International Energy Agency

CCUS in Clean Energy Transitions

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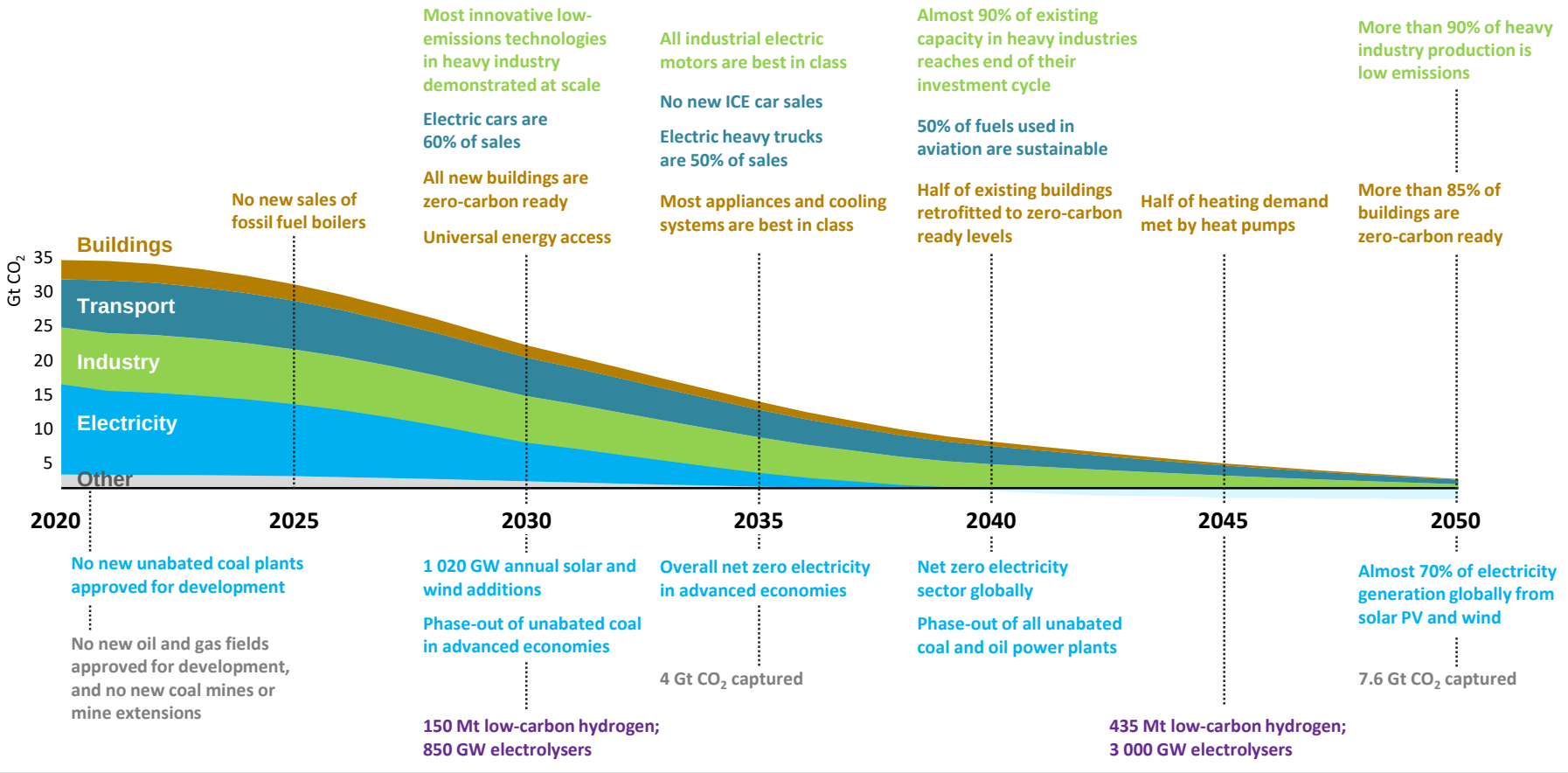
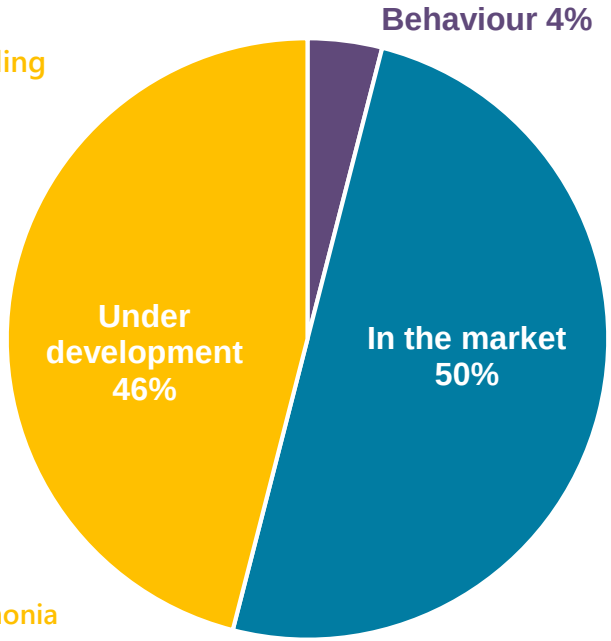
Set near-term milestones to get on track for long-term targets



Prepare for the next phase of the transition by boosting innovation

CO_2 savings by technology maturity in 2050, NZE scenario



Refrigerant-free advanced cooling

Advanced batteries

Next-generation biofuels

CO_2 capture from cement

Hydrogen-based steel

Small modular reactors

Synthetic liquid fuels

Electrolytic hydrogen for ammonia

Autonomous trucks

Optimised heat pump with storage

Direct air capture

Ammonia-powered ships

Electrolytic hydrogen for methanol

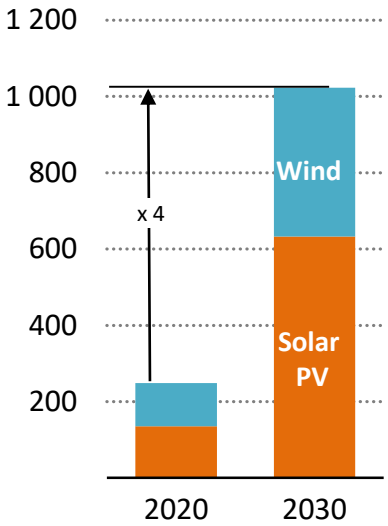
Building-integrated storage

Electric steam crackers

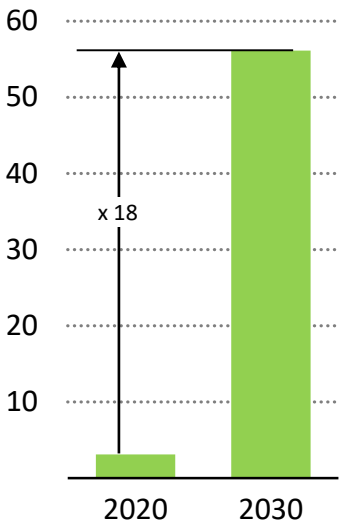
Unlocking the next generation of low-carbon technologies requires more clean energy R&D and $90 billion in demonstrations by 2030; without greater international co-operation, global CO_2 will not fall to net-zero by 2050.

Make the 2020s the decade of massive clean energy expansion

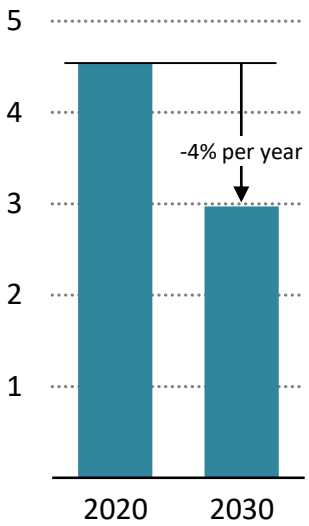
Solar PV and wind capacity additions (GW)



Electric car sales (millions)

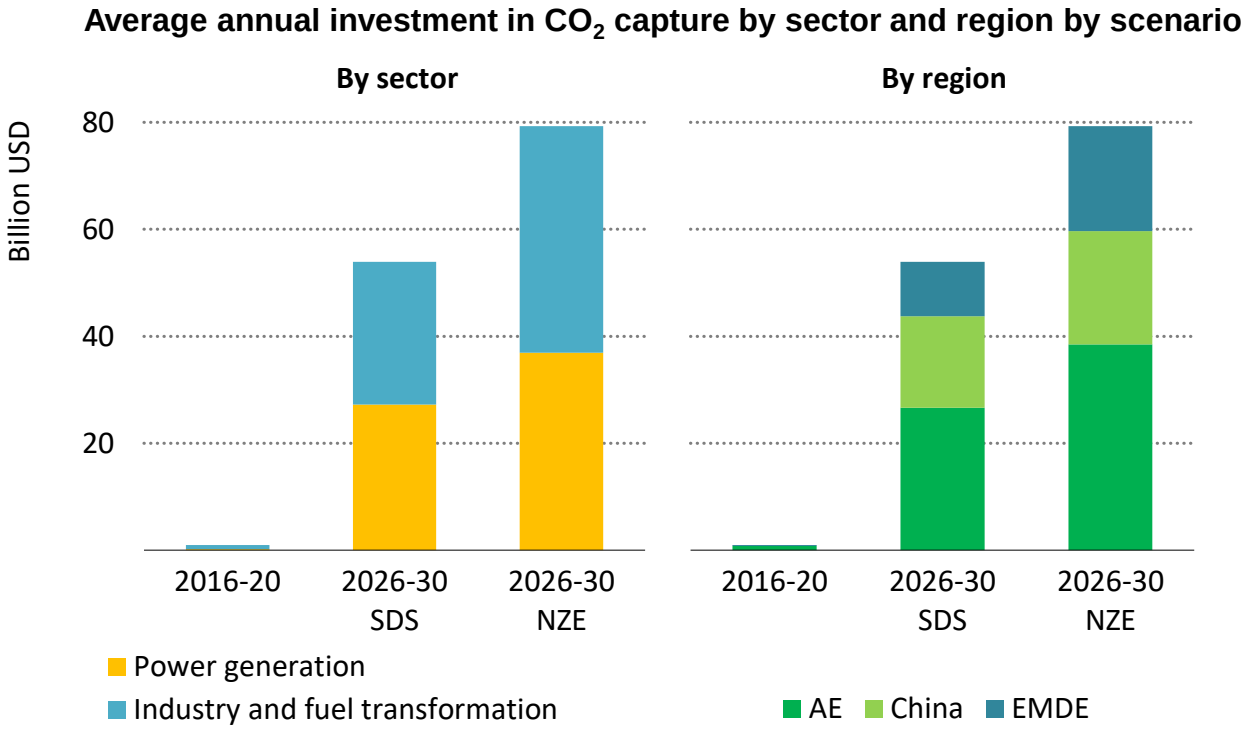


Energy intensity of GDP (MJ per USD PPP)



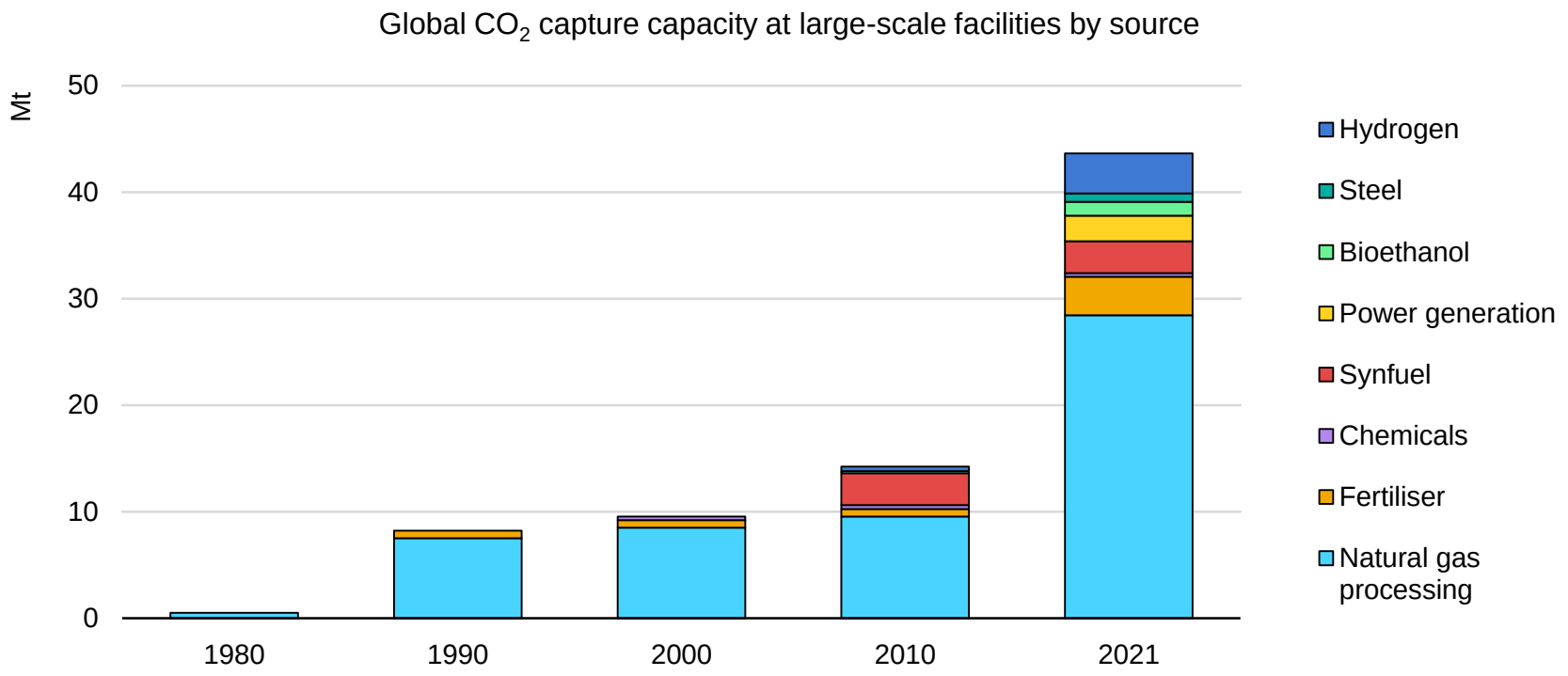
Technologies for achieving the necessary deep cuts in global emissions by 2030 exist, but staying on the narrow path to net-zero requires their immediate and massive deployment.

Investment in CCUS ramps up quickly



Meeting emissions reduction goals in climate-driven scenarios requires a ramp-up in CCUS investment in power, industry and hydrogen production.

Experience with CCUS has expanded in the last decade



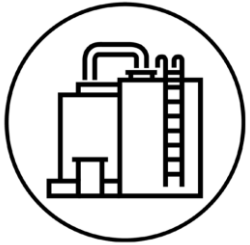
Carbon capture facilities have been operating since the 1970s, with the number and type of applications expanding in the last decade

Four strategic roles for CCUS in energy transitions

1. Tackling emissions from existing infrastructure

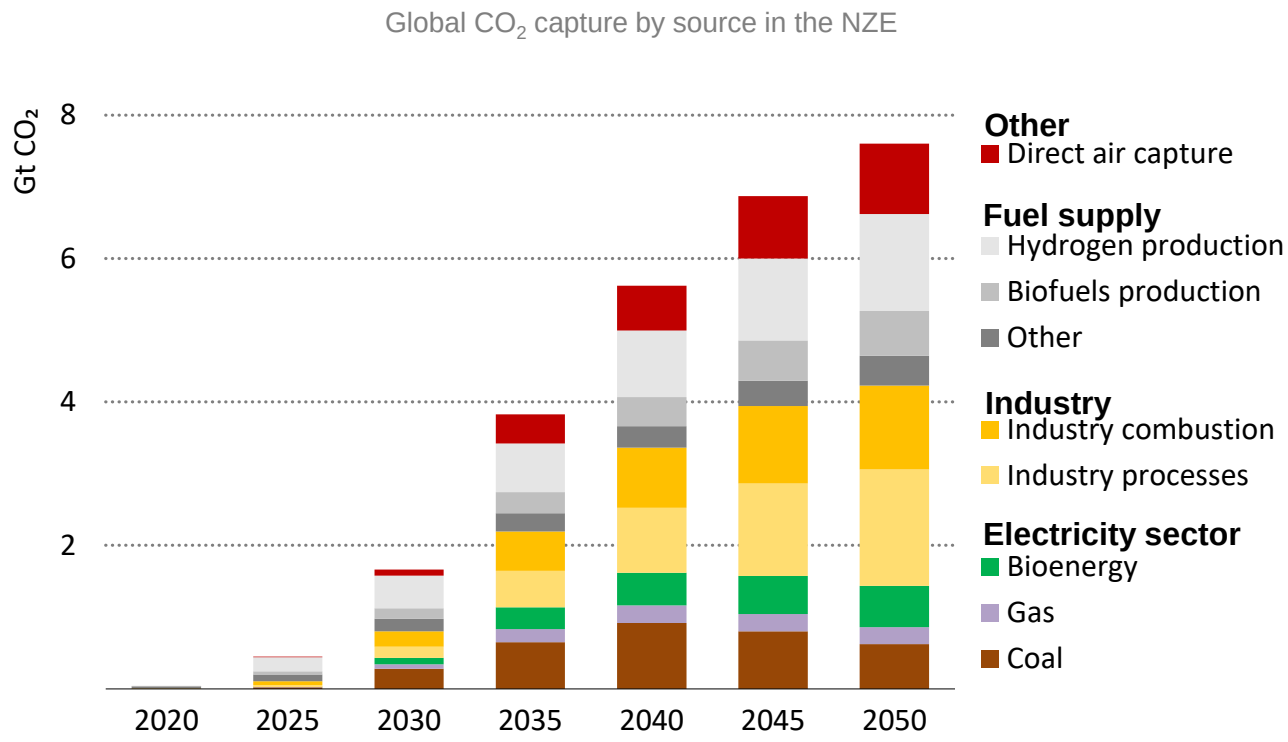
2. A solution for hard-to-abate emissions

3. Platform for low-carbon hydrogen production



4. Carbon removal

A rapid scale-up of CCUS is required



By 2050, 7.6 Gt of CO_2 is captured per year from a diverse range of sources
2.4 Gt CO_2 is captured from bioenergy use and DAC, of which 1.9 Gt CO_2 is permanently stored

Government and industry action this decade is crucial

- Four high-level priorities for governments and industry would accelerate the progress of CCUS over the next decade:

1. Create the conditions for CCUS investment
2. Target the development of industrial hubs with shared CO_2 infrastructure
3. Identify and encourage the development of CO_2 storage
4. Boost innovation for critical CCUS technologies