will be there regardless of emission reduction. Impacts from low-carbon options (e.g., car battery recycling). Minerals for clean energy transition.

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Thank you

Questions or comments?
Please contact Sergey Paltsev at paltsev@mit.edu

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