



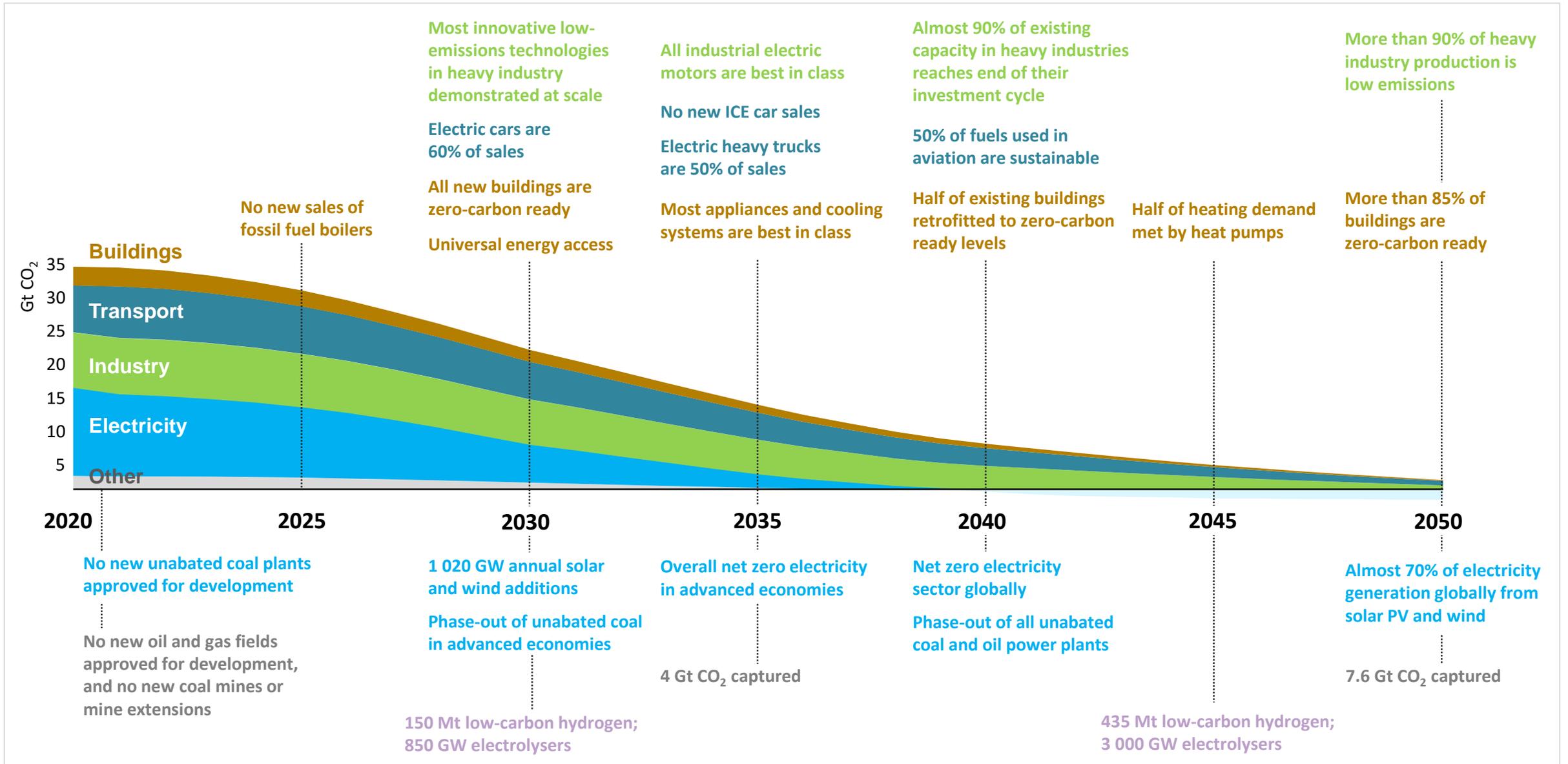
Net Zero by 2050: A Roadmap for the Global Energy Sector

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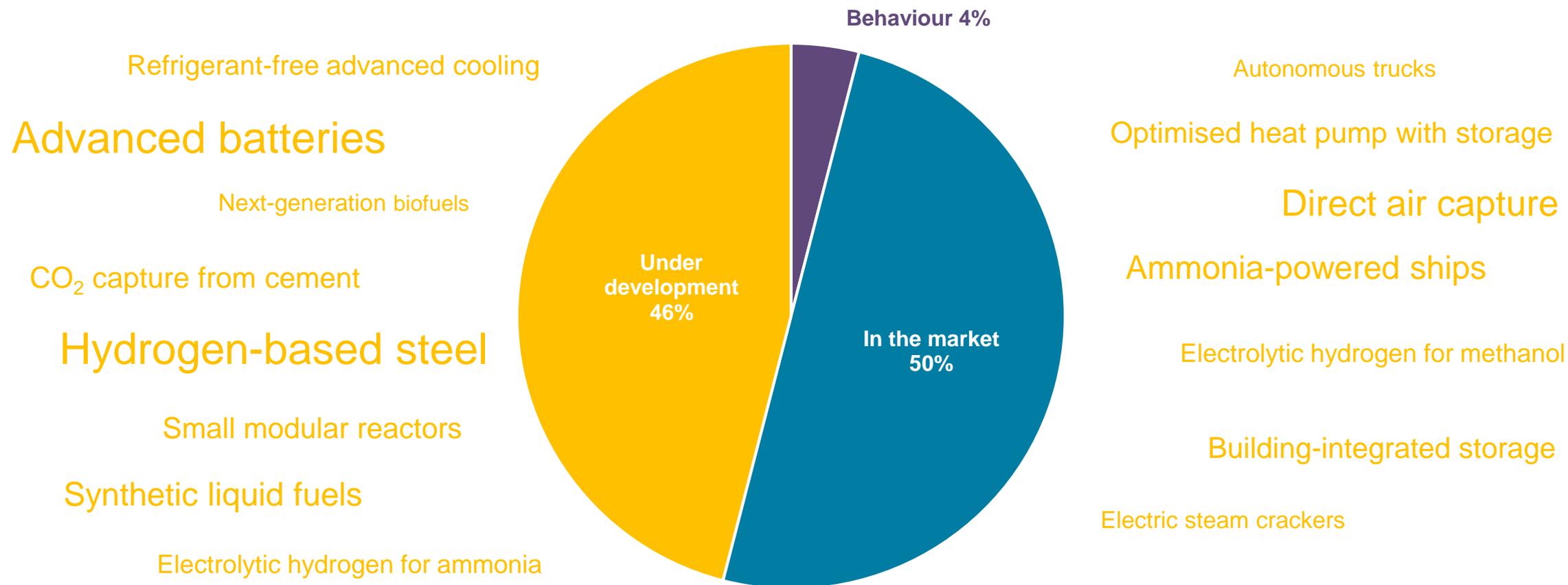
The Whitehall & Industry Group, August 2021

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



Prepare for the next phase of the transition by boosting innovation

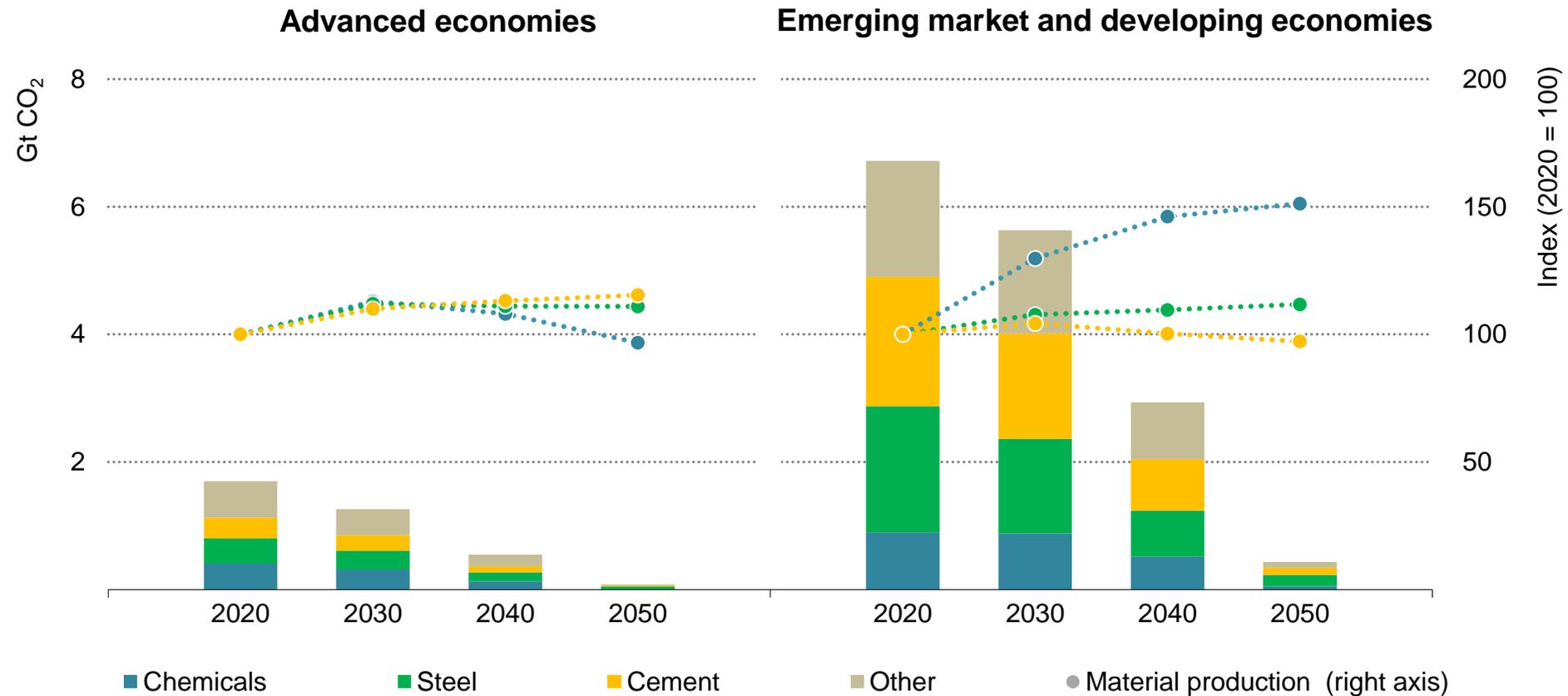
CO₂ savings by technology maturity in 2050, NZE scenario



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 CO₂ will not fall to net-zero by 2050.

Dramatic reductions in industrial CO₂ emissions are required

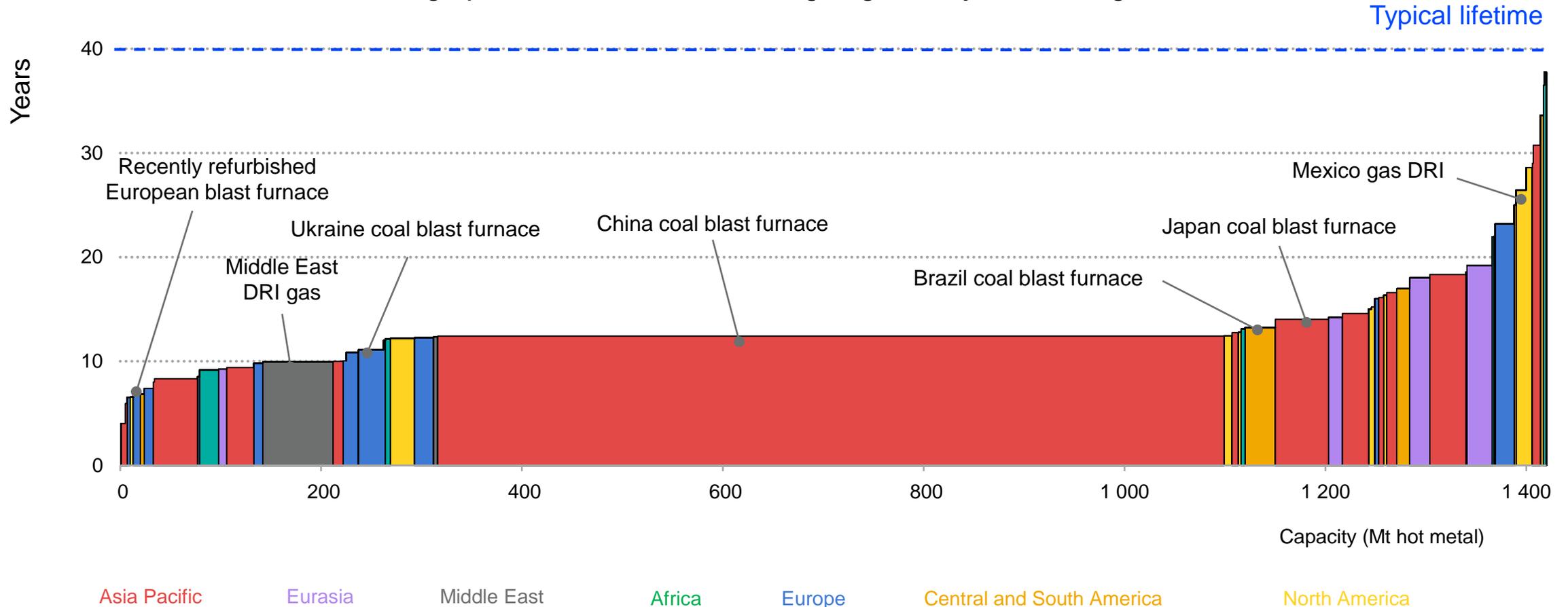
Global CO₂ emissions from industry by sub-sector in the NZE



The majority of residual emissions in industry in 2050 come from heavy industries in emerging market and developing economies

Where do we start in industry? Examining existing assets

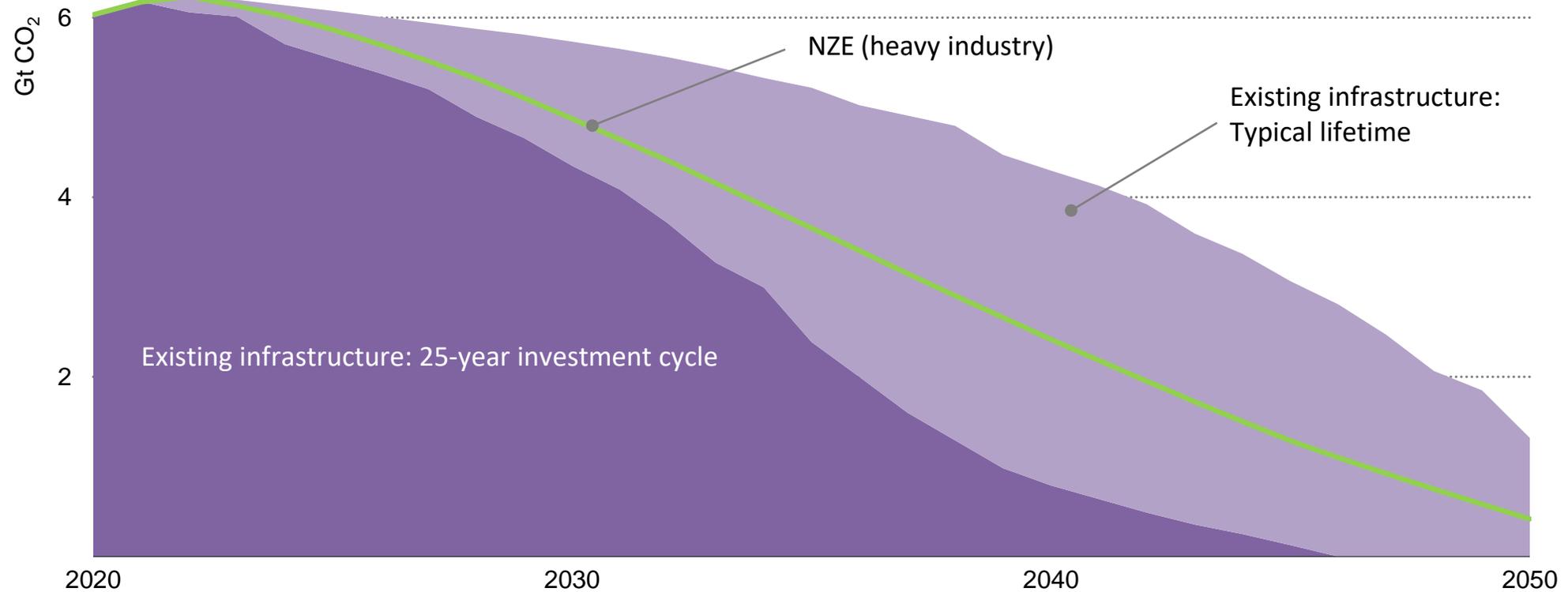
Geographic distribution and average age of key ironmaking assets



**Around 60% of the existing stock of ironmaking equipment is based in China.
The current stock is quite young, with a global average age of 13 to 14 years for blast furnaces and DRI furnaces.**

Addressing CO₂ emissions from heavy industry

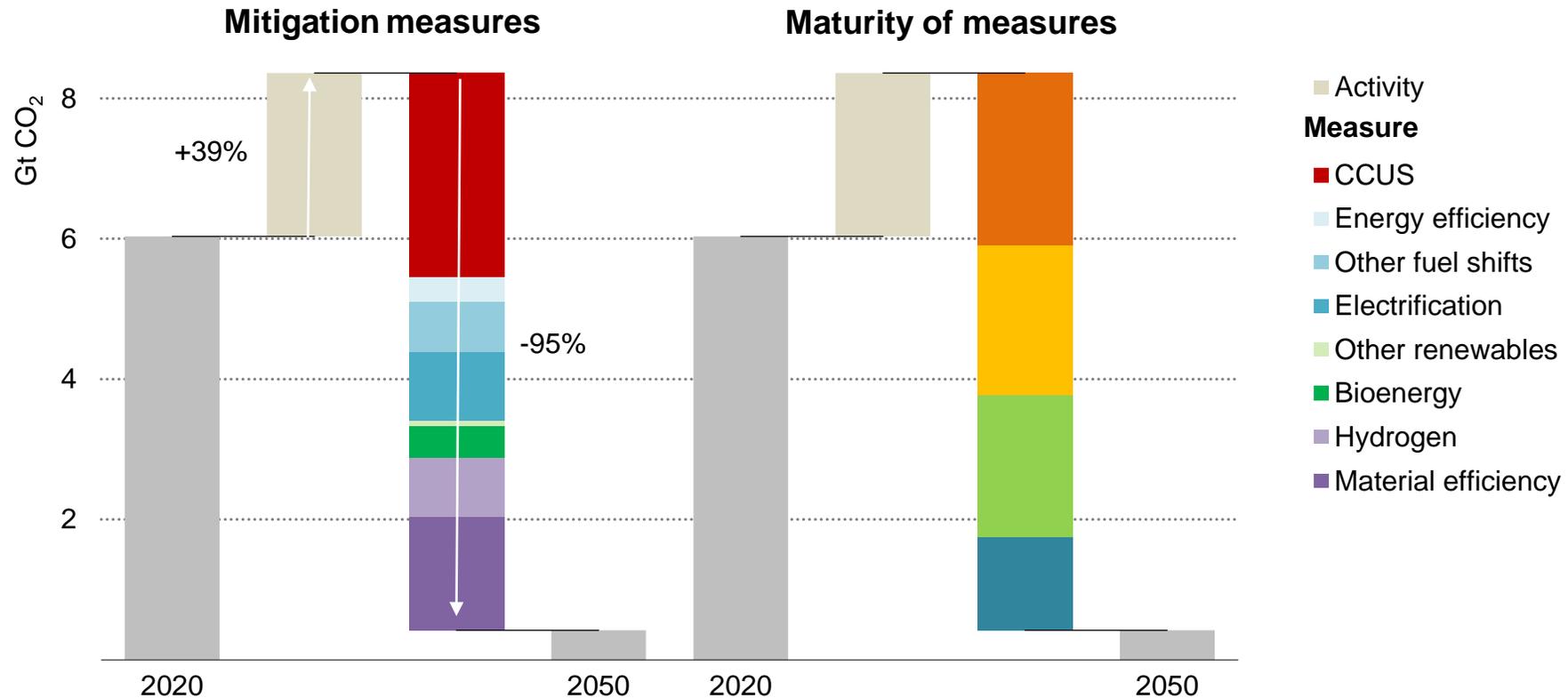
CO₂ emissions from existing heavy industrial assets in the NZE



Intervening at the end of the next 25-year investment cycle could help unlock 60 Gt CO₂, around 40% of projected emissions from existing heavy industry assets

Addressing CO₂ emissions from heavy industry

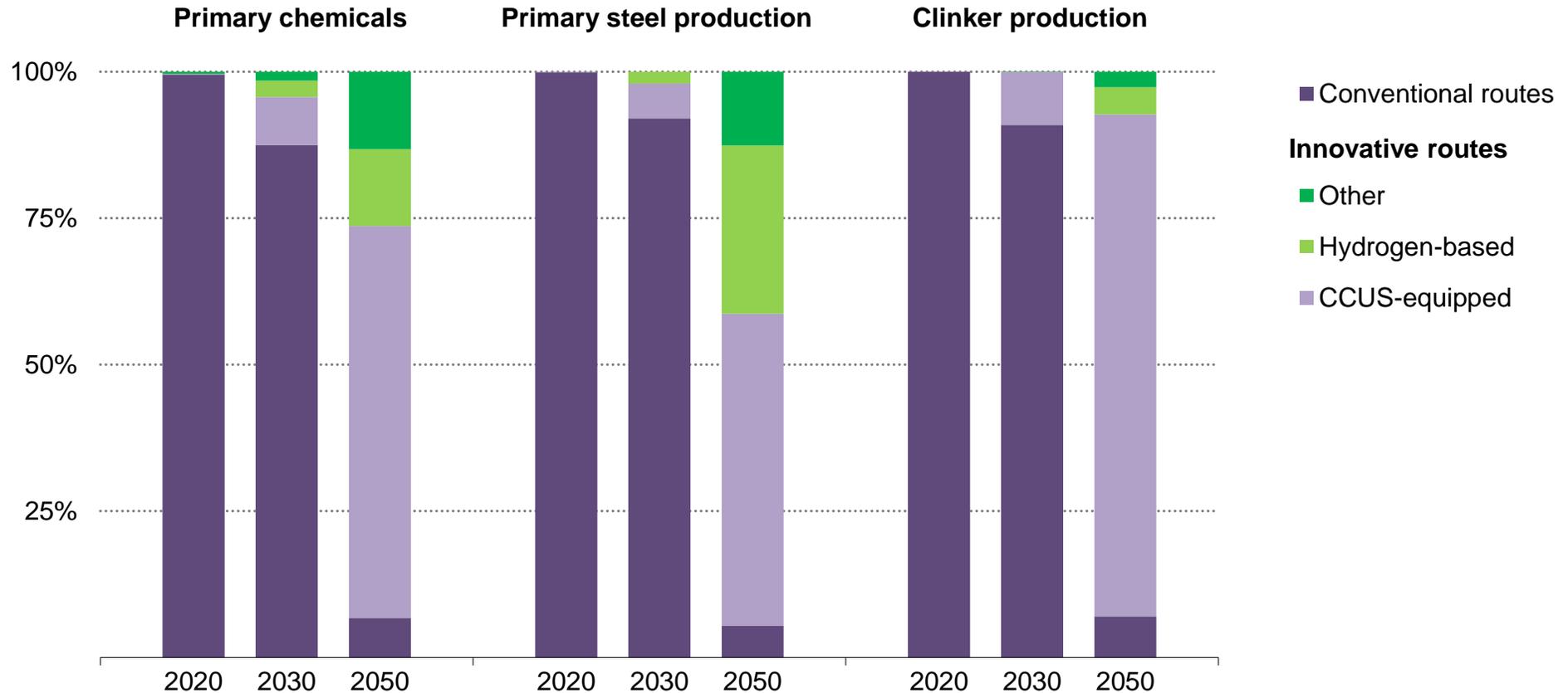
Global CO₂ emissions reductions in heavy industry by mitigation measure and technology maturity category in the NZE



An array of measures reduces emissions in heavy industry, with innovative technologies like CCUS and hydrogen playing a critical role

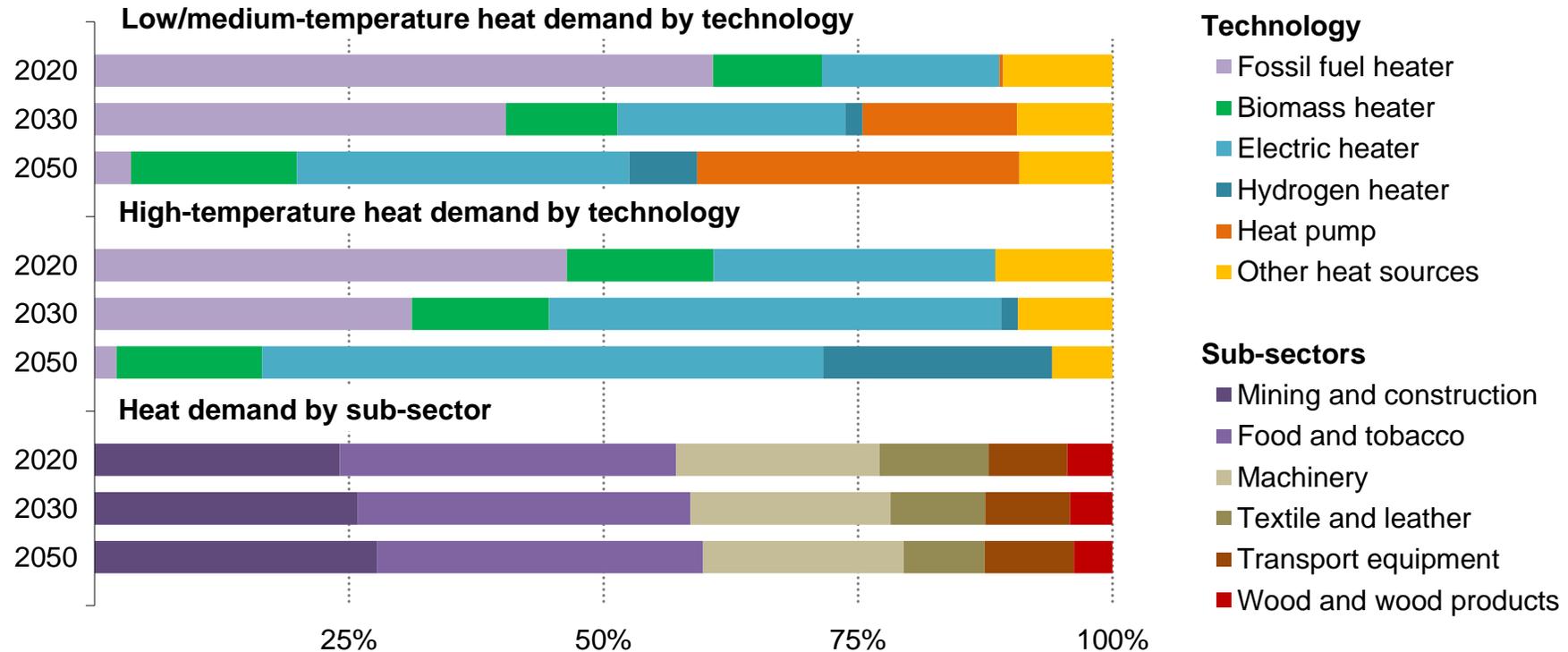
Innovative technology deployment in heavy industry

Share of innovative technology deployment in heavy industries in the NZE



Near-zero emissions routes dominate cement, primary steel and chemicals production by 2050, with key roles for CCUS and hydrogen-based technologies

Share of heating technologies in light industries in the NZE



The share of electricity in satisfying heat demand for light industries rises from less than 20% today to around 40% in 2030 and about 65% in 2050

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