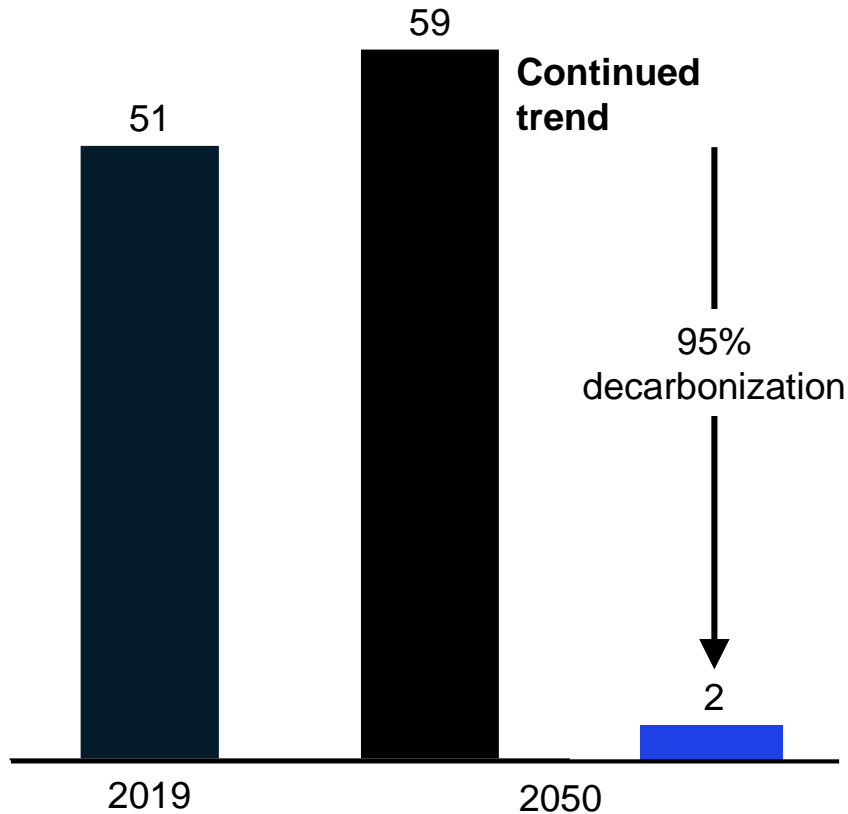


Role of hydrogen in the energy transition and implications for Italy

October 11th, 2019

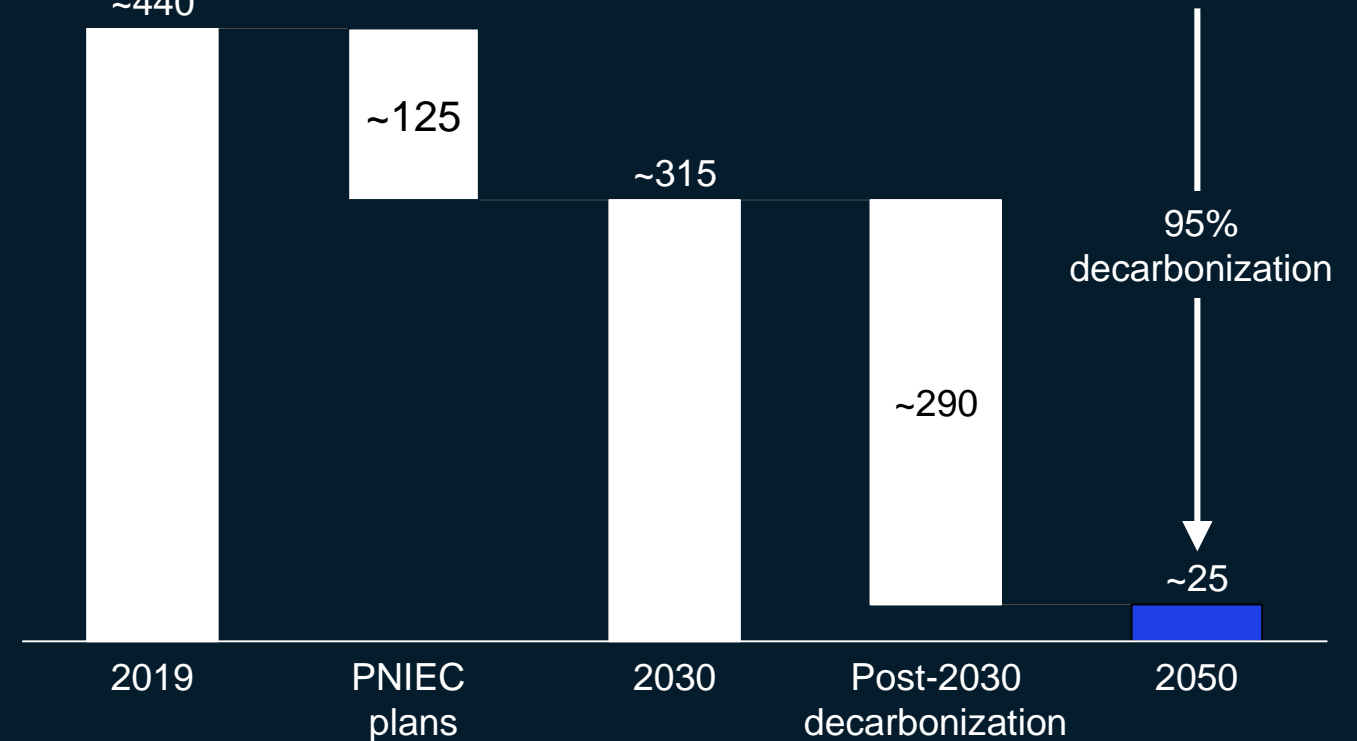
Global emissions need to fall rapidly

Global greenhouse gas emissions,
GtCO₂e



Italy defined the PNIEC as a first step to achieve its 2050 climate target

Italian greenhouse gas emissions,
MtCO₂e



Hydrogen can play 7 different roles in a decarbonized energy system

Enable the renewable energy system



Enable large-scale renewables integration and power generation



Distribute energy across sectors and regions



Buffer to increase system resilience



Decarbonize end uses



Decarbonize transportation



Help decarbonize building heating and power



Decarbonize industry energy use

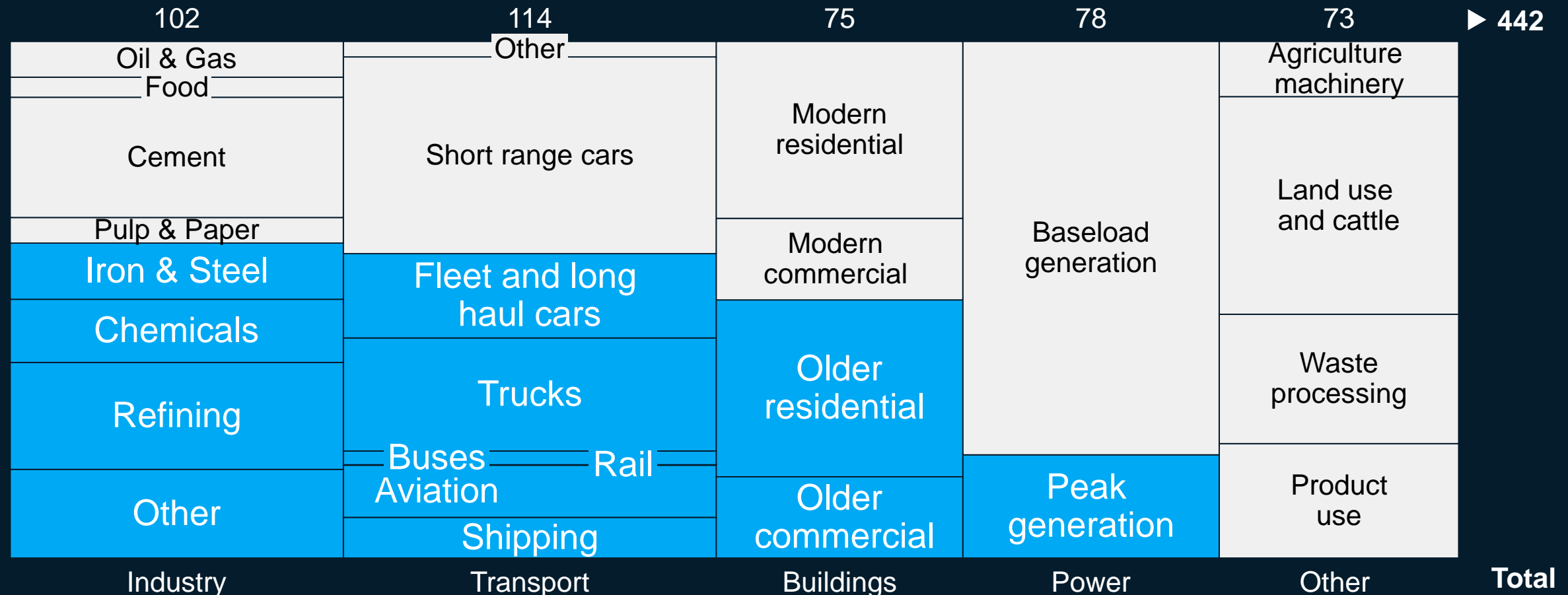


Serve as renewable feedstock

Hydrogen can abate emissions in hard-to-decarbonize sectors

Greenhouse gas emissions Italy,
MtCO₂e

■ Sectors where hydrogen can contribute



The production cost of hydrogen is set to decline rapidly in the coming years

Hydrogen production routes

Green hydrogen



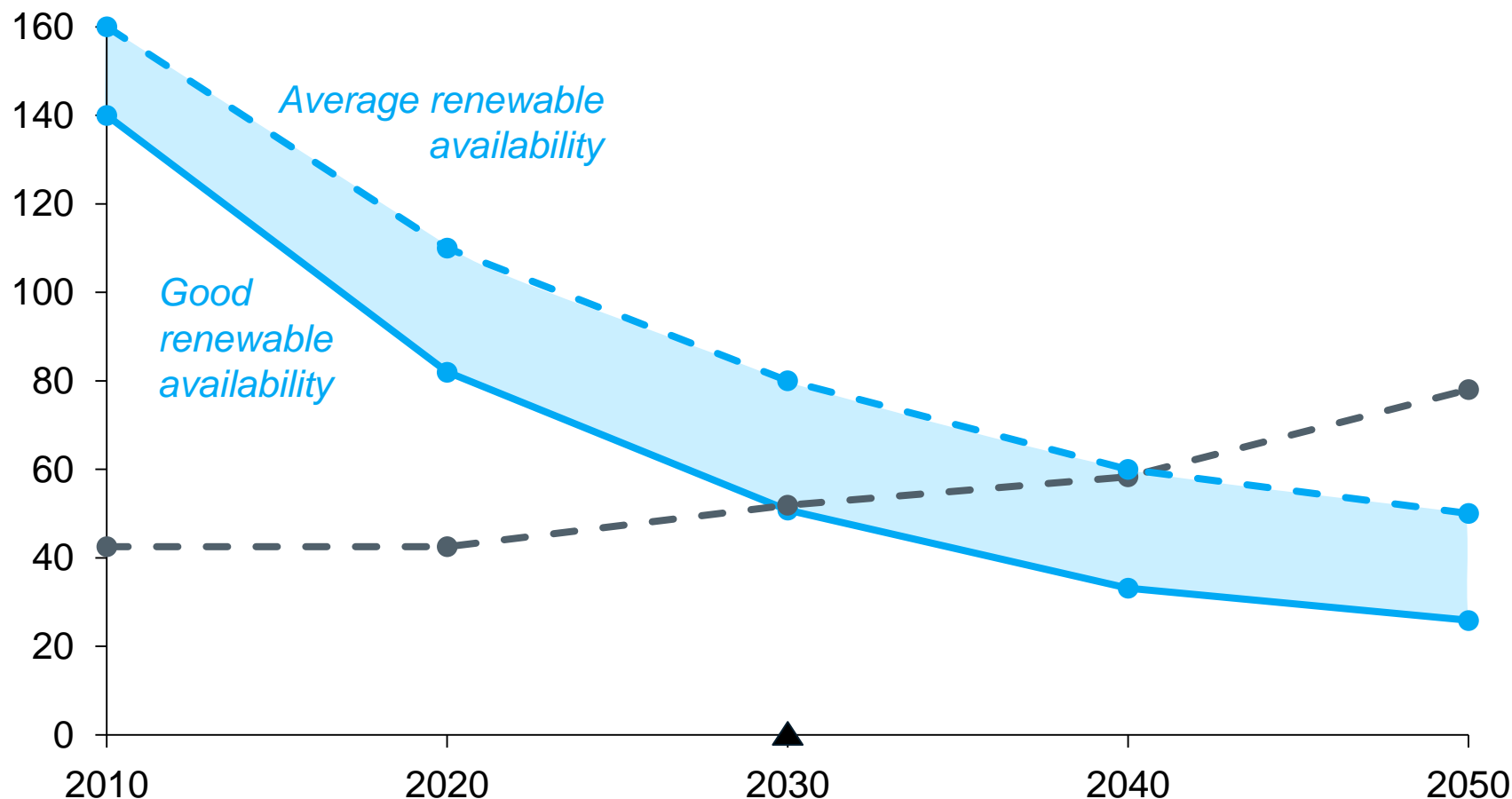
- Production from **water** and **green electricity** in an electrolyzer
- **Carbon neutral**

Grey hydrogen



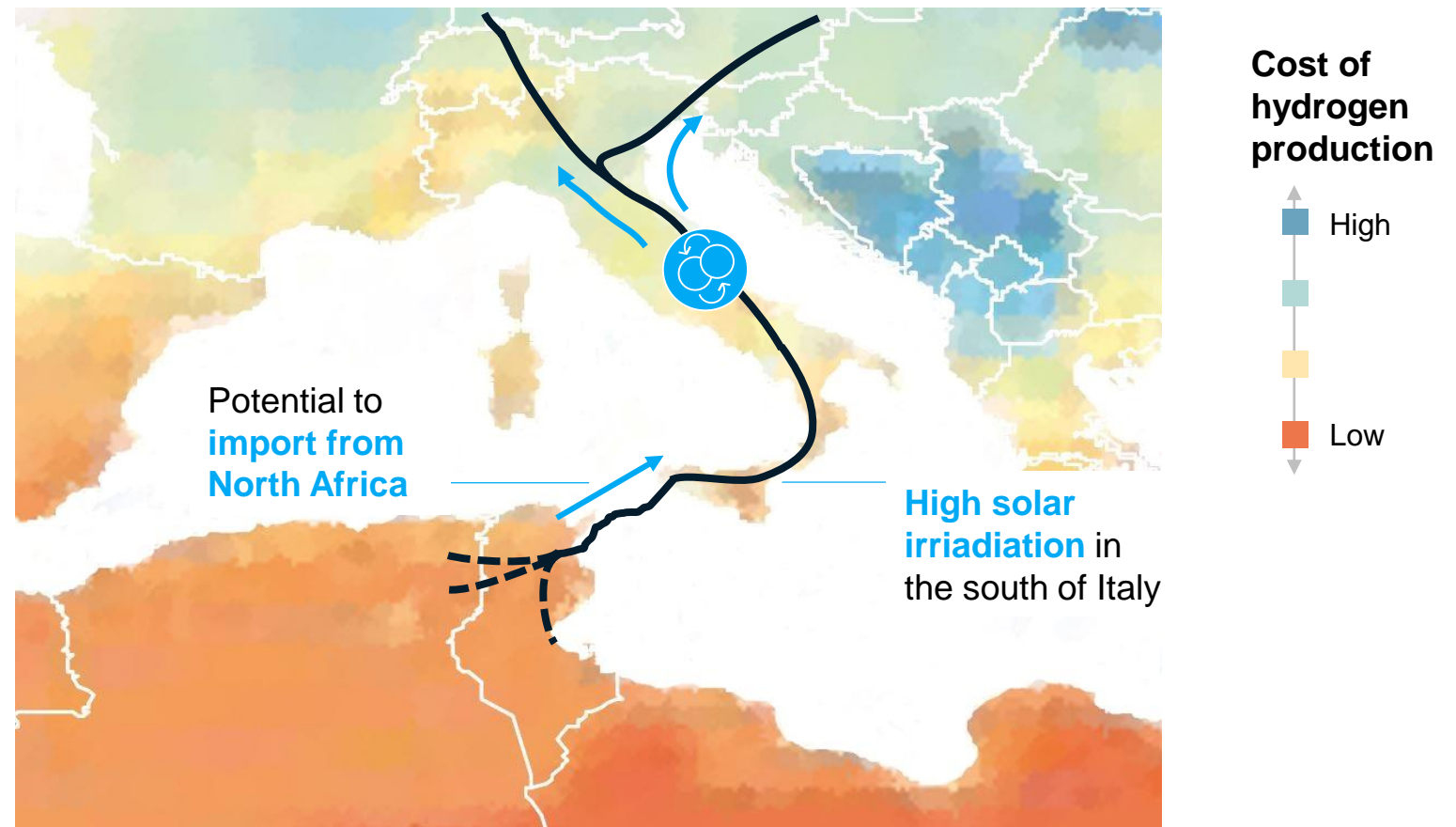
- Production from **natural gas** or **coal** in a reformer
- **Emits CO₂**

Cost of hydrogen production, EUR/MWh



Italy could **connect low-cost hydrogen production** from North Africa with demand using **existing transmission infrastructure**

Hydrogen cost from hybrid solar PV and onshore wind systems

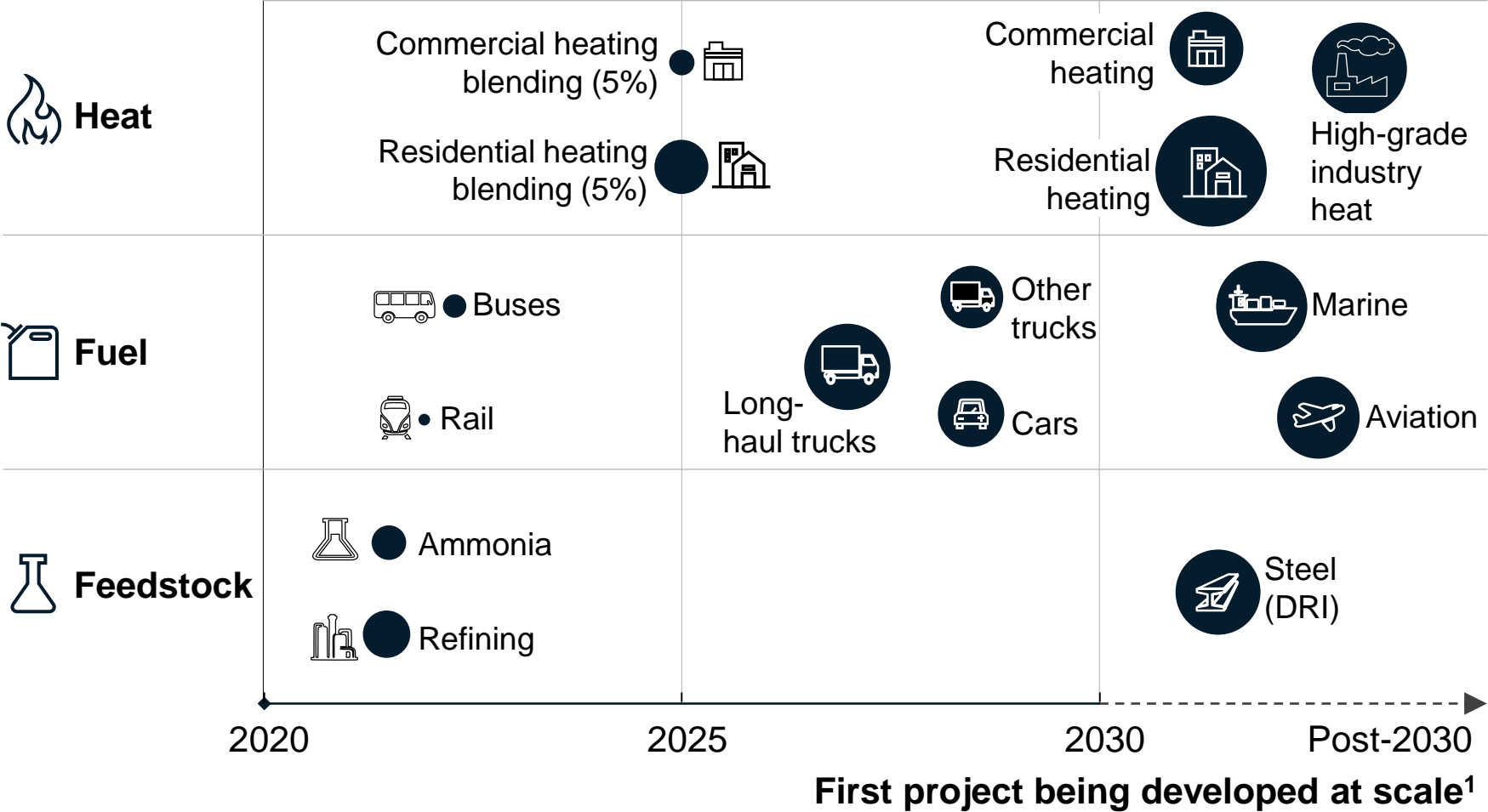


Source: IEA, Team analysis

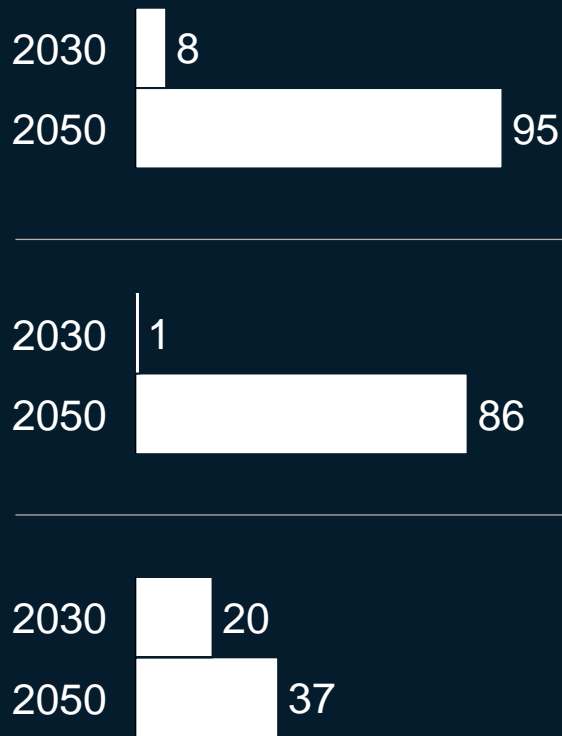
Decreasing hydrogen prices are expected to drive up hydrogen demand across end-use sectors

○ Bubble size indicates hydrogen consumption in 2050, TWh

Expected timing of roll-out and market size of hydrogen end-uses

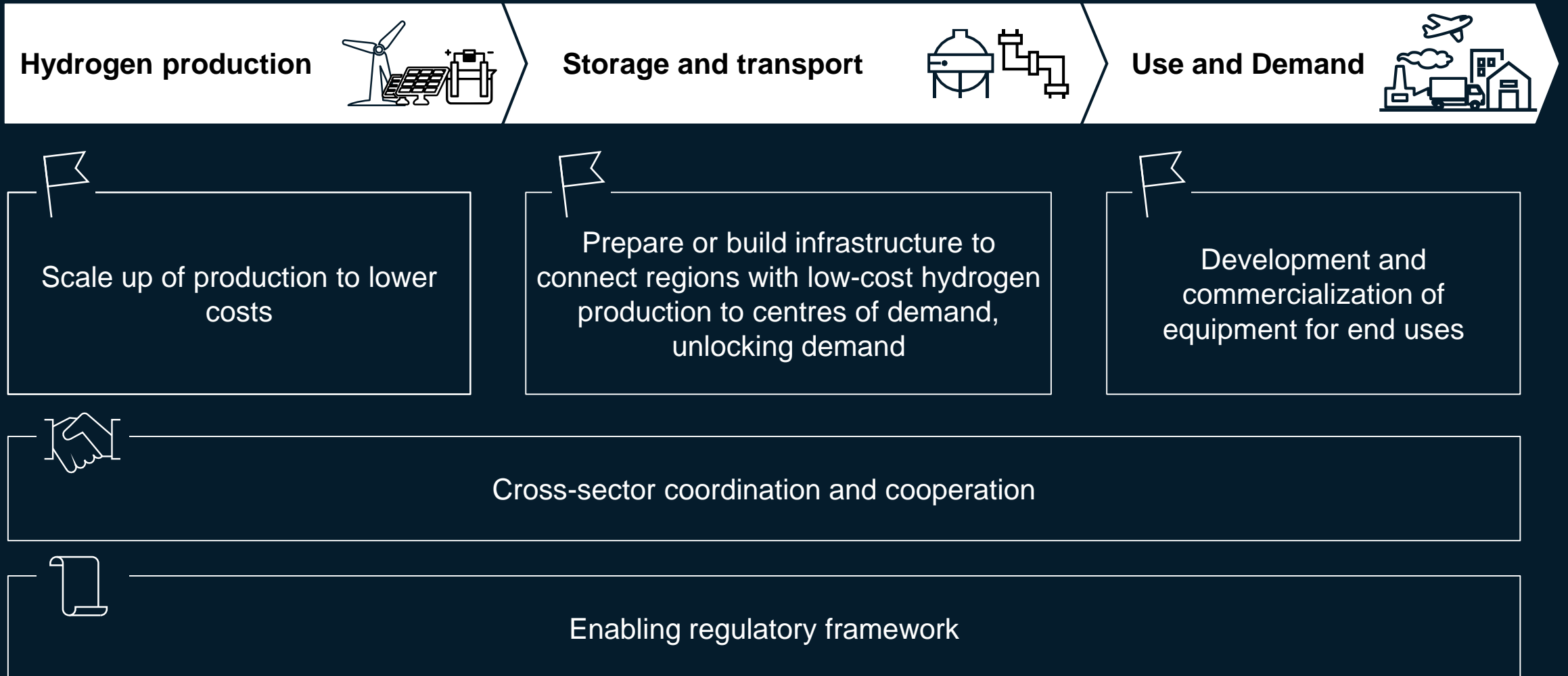


End market demand for hydrogen, TWh H2



1. First instance of at scale project being deployed and start of uptake of hydrogen in segment

Key challenges to scale up hydrogen



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