

An isometric illustration of a hydrogen valley facility. The scene includes wind turbines, solar panels, industrial buildings, a port with ships, a train, and residential houses. A network of pipes and roads connects these elements. A large white cloud is in the top left. The text 'Clean Hydrogen Partnership' is in the upper left, and 'Hydrogen market overview' is in the lower left. The Roland Berger logo is in the bottom right.

Clean Hydrogen
Partnership

Hydrogen market overview

Hydrogen Valley Facility

2025

Roland
Berger

The H2V Facility delivers dedicated support to hydrogen practitioners via PDA services, the H2V Knowledge Centre and the H2V Platform

The Hydrogen Valleys Facility

h2v.eu

Dedicated support via the **Hydrogen Valleys Facility** by



1



Project Development Assistance

Provision of dedicated Project Development Assistance (PDA) for Hydrogen Valleys projects towards Final Investment Decision

2



H2V Knowledge Centre

Sharing & dissemination of knowledge and provision of capacity building for the broader hydrogen community

3

H2V Platform



Maintenance & extension of the Hydrogen Valley Platform to enhance its positioning as the global one-stop-shop for hydrogen flagship projects

Delivery
partners

Roland
Berger



worley

Inycom

Aspirational target

2030

50

Hydrogen Valleys
operational/under
construction

within the EU



This document is part of the H2V Knowledge Centre that offers hydrogen practitioners knowledge material in written and interactive formats

The H2V Knowledge Centre



Structure and scope of the H2V Knowledge Centre

Self-service Knowledge Material

Commercial



Technical



Regulatory



Valley governance



- Knowledge material specifically developed as part of the H2V Facility project
- Links and information to other third-party resources and material

Interactive Formats

- Webinars with content experts (Roland Berger, Worley and external speakers)
- Project Development Assistance experience sessions with Hydrogen Valley practitioners

Target audience



Hydrogen Valleys



Project developers



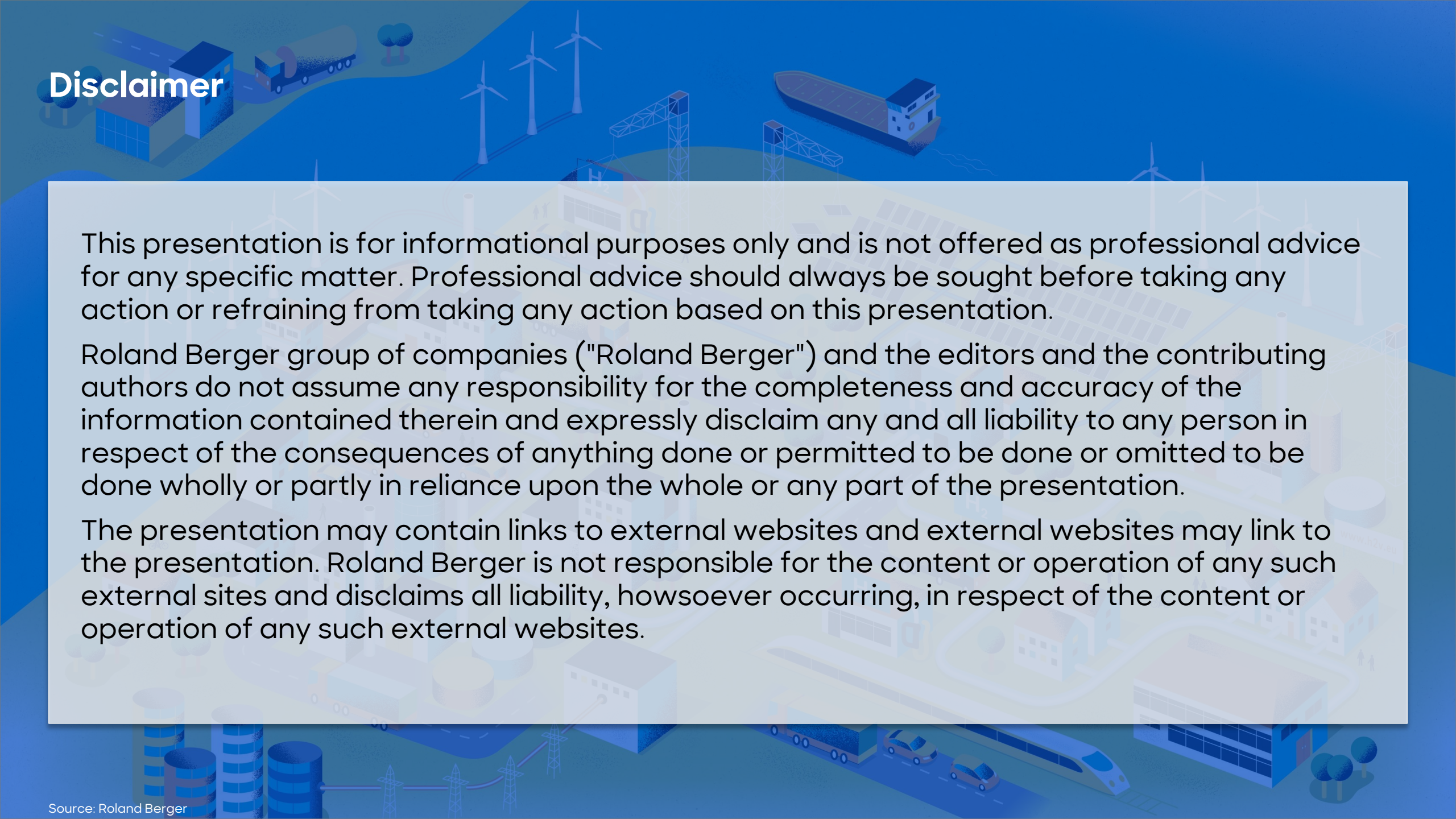
National, regional and local authorities



Investors



Other hydrogen practitioners



Disclaimer

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Key objective of this document is to support Hydrogen Valleys with an understanding of the H₂ market dynamics and long-term demand trends

Key objectives and content of this document

Key objectives



Provide H₂ practitioners with an **up-to-date understanding of the hydrogen market** and key trends to inform strategic decision-making

Key content

- 1 Net zero scenario
- 2 Political momentum regarding H₂
- 3 Green H₂ project announcements
- 4 Key H₂ project archetypes
- 5 Development of the green H₂ market

Understanding current market trends enables Hydrogen Valleys to adapt, position and thrive in a rapidly evolving hydrogen landscape

Relevance of hydrogen market overview for Hydrogen Valley developers

The hydrogen sector is evolving rapidly, creating uncertainty for **Hydrogen Valleys** ...



1

Swift market developments result in unclear planning and investment strategies but reward agile strategies

2

Lack of transparency in regional demand and supply dynamics

3

Difficulty in anticipating competitor moves and policy shifts

... **understanding market trends** enables a strategic positioning and long-term planning



Informed **strategic positioning** based on current and emerging trends



Improved investment decisions through data-driven insights



Enhanced adaptability and resilience in a shifting hydrogen landscape

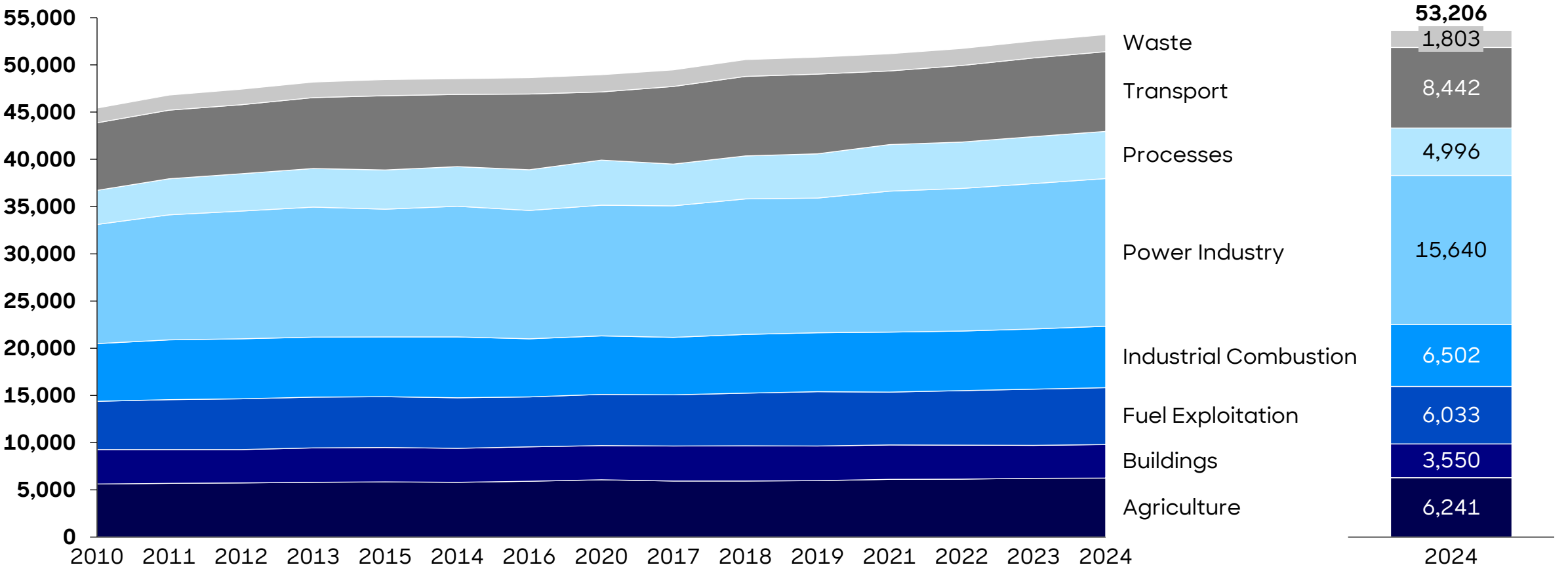
The clean hydrogen market will grow in the coming decades, with Europe emerging as a key demand hub

H₂ market fundamentals and developments: Summary

- 1 Net zero scenario:** No clean H₂, no "net zero"; to get there, H₂ use will have to grow 4.5x while green H₂ will have to supply the bulk of it, requiring c. 3.3 TW of electrolyzers by 2050 (as per Q4 2023)
- 2 Political momentum:** As of Q2 2025, governments have announced targets of 260 GW of electrolysis by 2030 and are increasingly adopting demand-side incentives to push clean H₂ use
- 3 Green H₂ project announcements:** As of Q2 2025, developers have announced 560 GW of electrolysis projects targeting COD by 2030, up from only a few GW in 2021
- 4 Key project archetypes:** Small-scale & mobility-focused H₂ projects (<10 MW), on-site industrial H₂ projects (<300 MW) and centralized large-scale H₂ export "giga-projects"
- 5 Development of green H₂ market:** Market will evolve over the next decade as demand centers in Europe and East Asia source large volumes from regions with abundant low-cost renewable energy

Global GHG emissions have steadily increased to c. 53.2 bn tons in 2024 – the energy sector is the largest emitter, followed by industry

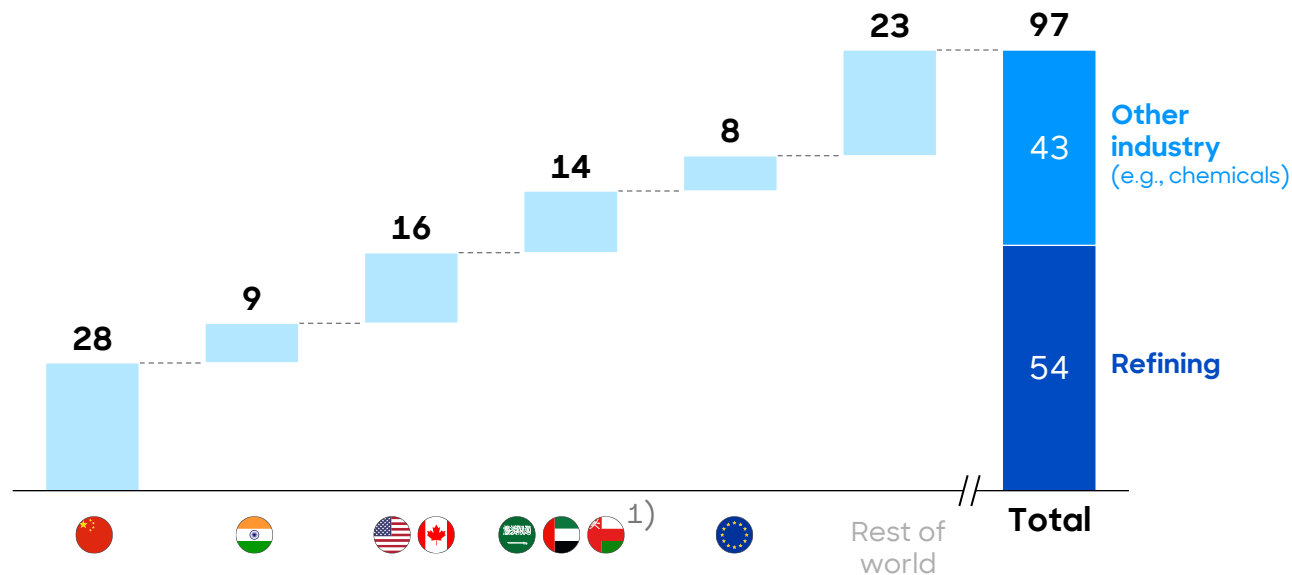
Global GHG emissions by end-use segments [in m t CO₂e, indicative]



Today, c. 97 m tons of H₂ are used by industry with virtually all produced from fossil fuels (mostly natural gas and coal) – EU with c. 8 m tons H₂ demand

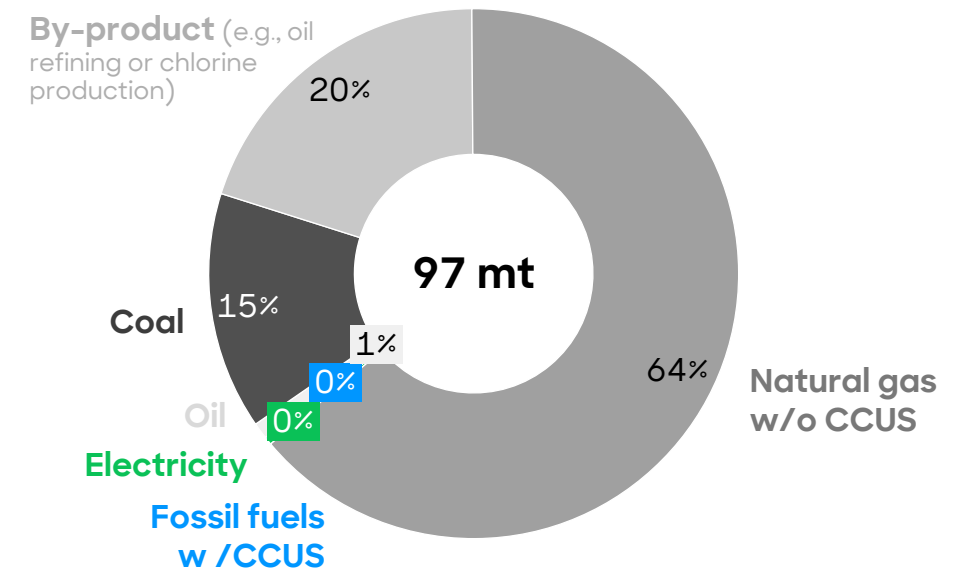
Hydrogen demand and supply today

Hydrogen demand 2024 [in m tons]



- Today **demand** mainly coming **from industry**
- While **China, India** and the **US** are expected to be **self-sufficient** going forward, **Europe** as well as **East Asia** will be a **net importer** in 2030s

Hydrogen supply 2024 [in m tons]



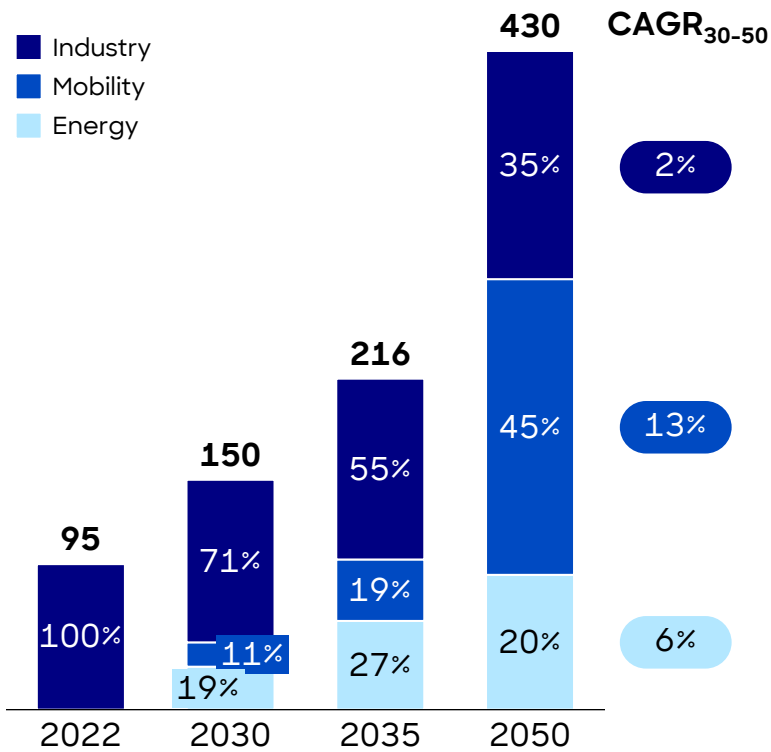
- 99% of hydrogen is currently **produced by petrochemical players via fossil routes**
- Going forward, **production needs to be decarbonized**

1) Representing MENA region

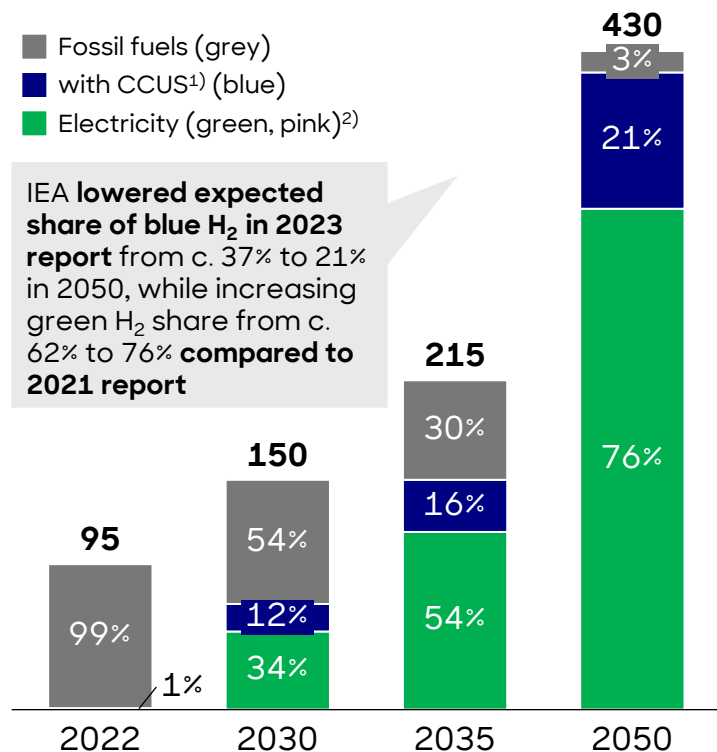
Green H2 will have to meet most of decarbonized hydrogen demand, in order to get to "net zero" - More than 1 TW of electrolyzer capacity is required

Hydrogen's role in the IEA's updated Net Zero Emission Scenario (as per Q4 2023)

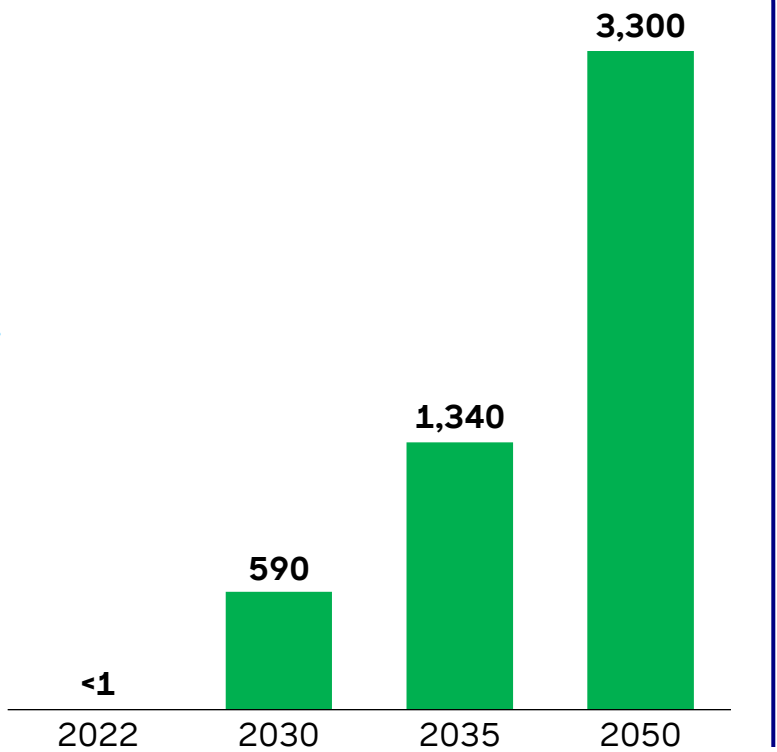
Global hydrogen demand in a "net-zero world" [m tons]



Global hydrogen supply in a "net-zero world" [m tons]



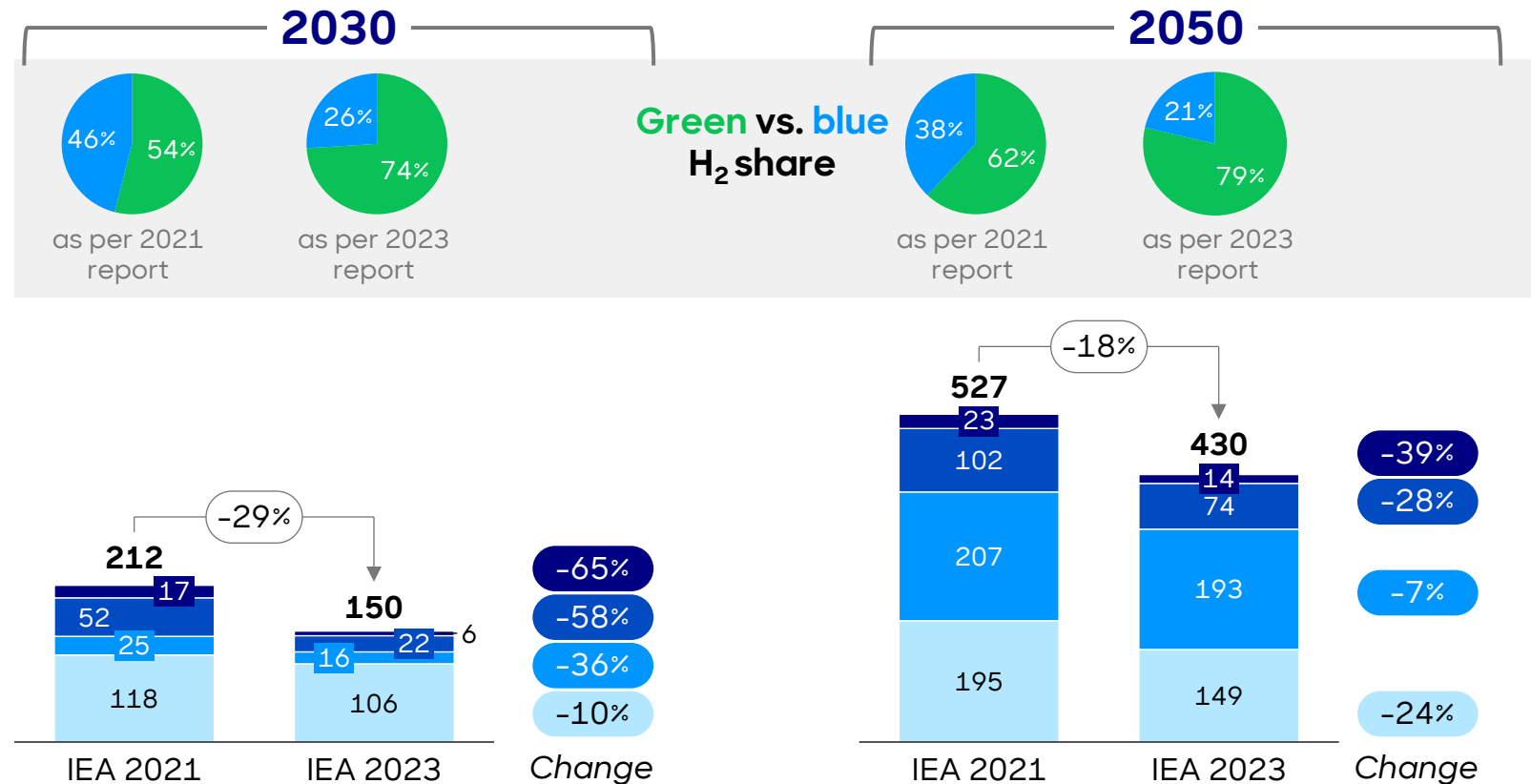
Required electrolyzer capacity in a "net-zero world" [in GW]



1) Carbon Capture, Utilization and Storage; 2) Pink H₂ = H₂ using electricity from nuclear power plants; no split by low-emission electricity source provided by IEA; but, electricity produced by PV, wind & other renewable sources will likely account for significantly largest share of electricity input for H₂ production (in 2050, IEA calculates that only c. 7% of total low-emission electricity production will be produced by nuclear power plants)

The IEA's forecast lowers overall hydrogen demand, especially in the energy sector, while projecting growth in industrial and transport applications

Deep dive: Evolution of long-term H₂ IEA demand scenarios [in m tons, all H₂ colours]



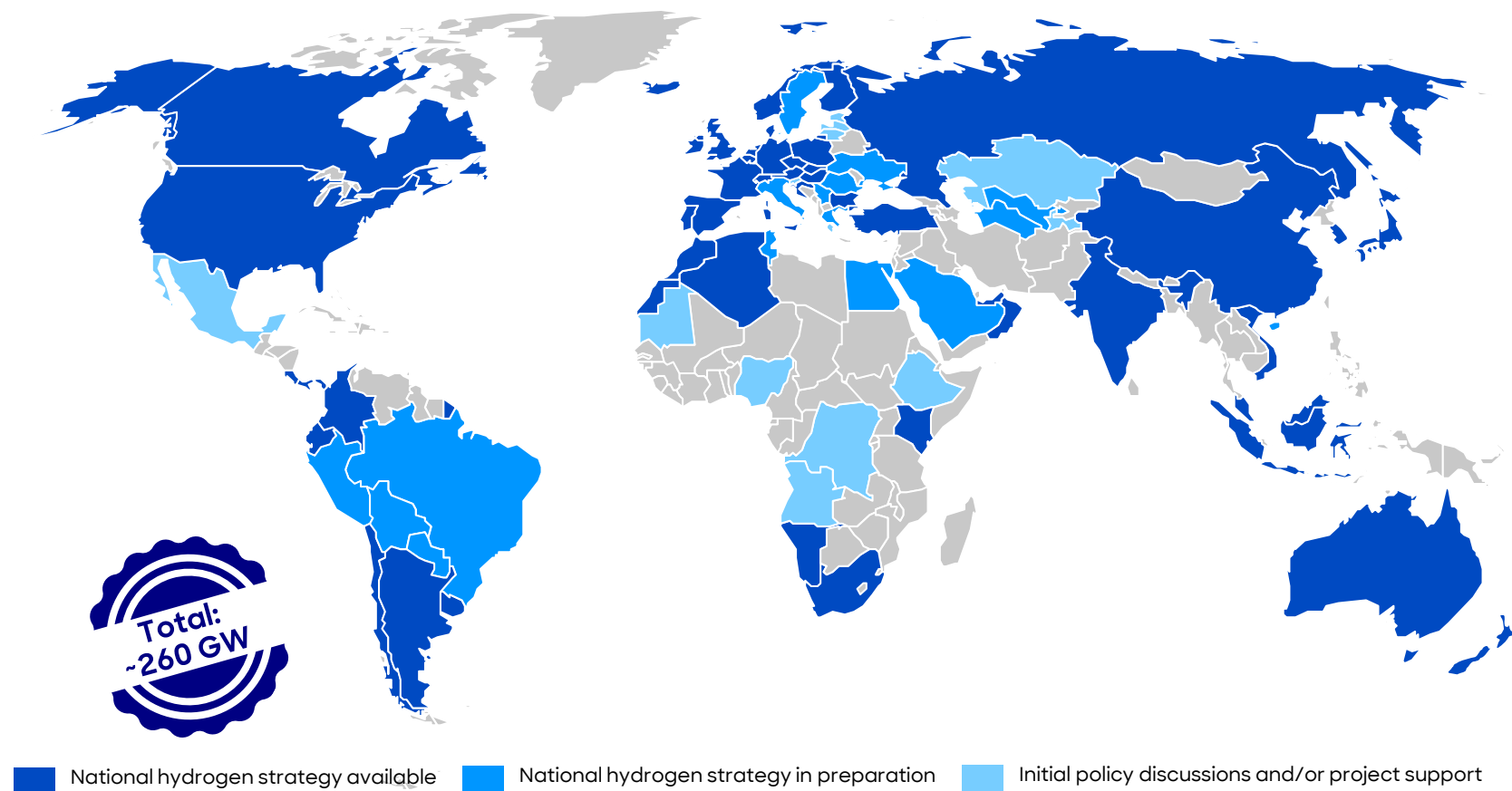
Key observations

Latest IEA H₂ forecast (2023) changed compared to the 2021 forecast:

- **Share of green H₂** in total low-carbon H₂ has been increased, limited role of blue H₂ due to:
 - **Project size, complexity** ("first of a kind")
 - **Long(er) lead times** (than green H₂ projects)
 - **Challenging project economics**, incl. rising project costs, uncertainty on CCS cost & performance, unstable policy environment
- Especially in energy sector, total H₂ demand expectations have been lowered, e.g., due to stronger expected role of electrification

Governments are pushing hydrogen with national strategies – Big targets for consumption, production, investment and value creation

National hydrogen strategies (as per Q2 2025)



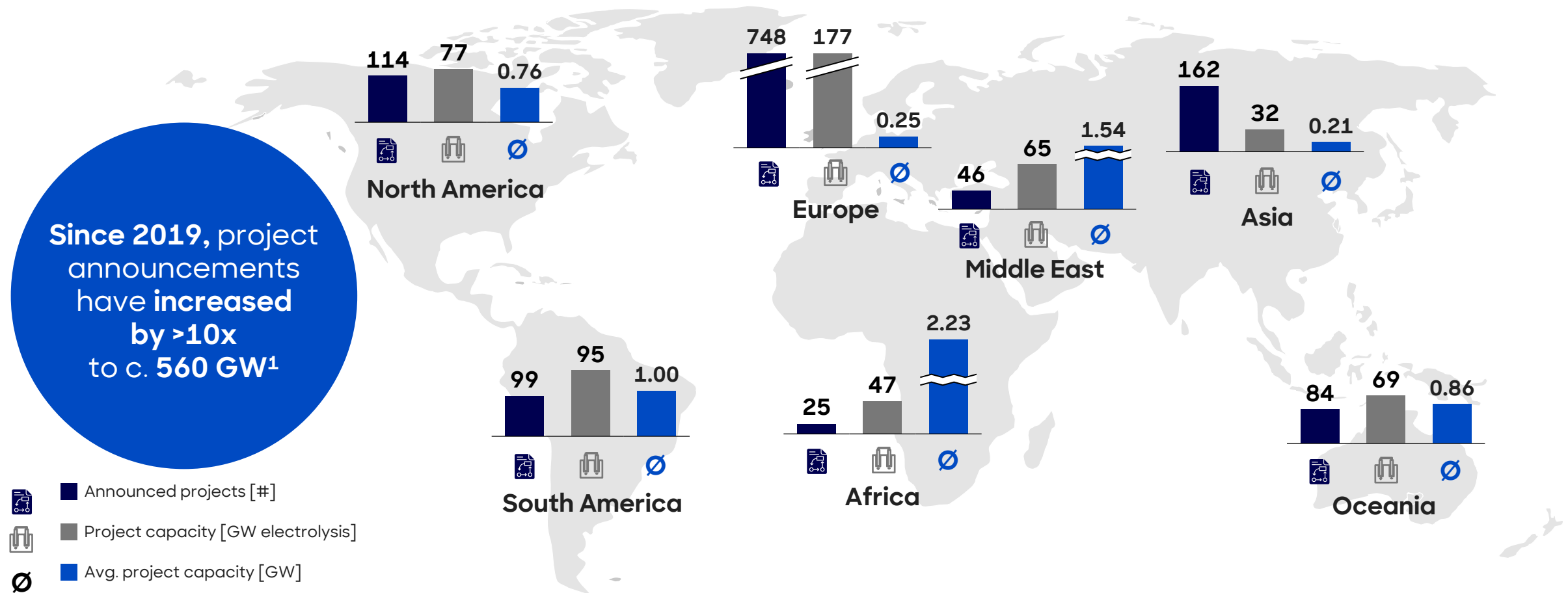
Key observations

- **Hydrogen activities are well spread around the globe** with major interest being located in Europe, Asia, as well as in the Americas
- **40+ countries** have published hydrogen strategies, along with the EU
- Main **drivers are GHG emission reduction goals** as well as the opportunity for economic growth

1) Based on DOE Hydrogen Strategy which sets a goal for 10 million tons of clean hydrogen by 2030, electrolyzer capacity depending on utilization rates and efficiency factors; 2) RepowerEU proposed Hydrogen Accelerator: 10 million tons of annual domestic production by 2030 – requires c. 65–100 GW electrolyzer capacity; 3) Until 2040; 4) 15 GW installed by JP companies globally; 5) National target of 5 million tons by 2030

The global green H₂ project landscape is growing stronger than ever: projects of c. 560 GW by '30 announced – >10x increase since 2019

Global announced green hydrogen projects by 2030 (as per mid 2024)



1) As of June 2024, including green H₂ projects at very preliminary studies or at press announcement stages; some announced green H₂ projects have not yet specified electrolyzer capacity

Three project archetypes are emerging: small-scale local mobility projects, mid-scale industrial decarbonization projects and export-oriented "giga-projects"

Green hydrogen project archetypes



Archetype 1

Small-scale, mobility-driven

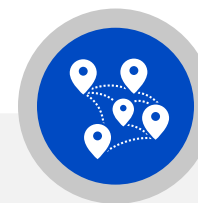
- **Rationale:** pooling demand from mobility applications (truck fleets, bus fleets, etc.), shared use of refueling infrastructure, scaling supply
- **Capacity:** 5–20 MW ELY (typically grid power, w/ green PPA)
- **Regional focus:** EU, Asia
- **Key challenges:** many stakeholders involved (high complexity against comparatively low H₂ volumes)



Archetype 2

Medium-scale, industry-driven

- **Rationale:** decarbonizing grey industrial feedstock with green H₂; anchor offtake from petro-chemicals, steel, etc.; mobility off-take as add-on
- **Capacity:** 20–300 MW ELY (often grid power, w/ green PPA)
- **Regional focus:** EU, US, China
- **Key challenges:** regulation and power sourcing (e.g., EU RED II DA), seamless integration with ind. processes, expansion limits



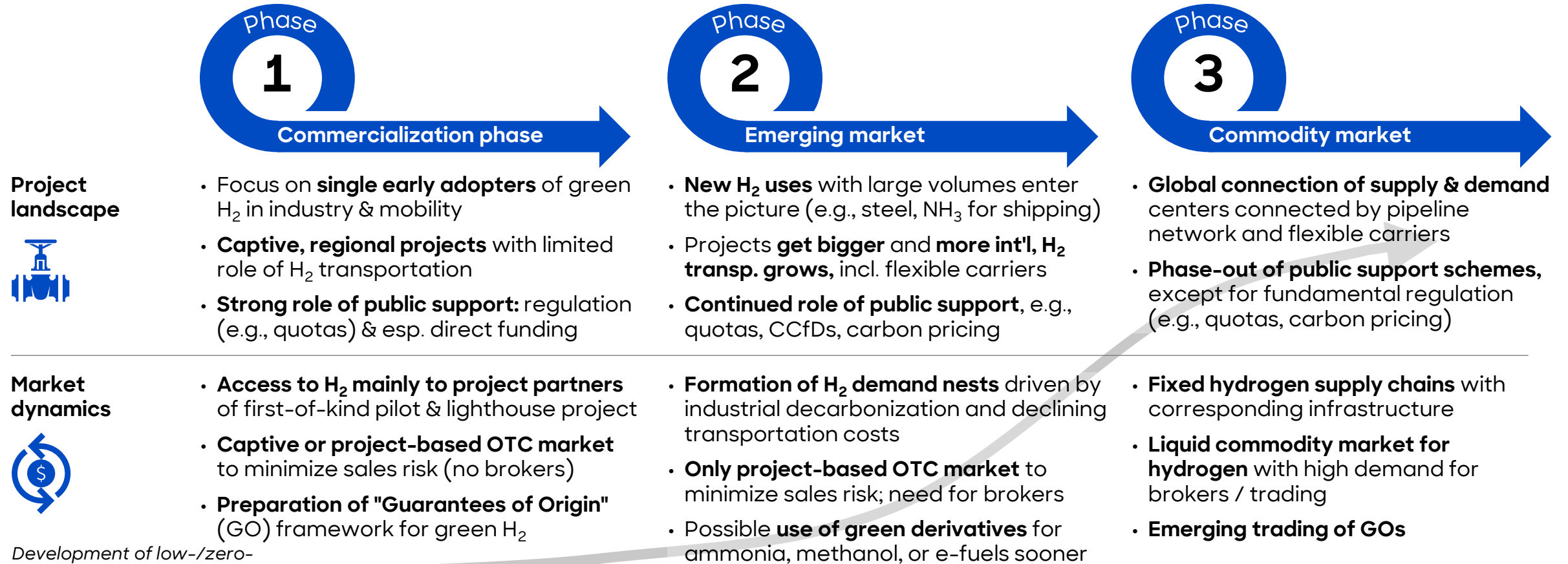
Archetype 3

Large-scale, supra-regional

- **Rationale:** Building a local valley with the ultimate ambition to export green molecules, connecting supply and demand across regions
- **Capacity:** 500+ MW ELY (typically dedicated add. renewables)
- **Regional focus:** MENA, AU, LA, NA
- **Key challenges:** regulatory and other enablers for long-term offtake contracts, technology at scale, transportation

Within 10+ years, clean H₂ will become a globally traded commodity, with the upstream project development industry already maturing

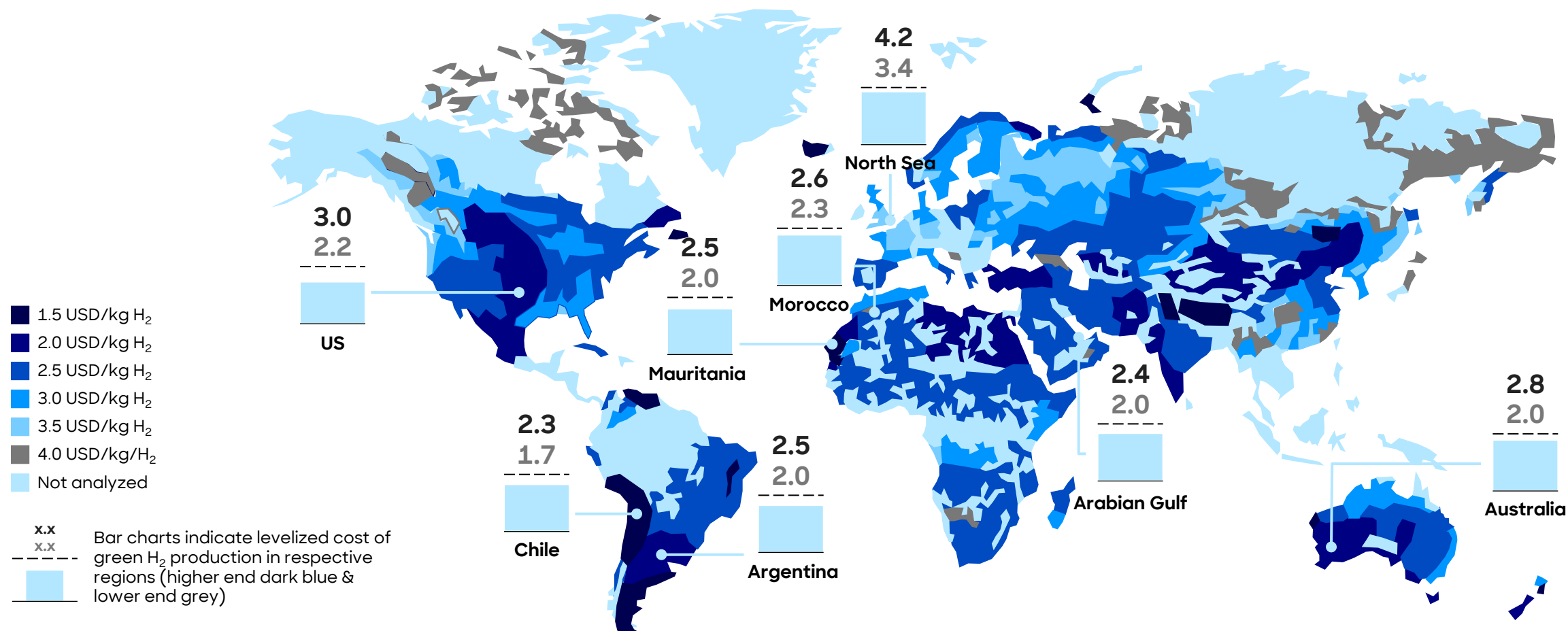
H₂ market development phases



Development of low-/zero-carbon H₂ demand over time [indicative]

With the most abundant solar and wind density, the global south can produce the most cost-efficient green H₂

Indicative LCOH in different world regions, excl. transport costs [2035+, USD/kg H₂]¹



1) As per latest IEA report with following key assumptions: 6% WACC, c. 600 USD / kW ELY Capex, regional solar and wind Capex, optimized mix of wind and solar power depending on region

In the long-run, Africa, Australia, Latin America and the Middle East will export H₂; Europe and East Asia will be net H₂ importers

Expected global clean H₂ export and import centers [2035+]

