



Net Zero by 2050: Focus on Industry

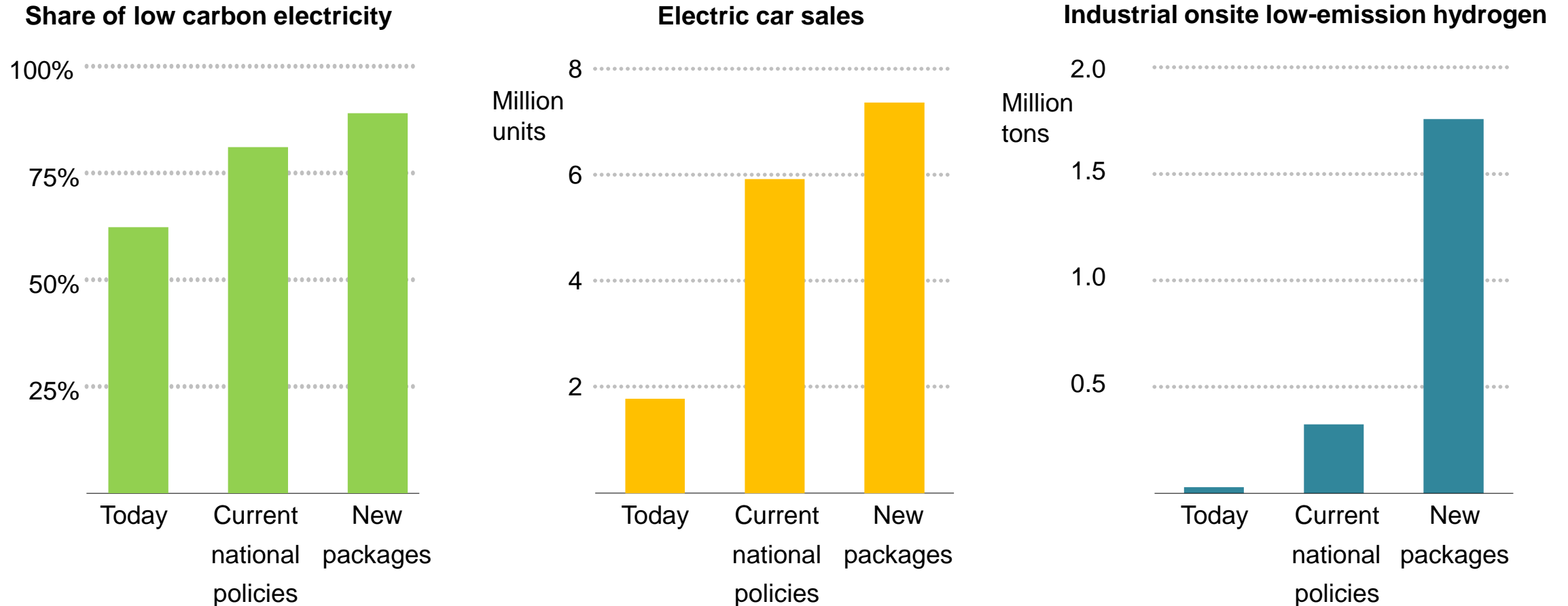
Araceli Fernandez, Technology Innovation Unit Head, International Energy Agency

Madrid, 22 November 2022

- **Policy** support continues to expand in key regions, including the US Inflation Record Act and REPowerEU
- **Renewable electricity capacity additions** are estimated to reach a record of 340 GW in 2022
- 300 **carbon capture and storage** projects are currently under development
- **Electrolyser** manufacturing capacity has doubled since last year
- Record growth in sales of **electric vehicles and heat pumps**
- Fully fossil-free **hydrogen-base steel production** has been successfully piloted for the first time

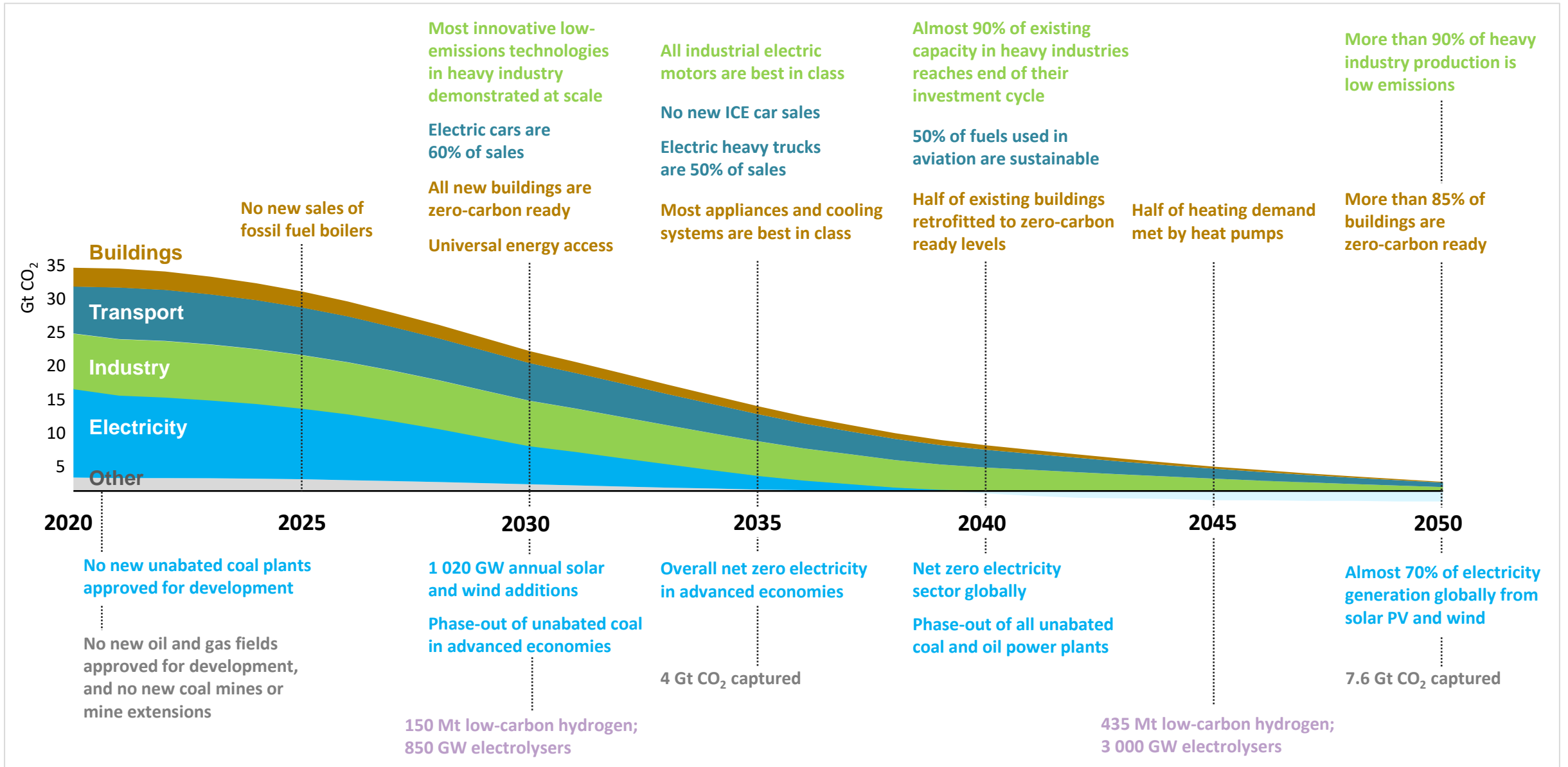
REPower EU and Fit for 55 accelerate clean energy technologies

Electricity generation and end use demand indicators by 2030 in the European Union



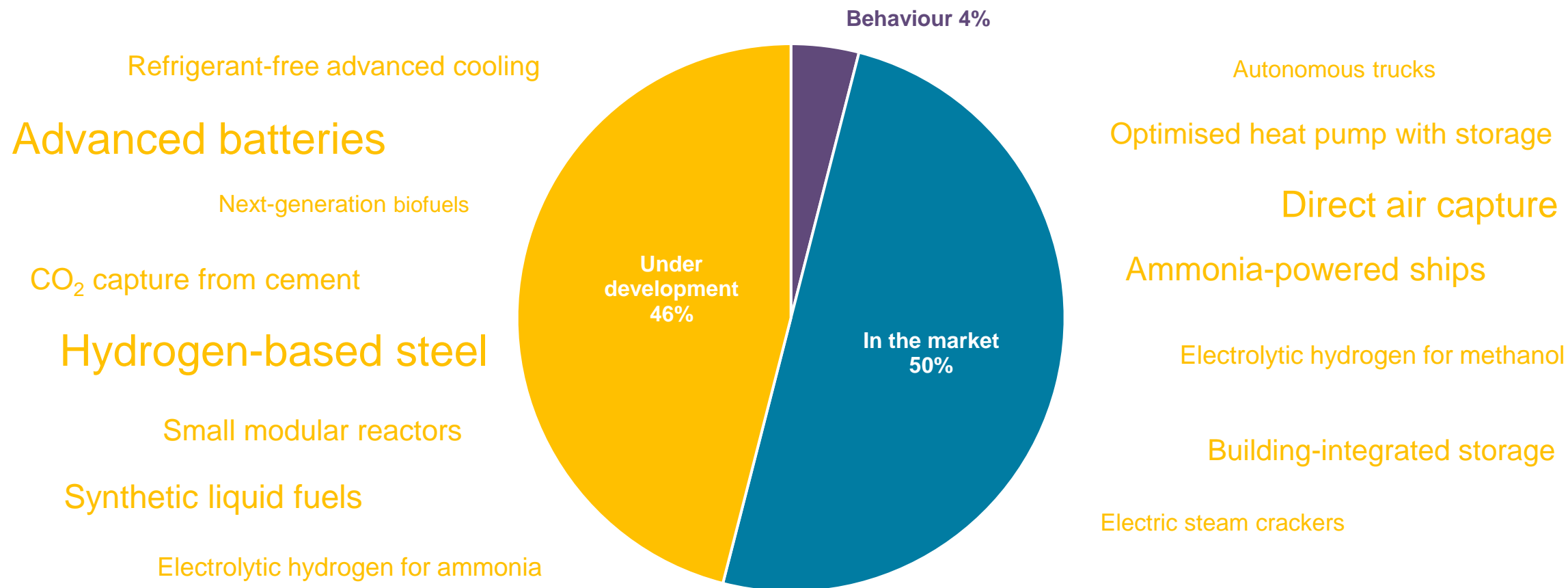
The Fit for 55 and REPower EU package accelerate the deployment of clean energy technologies and particularly the use of low emission hydrogen in the European Union

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



Prepare for the next phase of the transition by boosting innovation

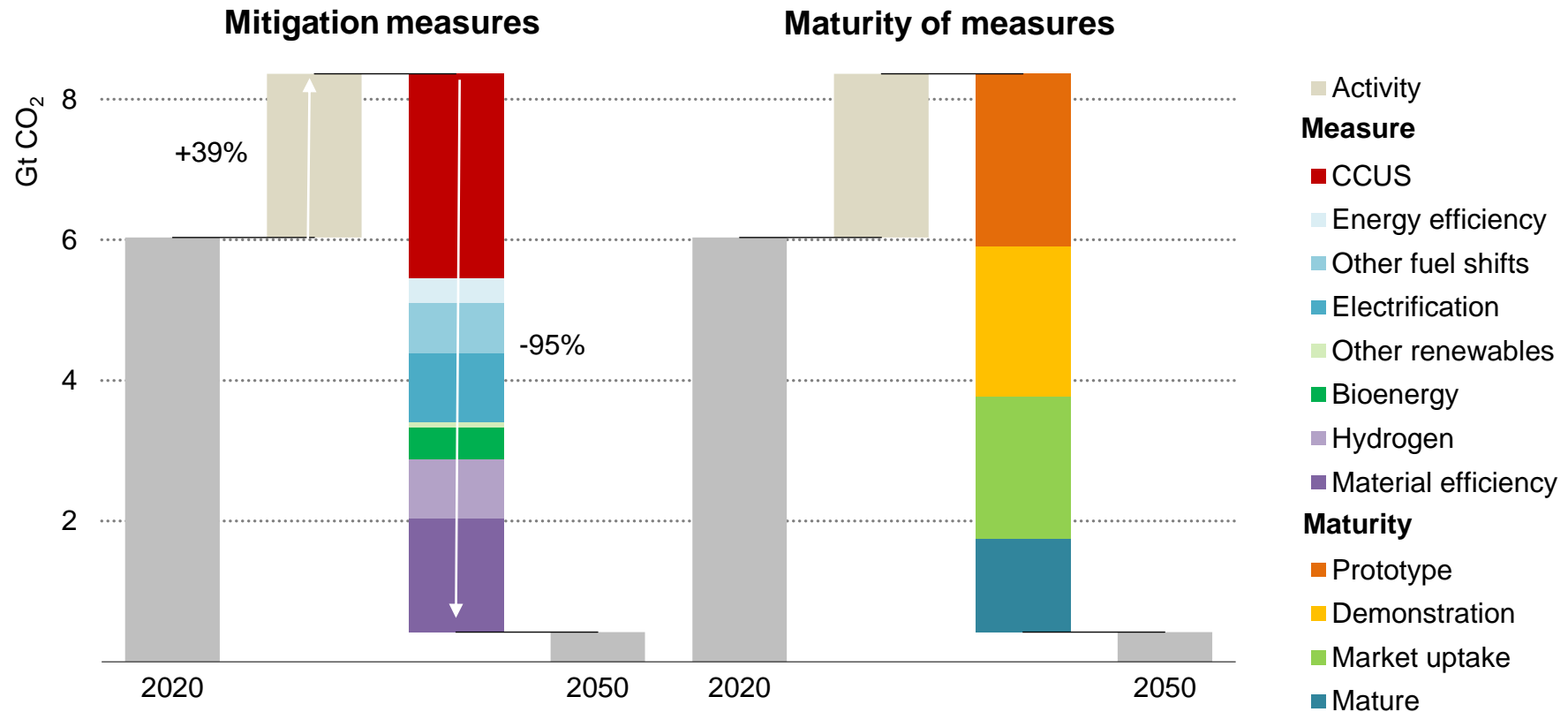
CO₂ savings by technology maturity in 2050, NZE scenario



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.

Addressing CO₂ emissions from heavy industry

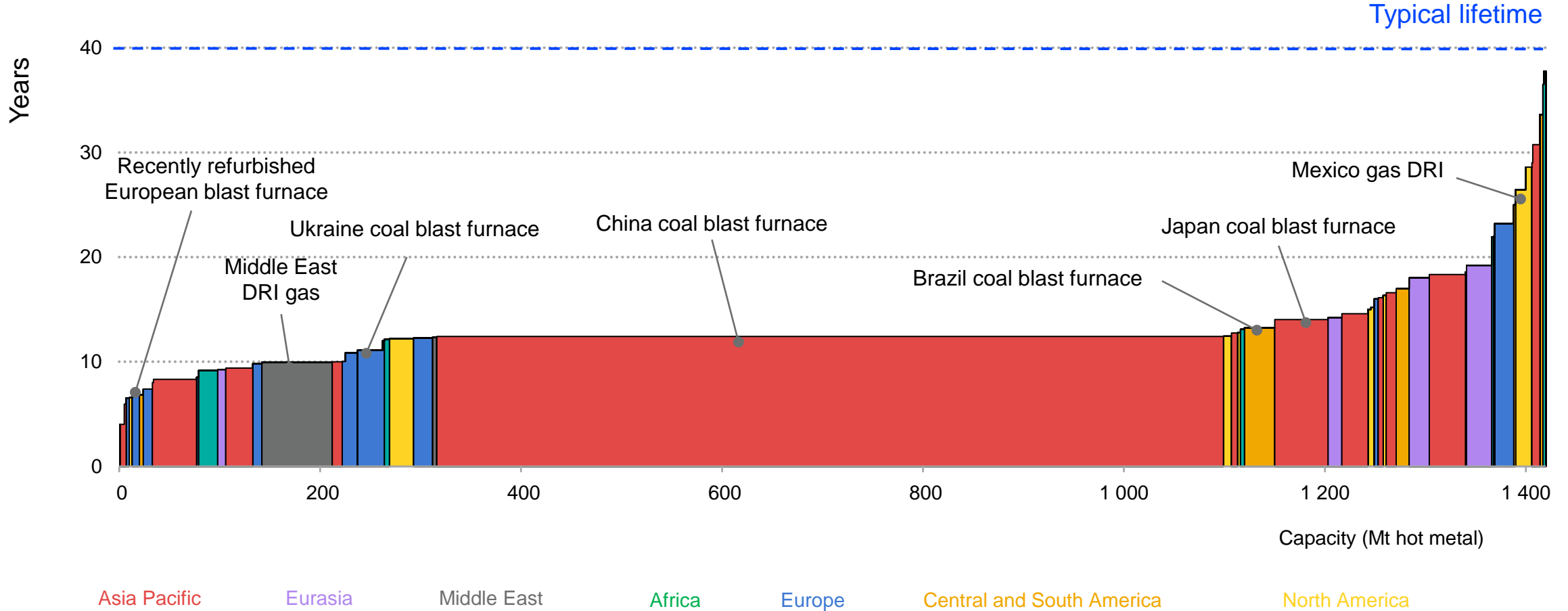
Global CO₂ emissions reductions in heavy industry by mitigation measure and technology maturity category in the NZE



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

Tackling emissions from existing assets

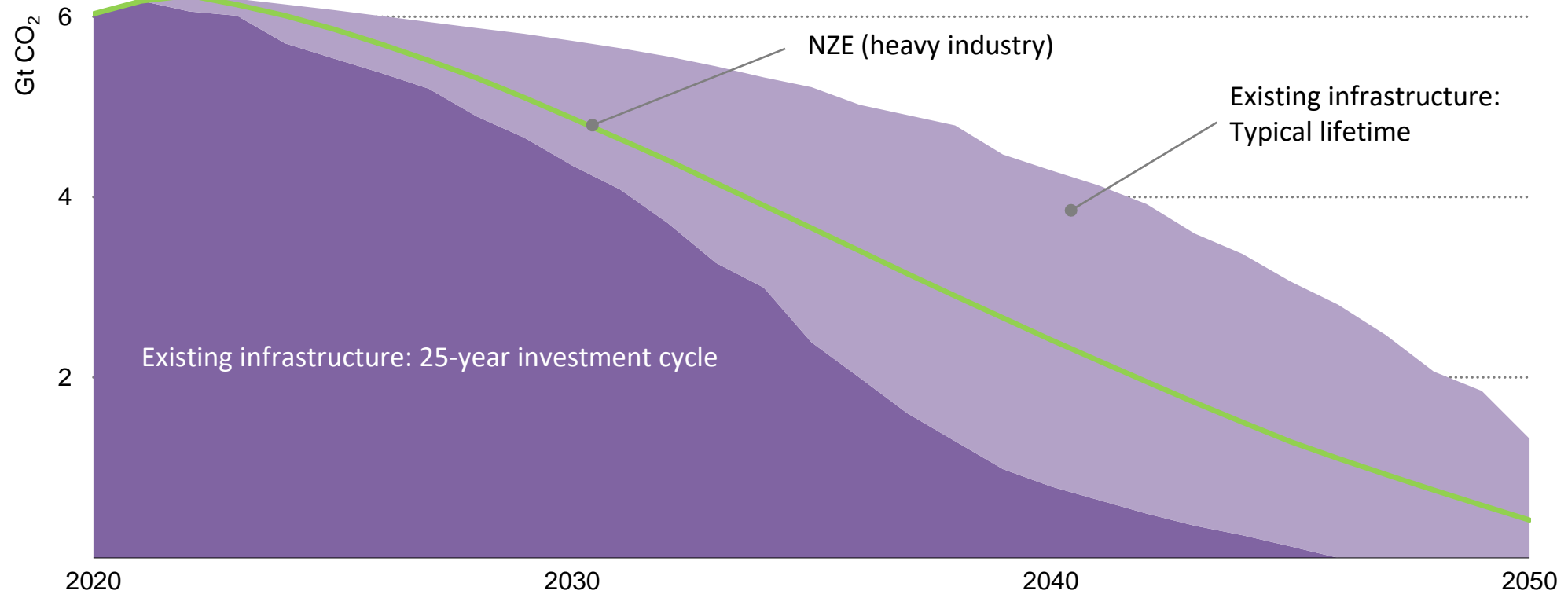
Geographic distribution and average age of key ironmaking assets



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.

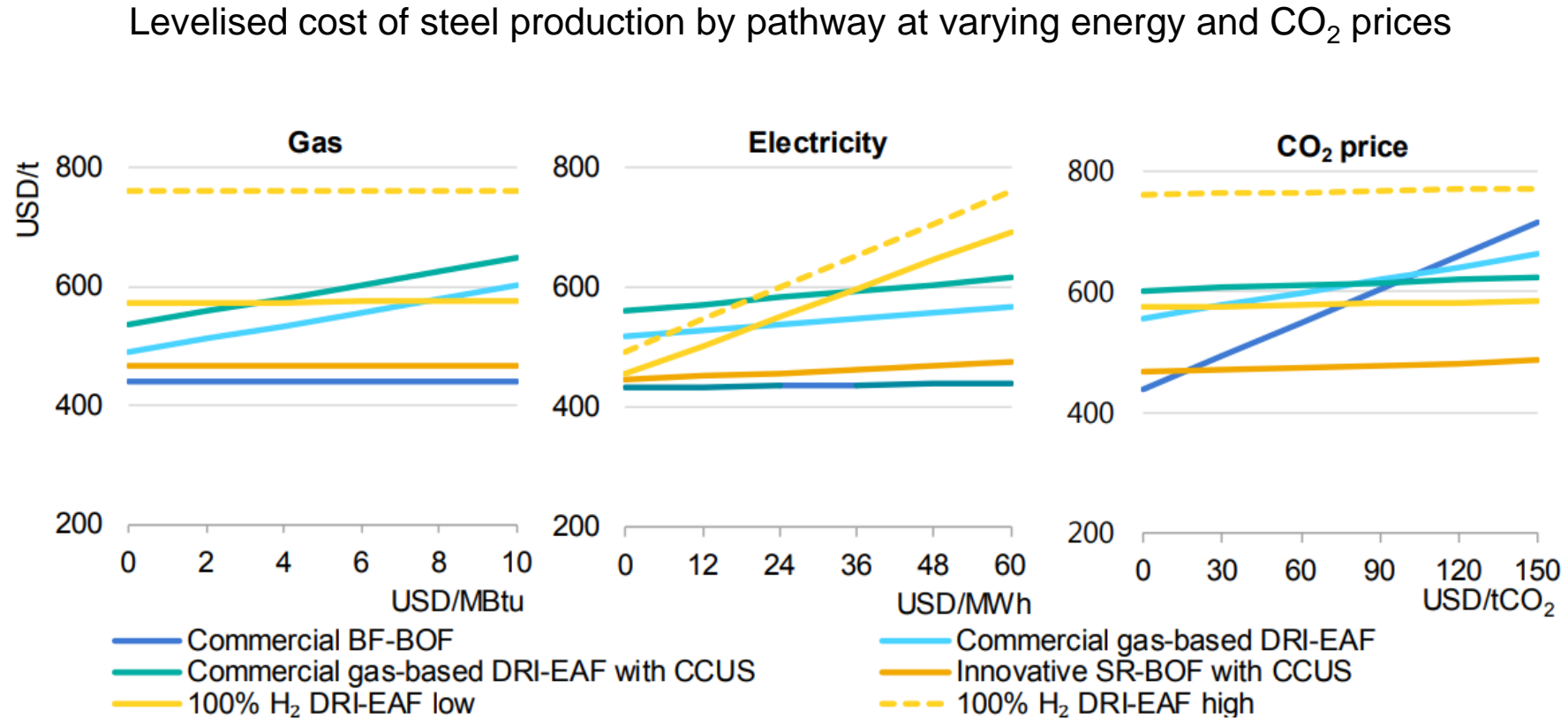
Addressing CO₂ emissions from heavy industry

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

Key factors affecting material production costs

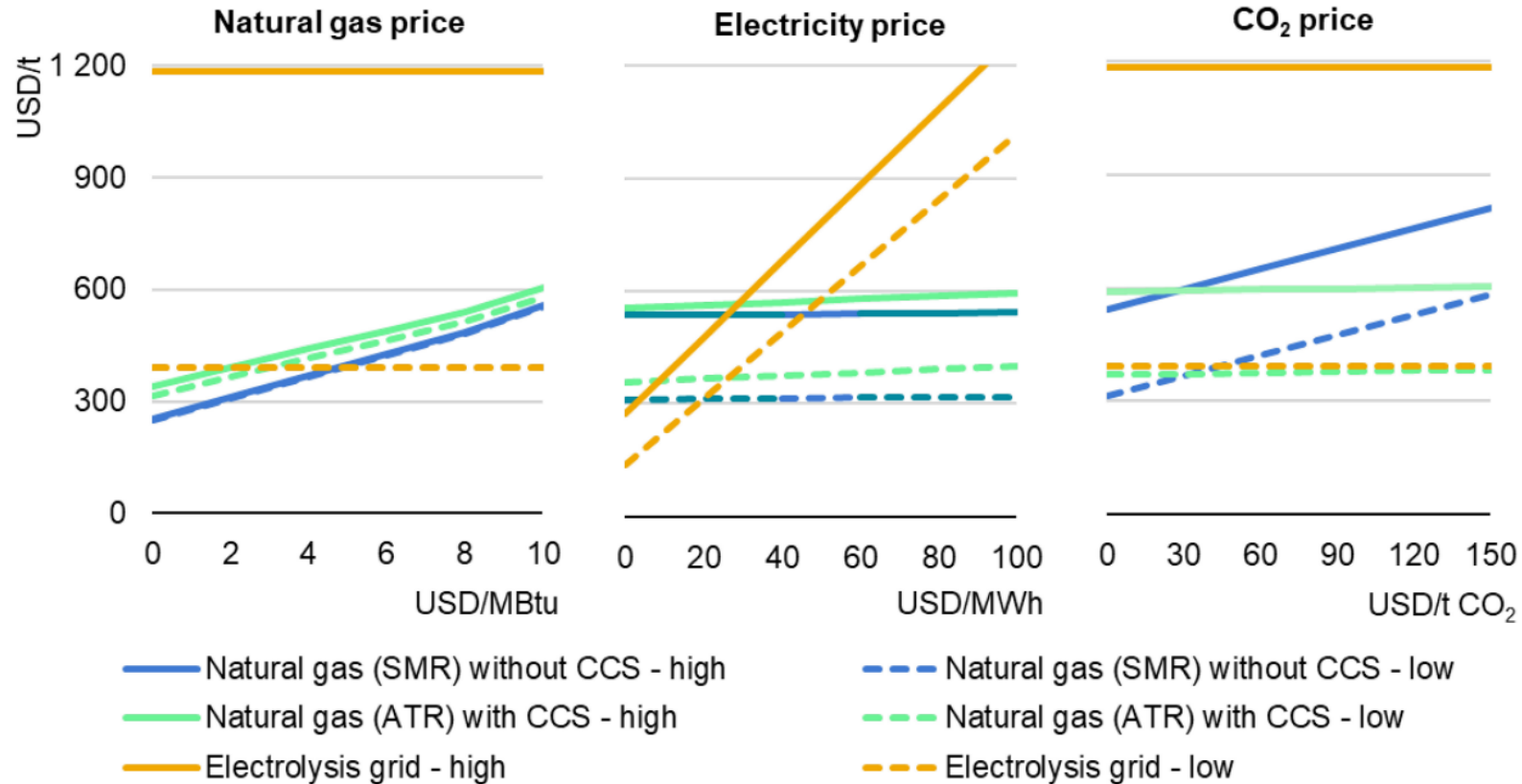


Source: [IEA Iron and Steel Technology Roadmap](#)

At a gas price of USD 6/MBtu, the hydrogen-based DRI route becomes competitive with its gas-based counterpart equipped with CCS at electricity prices below USD 35/MWh

Key factors affecting material production costs

Levelised cost of ammonia production by pathway at varying energy and CO₂ prices



Source: [IEA Ammonia Technology Roadmap](#)

Electricity prices of about USD 40/MWh or lower are required for electrolysis to be cost-competitive with natural gas-based ammonia production with or without CCUS. CCS in gas-based ammonia becomes competitive at CO₂ prices of USD 30/t CO₂.

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

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