



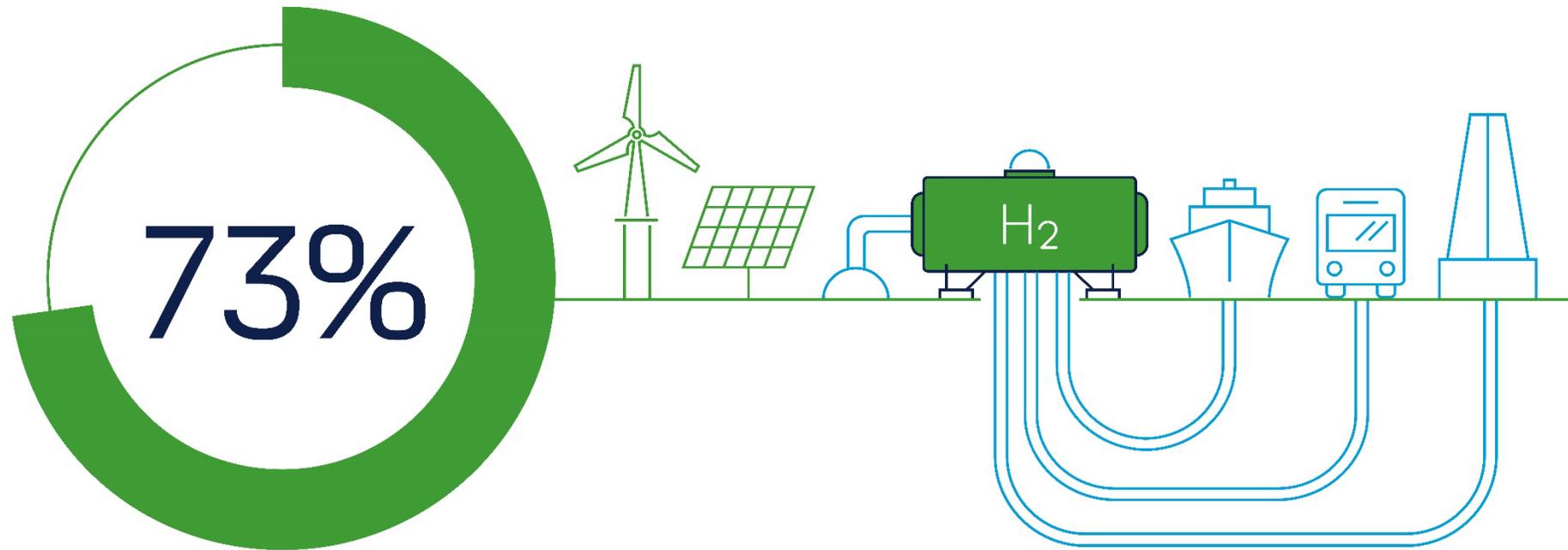
WHEN TRUST MATTERS

Rising to the challenge of a hydrogen economy

Hydrogen and Energy Transition: Energy and Socio-Economic Opportunities for Brazil



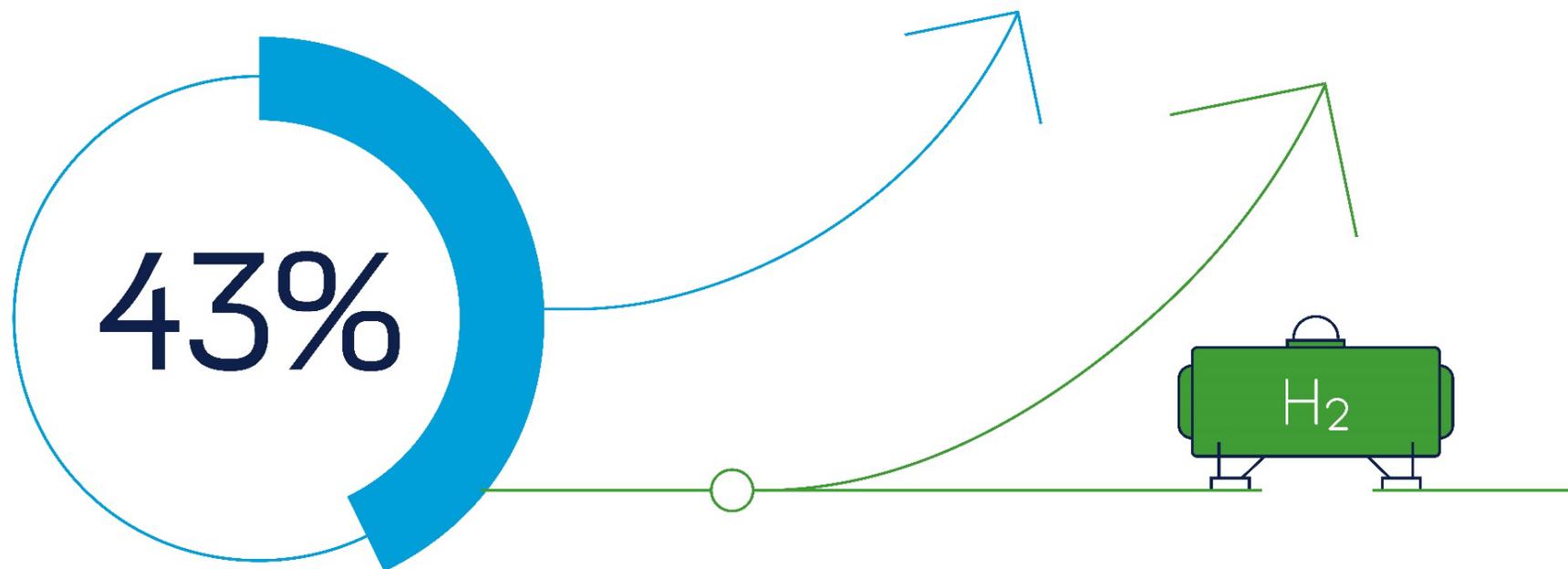
For many, hydrogen is essential to a clean energy future



Say Paris Agreement targets will not be possible without a large-scale hydrogen economy



Are hydrogen targets achievable?



Believe that the majority of national and organizational hydrogen goals are realistic

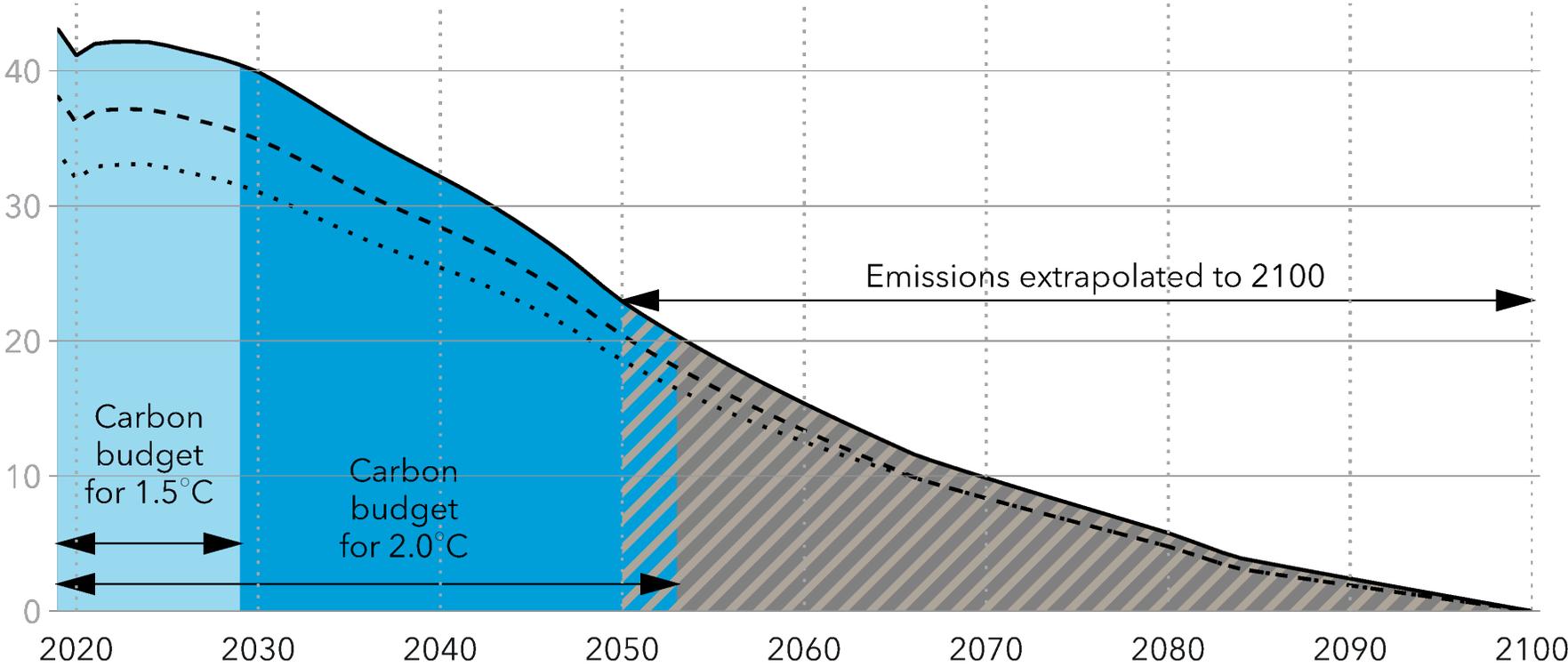


Energy Transition Outlook 2021

Cumulative emissions exhaust 1.5°C budget in 2029, 2°C budget in 2053

Carbon emissions and carbon budget

Units: GtCO₂/yr



Sources of emission:

- Total including AFOLU
- - - Energy-related and industrial processes
- Energy-related only



The euphoria – Uses of low carbon hydrogen as an energy carrier

Heating



Mobility (FC + ICE)



Storage and use of excess electricity



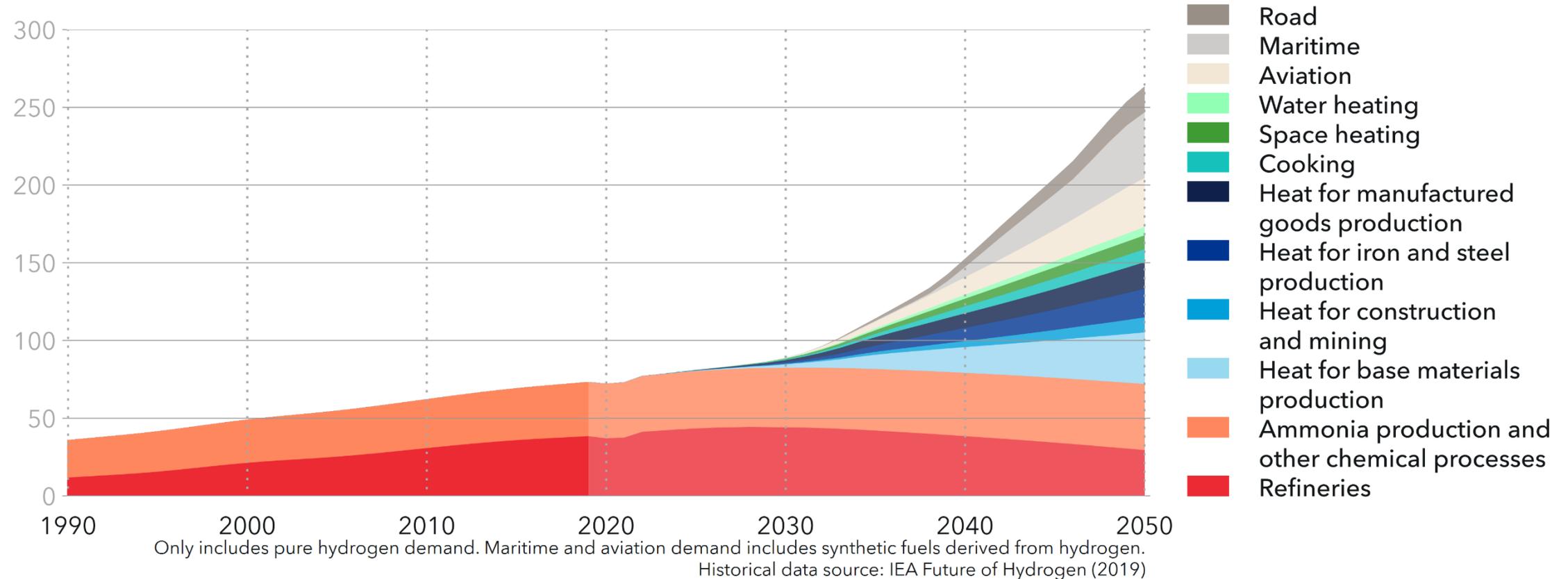
Industry – Energy intensive heating



Hydrogen - late but strong growth: 5% of global energy demand in 2050

World hydrogen demand by sector

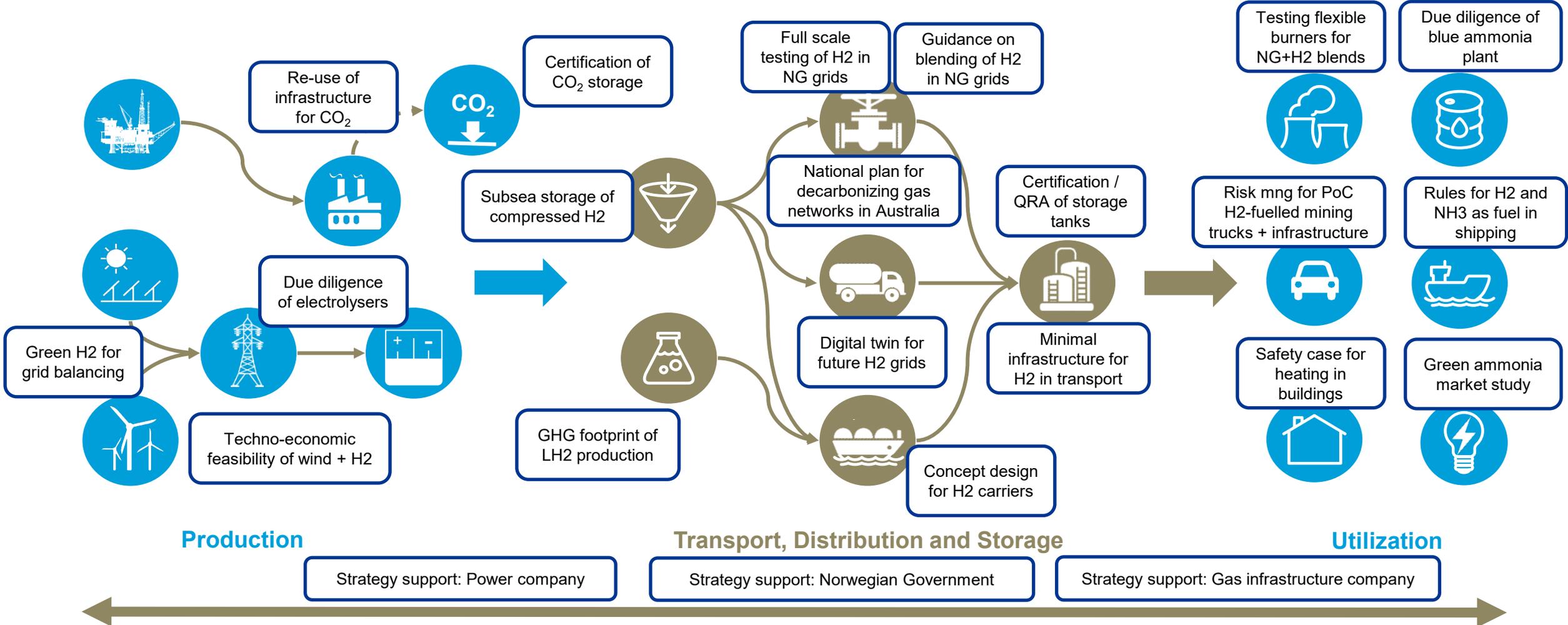
Units: Mt/yr



How can Norway contribute to develop a new hydrogen industry in Brazil?

- 1 Norway and Brazil share large hydropower resources – can be leveraged to position countries as leaders in green H₂/NH₃
- 2 Norway is a front-runner in development of low-carbon shipping: Battery, hydrogen and ammonia.
- 3 Norway has been a leader in early deployment of CCS – Can help Brazil become a leader in blue hydrogen and blue ammonia.

DNV: Deep knowledge about all parts of hydrogen value chains



DNV offers a wide range of both **technical and business advisory** services and, with broad expertise across the energy and maritime industries, we are in a **unique position** to cover the **whole hydrogen value chain**.

Rising to the challenge of a hydrogen economy

dnv.com/focus-areas/hydrogen

www.dnv.com