



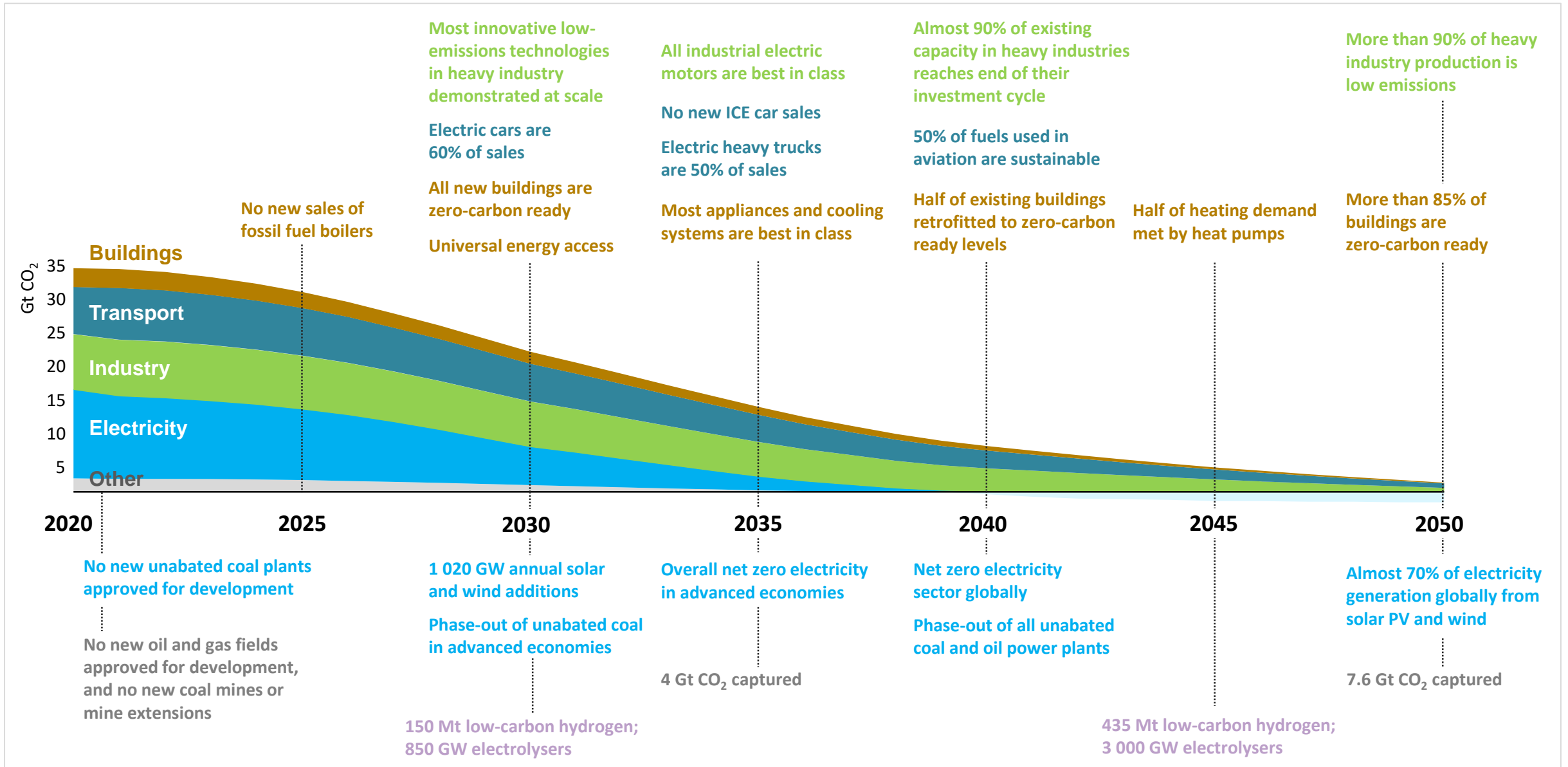
# **Net Zero by 2050: A Roadmap for the Global Energy Sector**

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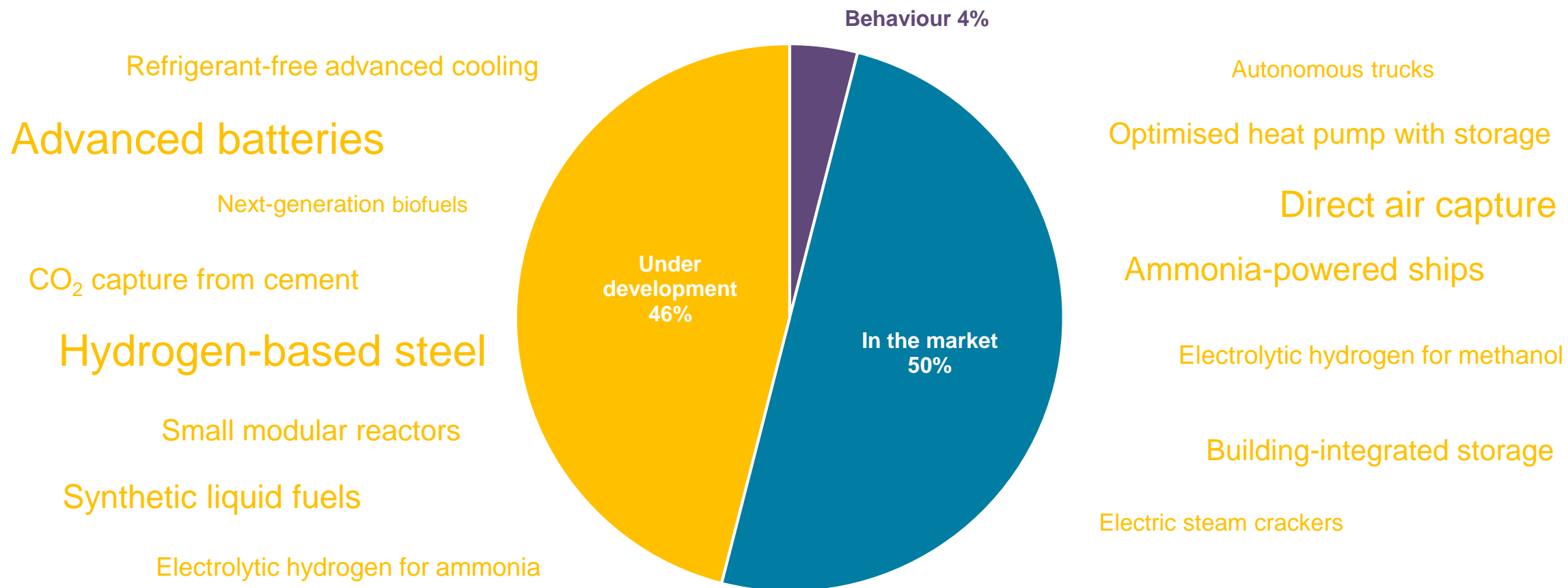
The Whitehall & Industry Group, August 2021

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



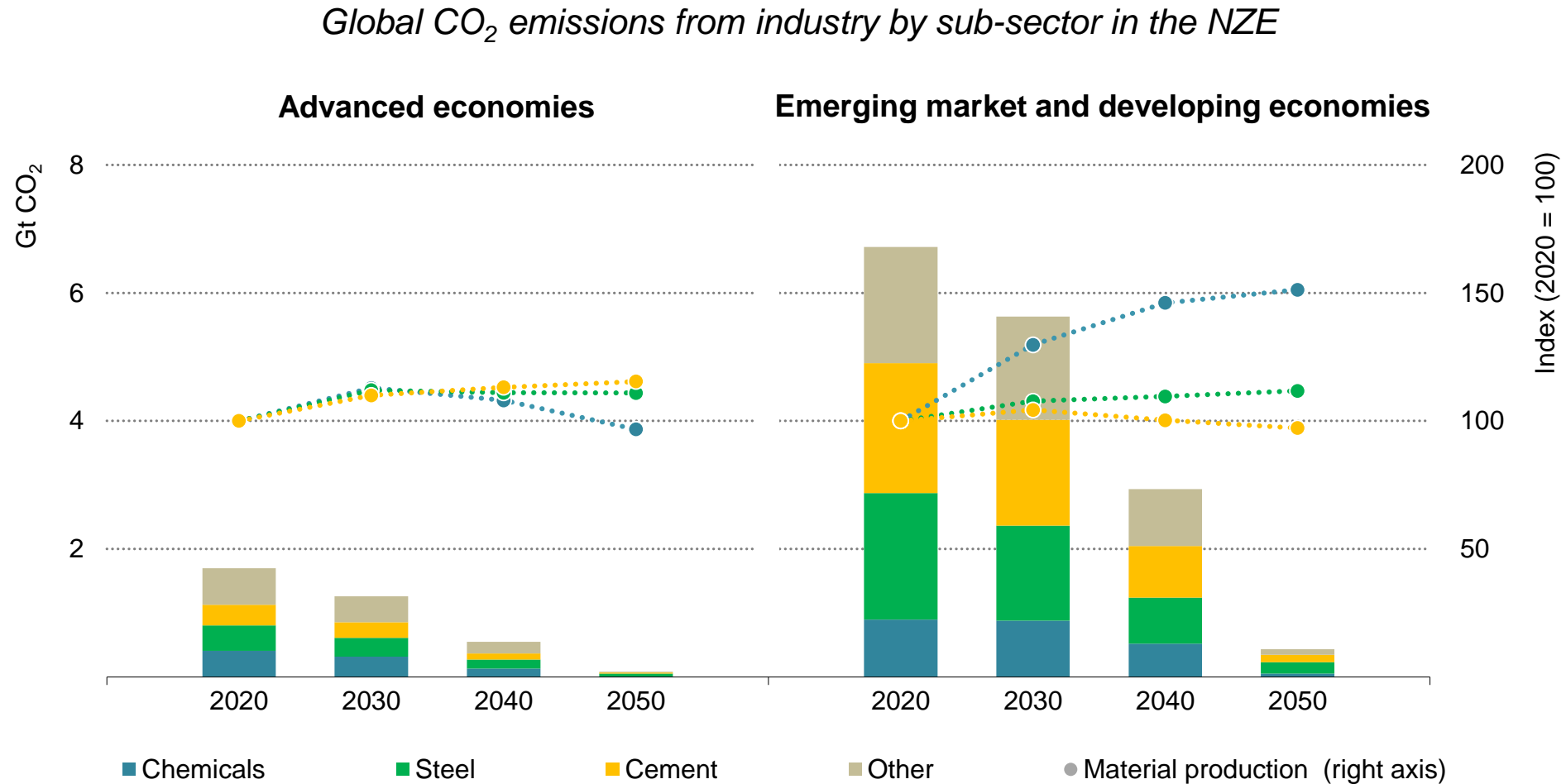
# Prepare for the next phase of the transition by boosting innovation

*CO<sub>2</sub> 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 CO<sub>2</sub> will not fall to net-zero by 2050.**

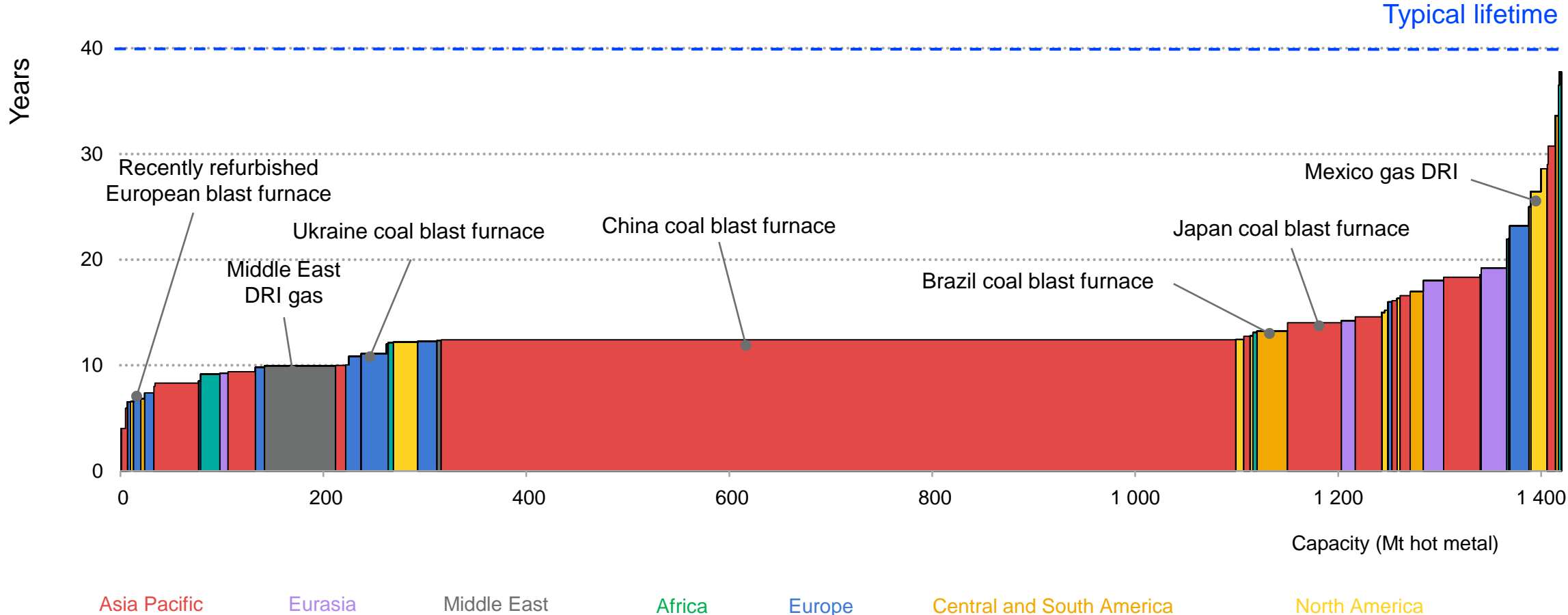
# Dramatic reductions in industrial CO<sub>2</sub> emissions are required



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

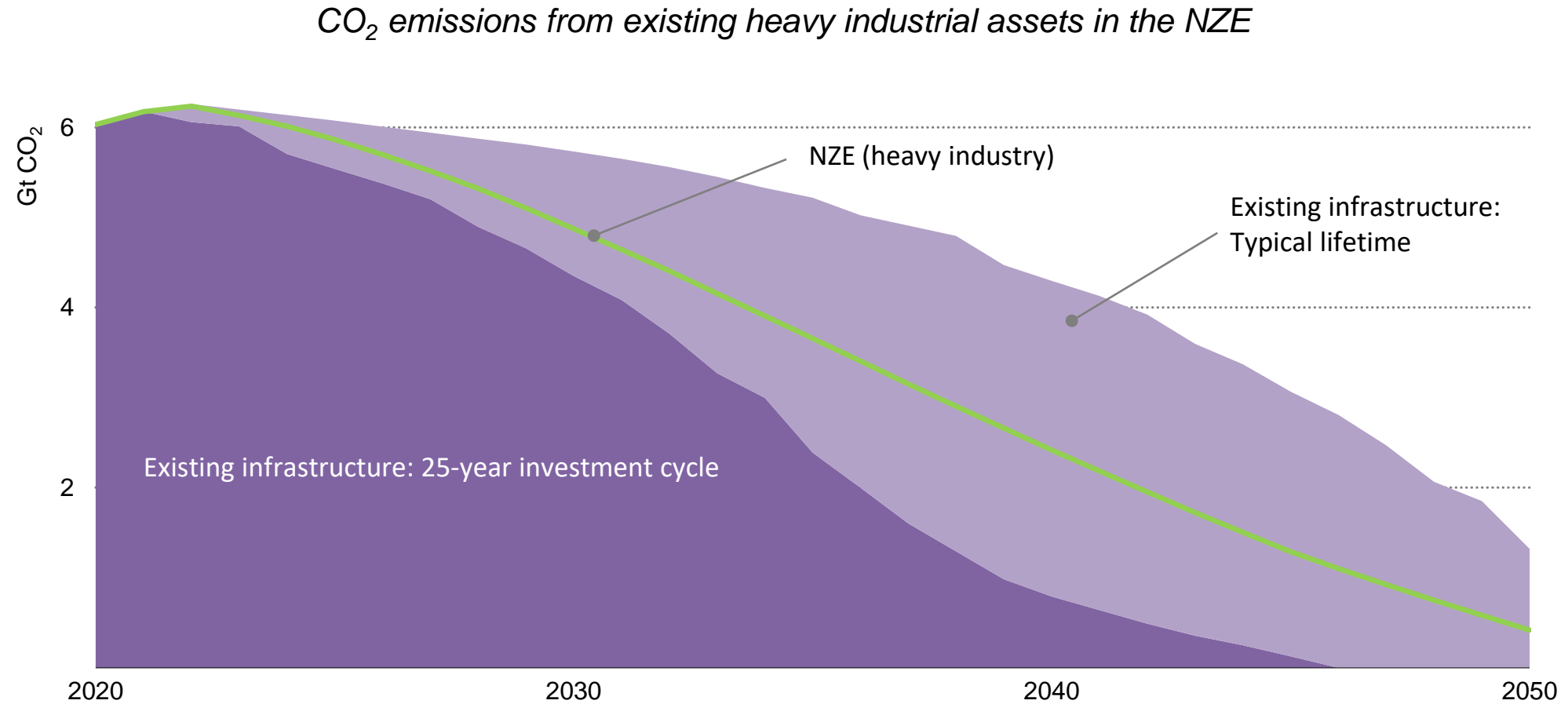
# Where do we start in industry? Examining existing assets

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.**

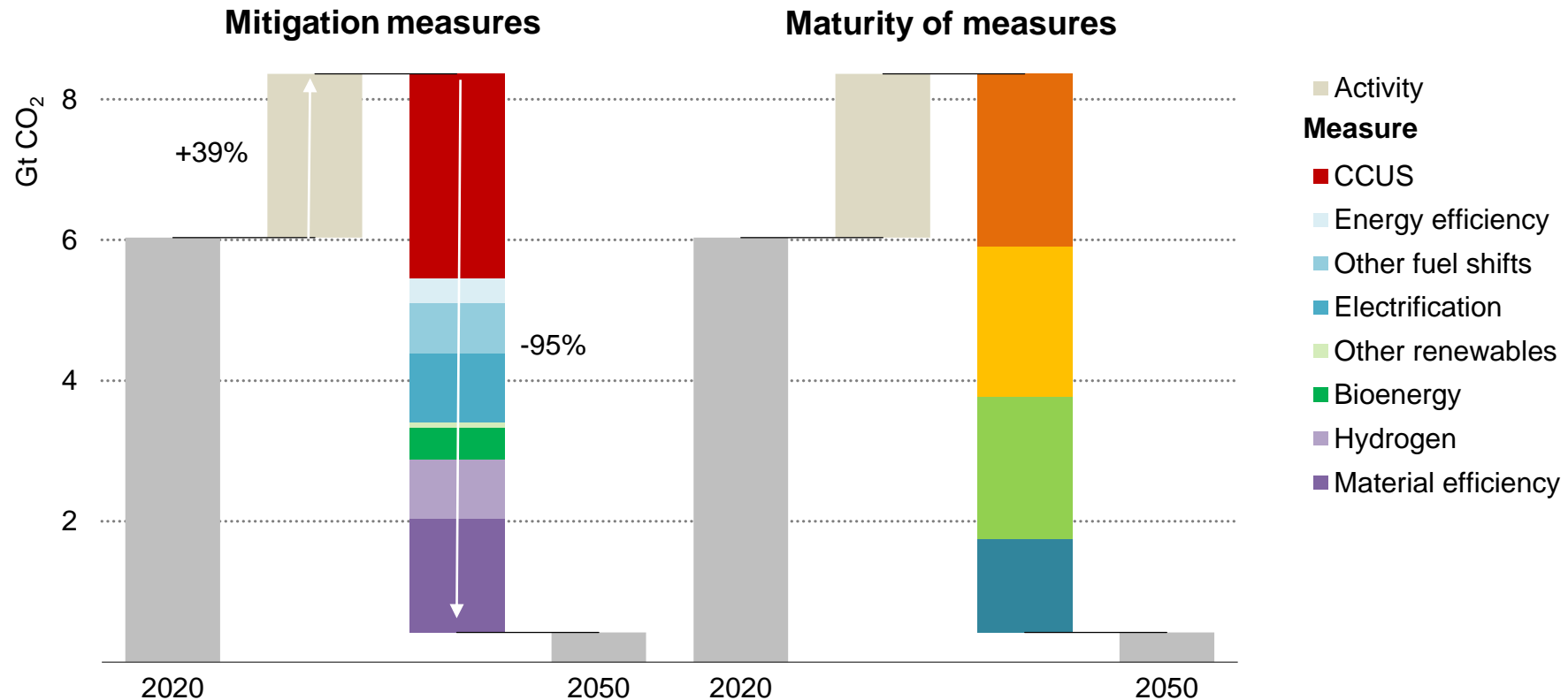
# Addressing CO<sub>2</sub> emissions from heavy industry



**Intervening at the end of the next 25-year investment cycle could help unlock 60 Gt CO<sub>2</sub>, around 40% of projected emissions from existing heavy industry assets**

# Addressing CO<sub>2</sub> emissions from heavy industry

*Global CO<sub>2</sub> 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**

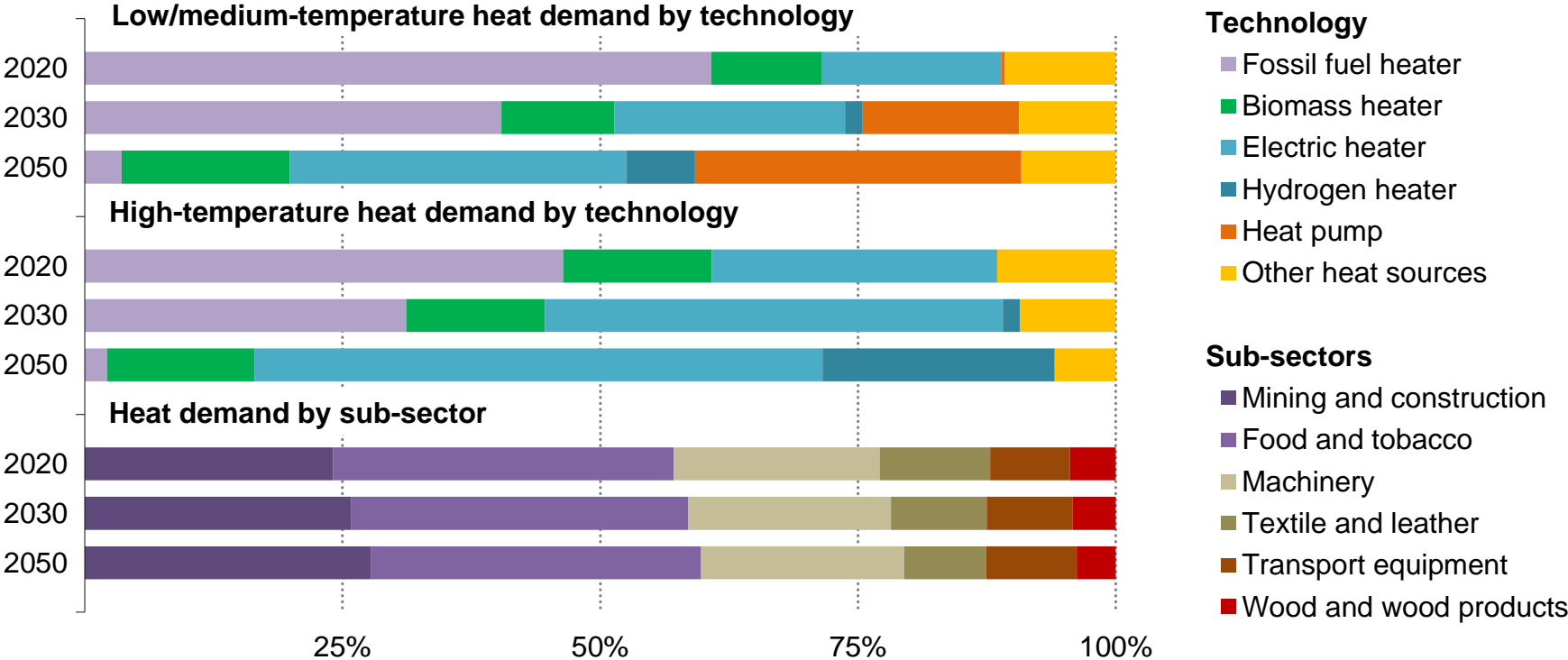
Share of innovative technology deployment in heavy industries in the NZE



**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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