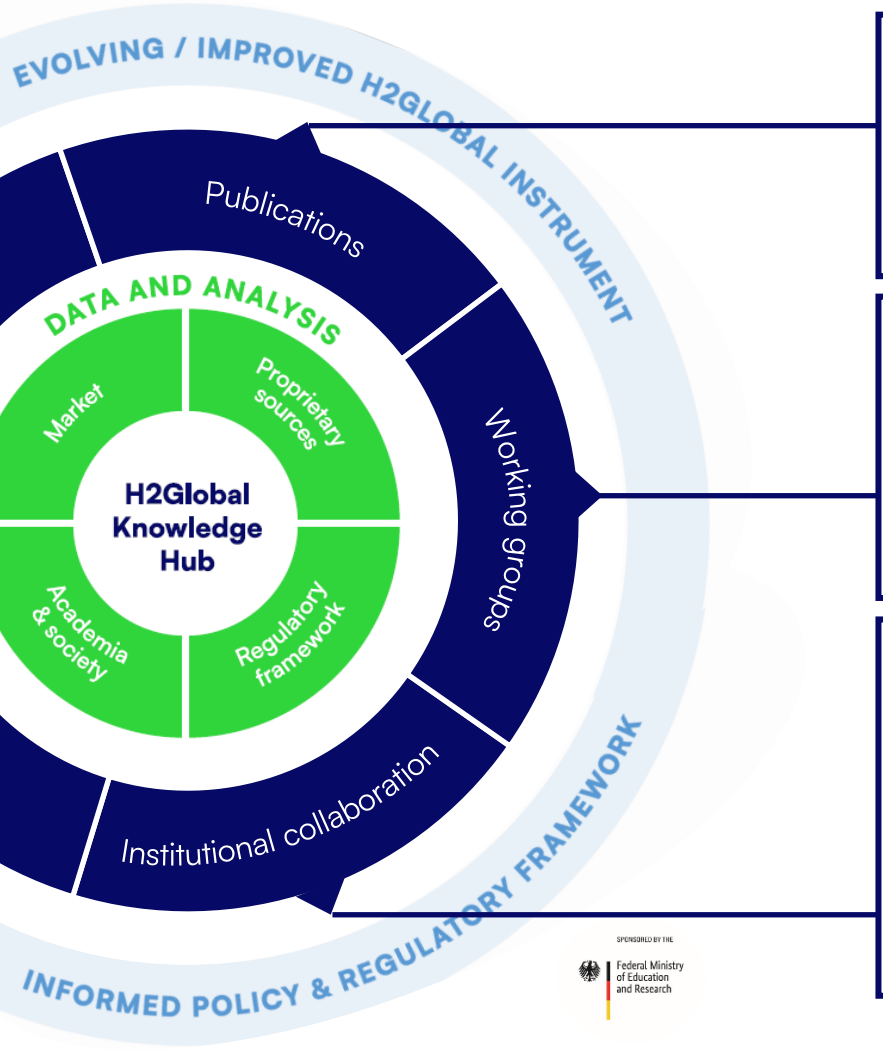
Unlocking potential: Scaling demand through hydrogen hubs

Report launch webinar
December 2024

H2Global

The report is part of the H2Global Knowledge Hub



SPONSORED BY THE
Federal Ministry of Education and Research

THREE PUBLICATIONS IN 2024

- Bridging the gap: Mobilizing investments in hydrogen infrastructure
- Unlocking potential: Scaling demand through hydrogen hubs
- Keep it simple: Aligning auction objectives for success

CONTRIBUTION OF INDUSTRY EXPERTS COVERING THE WHOLE HYDROGEN VALUE CHAIN

- Regular virtual knowledge exchanges and in-person workshops
- Representation from finance, supply, infrastructure, demand, and manufacturing

COLLABORATION WITH KNOWLEDGE PARTNERS FROM:

- Center on Global Energy Policies at Columbia University
- IRENA
- OECD
- Oxford Institute for Energy Studies
- World Bank

H2Global

Agenda

1 Challenge

- Scaling demand through hydrogen hubs

2 Analysis

- Identification of different hydrogen hub types
- Assessment of the contribution of hydrogen demand hubs to address demand-side challenges
- Case studies

3 Recommendations

H2Global

The challenge

H2Global

Projected demand for clean hydrogen and its derivatives is high
but firm offtake commitments remain low

Hydrogen demand in line with net zero emission scenarios:

65 Mtpa

by 2030

Share of supply projects with firm offtake:

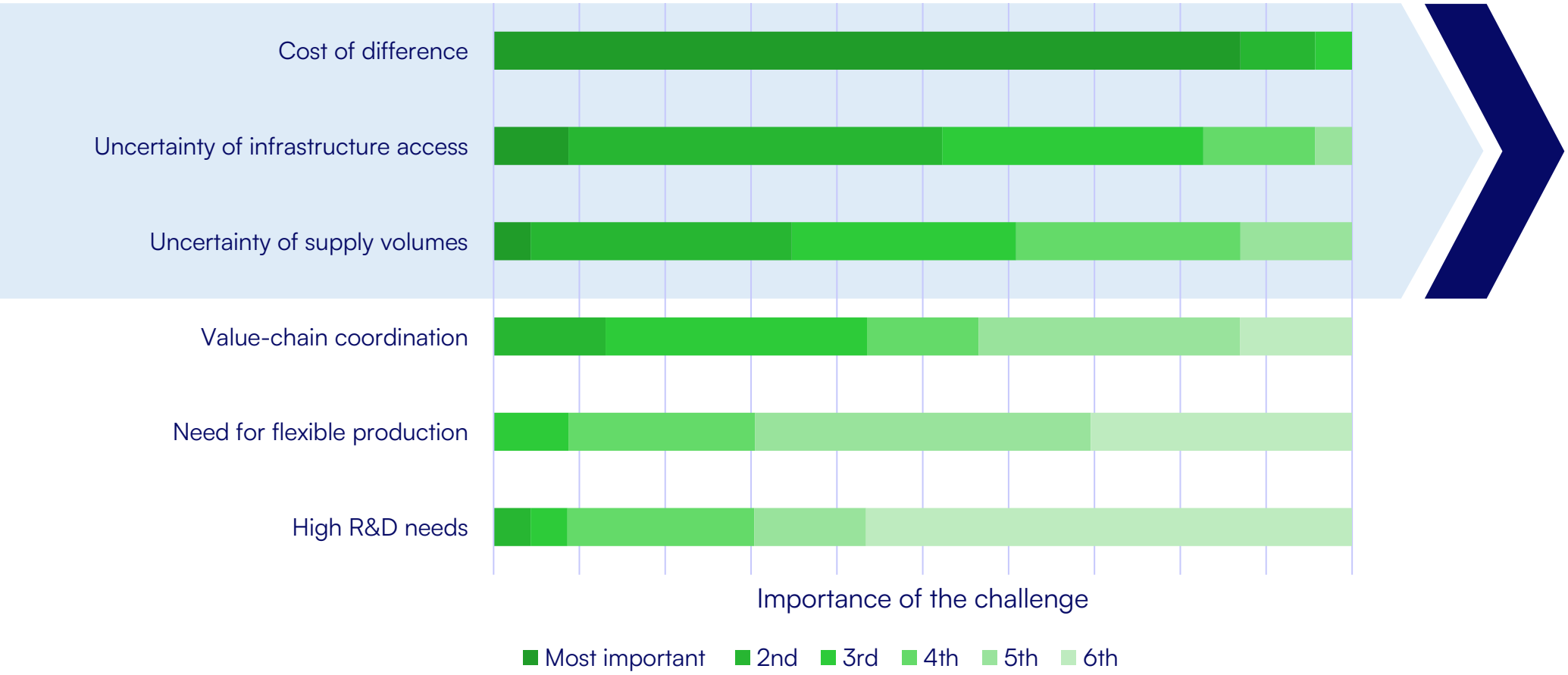
1.4%

in 2024

What inhibits demand uptake?

H2Global

Offtakers worry mostly about cost-of-difference & supply security



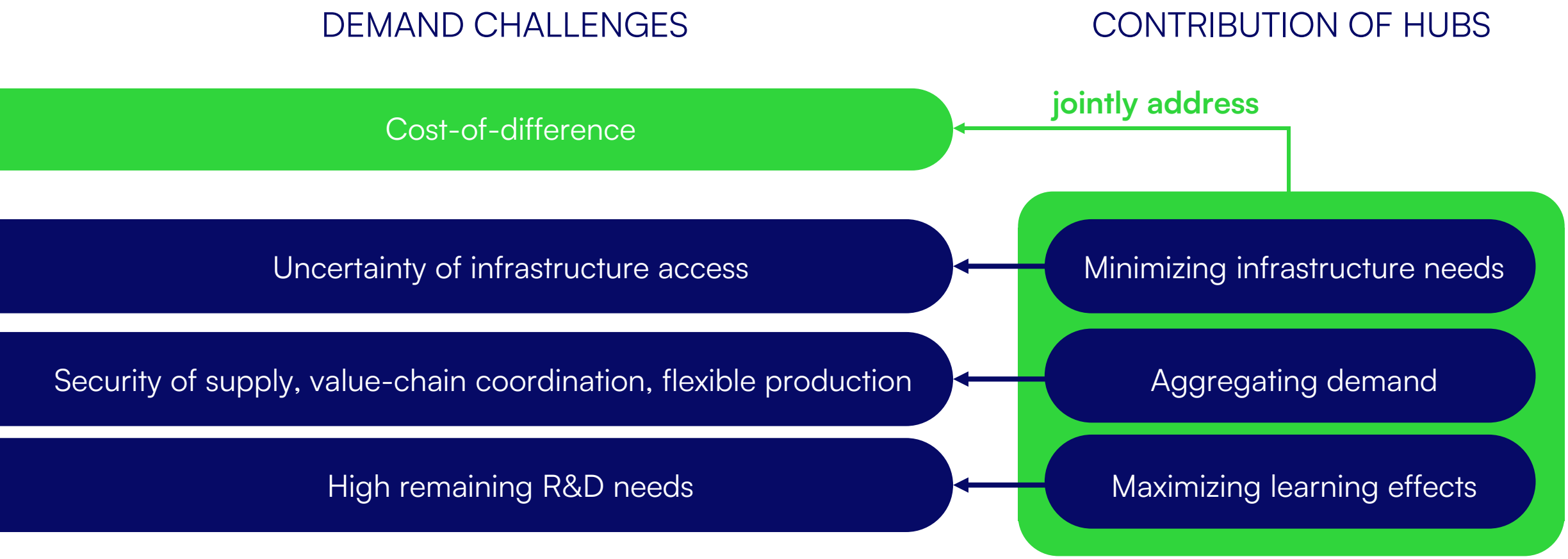
How to bridge the cost-of-difference?

How to ensure supply security?

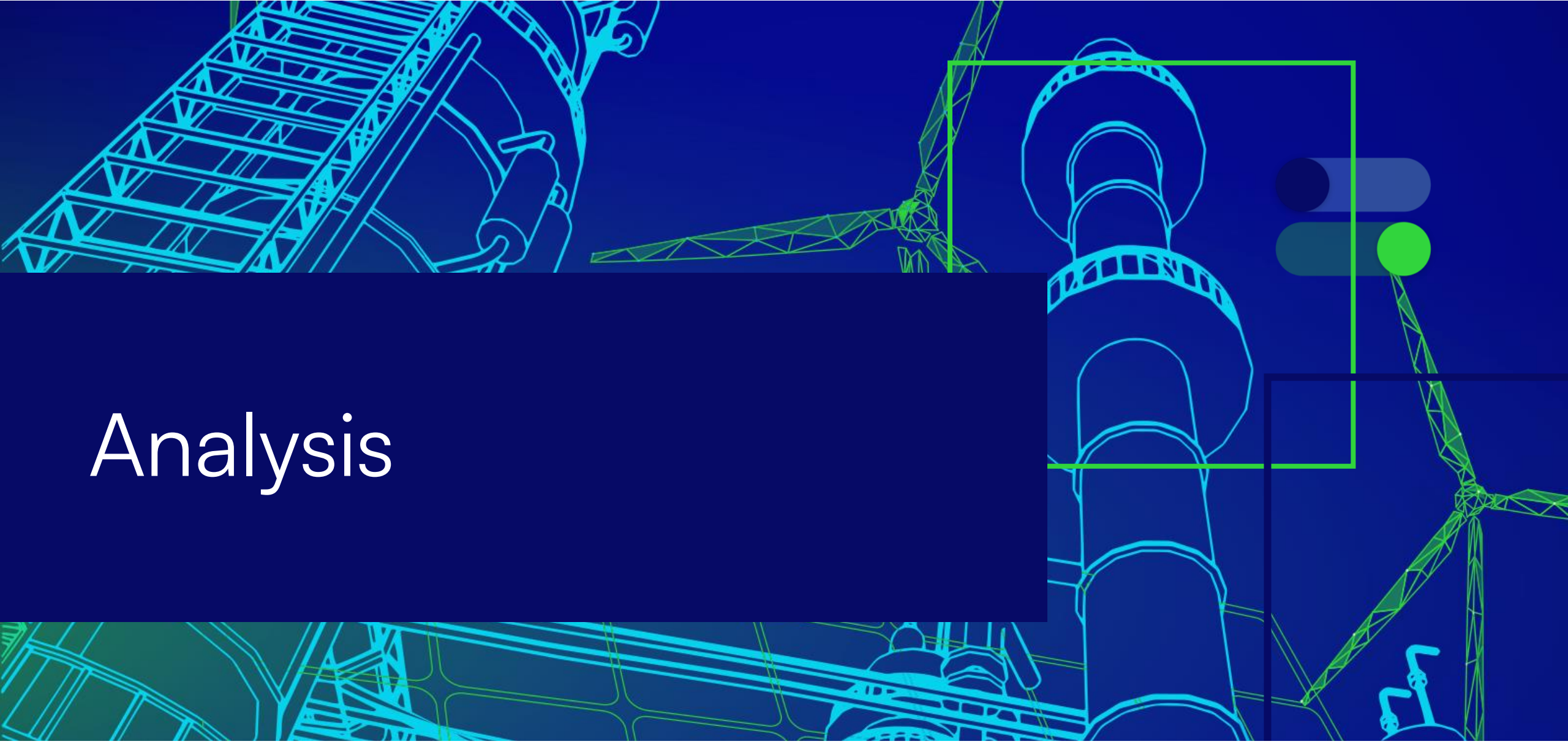
Source: H2Global survey among donors to the H2Global Foundation on priority challenges for potential clean hydrogen off-takers; n=23

H2Global

Hydrogen hubs have the potential to address multiple demand challenges at the same time



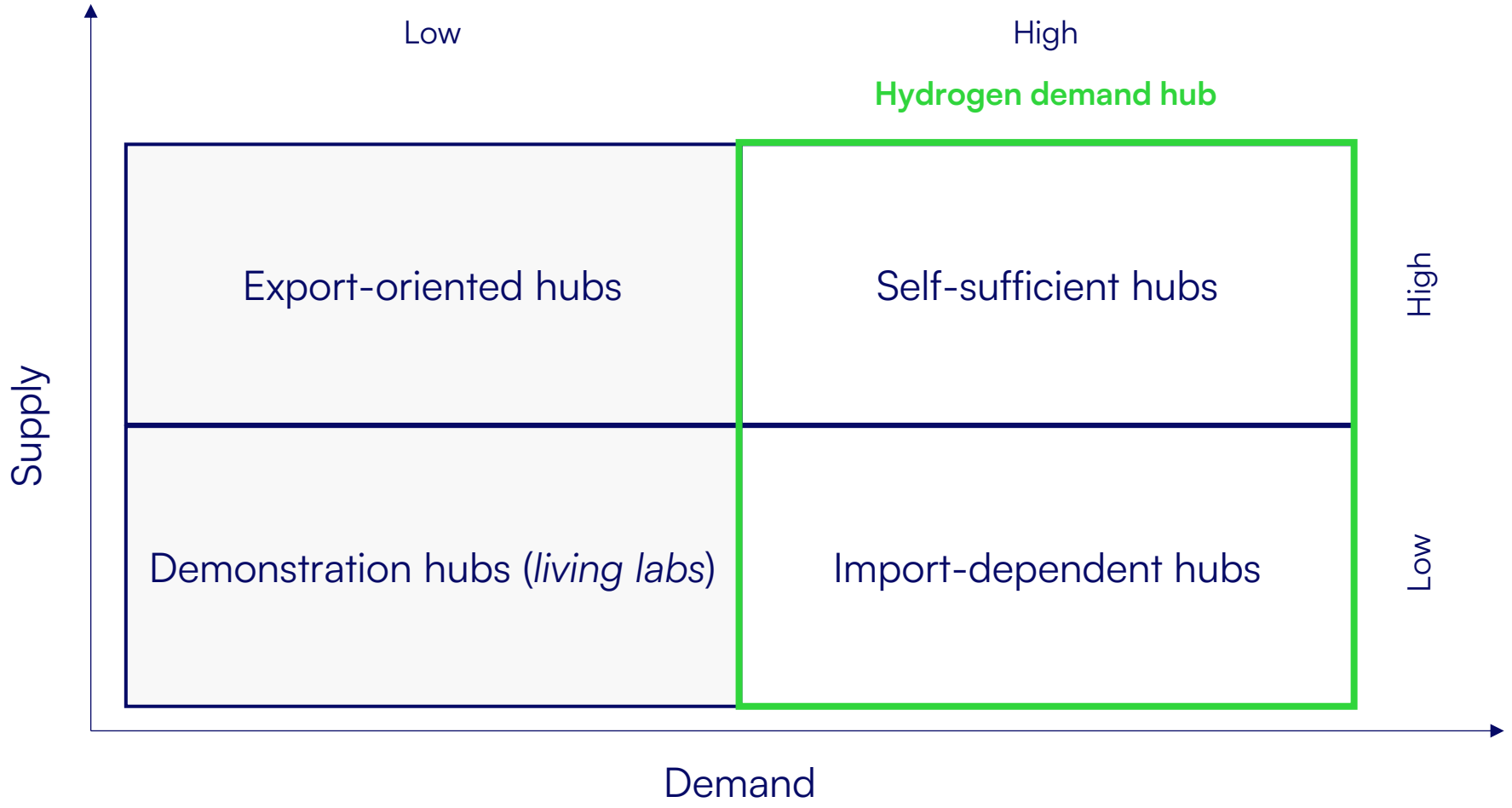
H2Global



Analysis

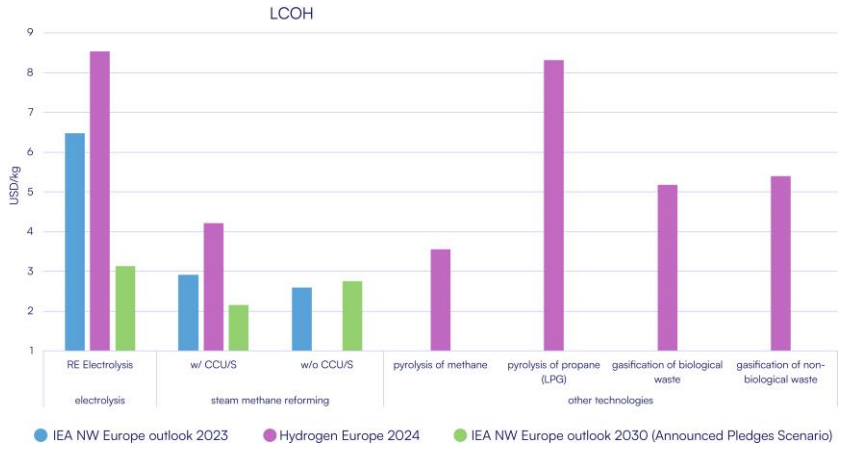
H2Global

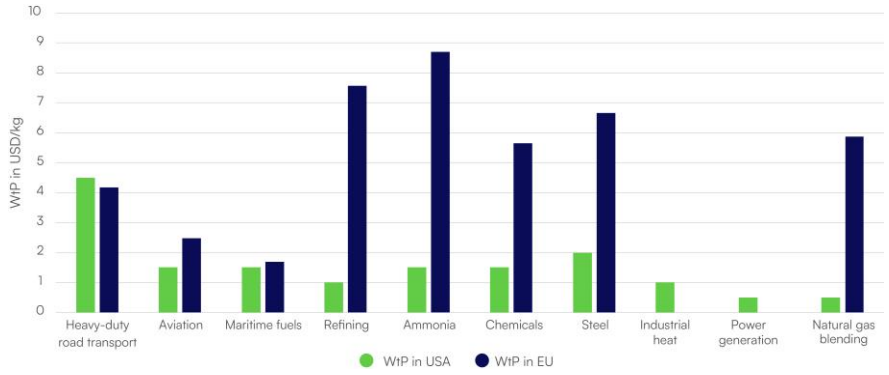
Hydrogen hubs can take different forms
depending on the emphasis given to supply and demand



H2Global

Cost-of-difference
is addressed differently in the two demand hubs





Sources for WtP rely on different methodologies

SELF-SUFFICIENT HUBS

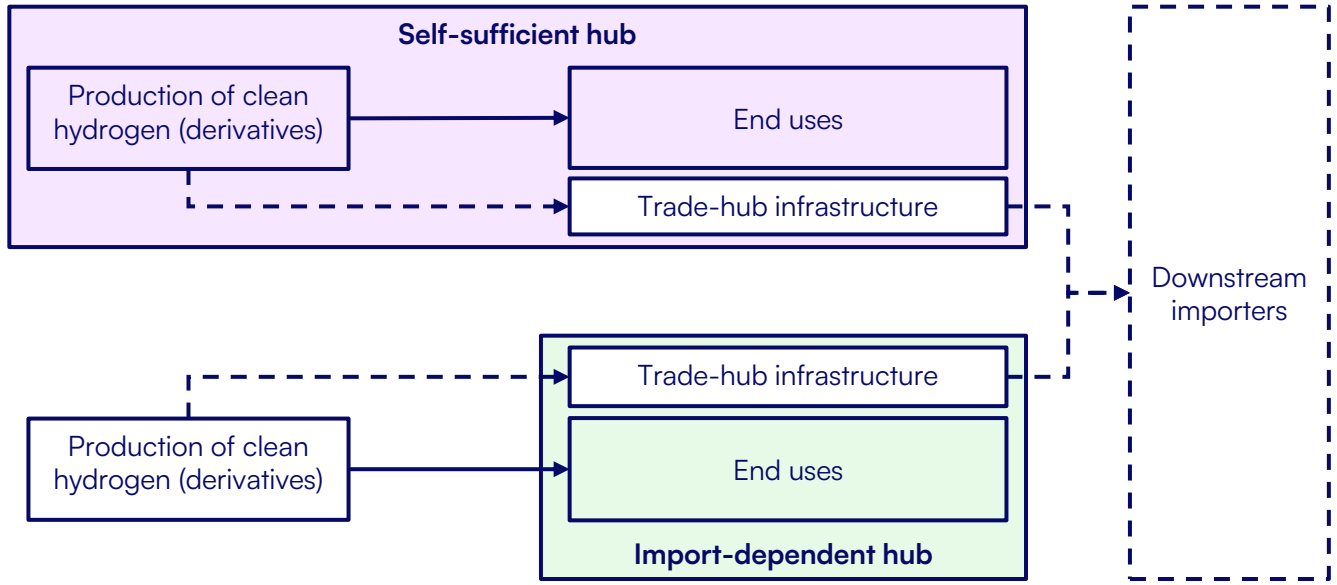
- Select production technologies to match the willingness to pay (WtP)
- Reduce infrastructure costs through proximity

IMPORT-DEPENDENT HUBS

- Optimize location to match most economic supply
- Leverage collective buying power

H2Global

Infrastructure access and security of supply are tackled in distinct ways by the two demand hubs



SELF-SUFFICIENT HUBS

- Supply matches demand within the hub
- Infrastructure requirements are lower since distances are relatively short within the hub

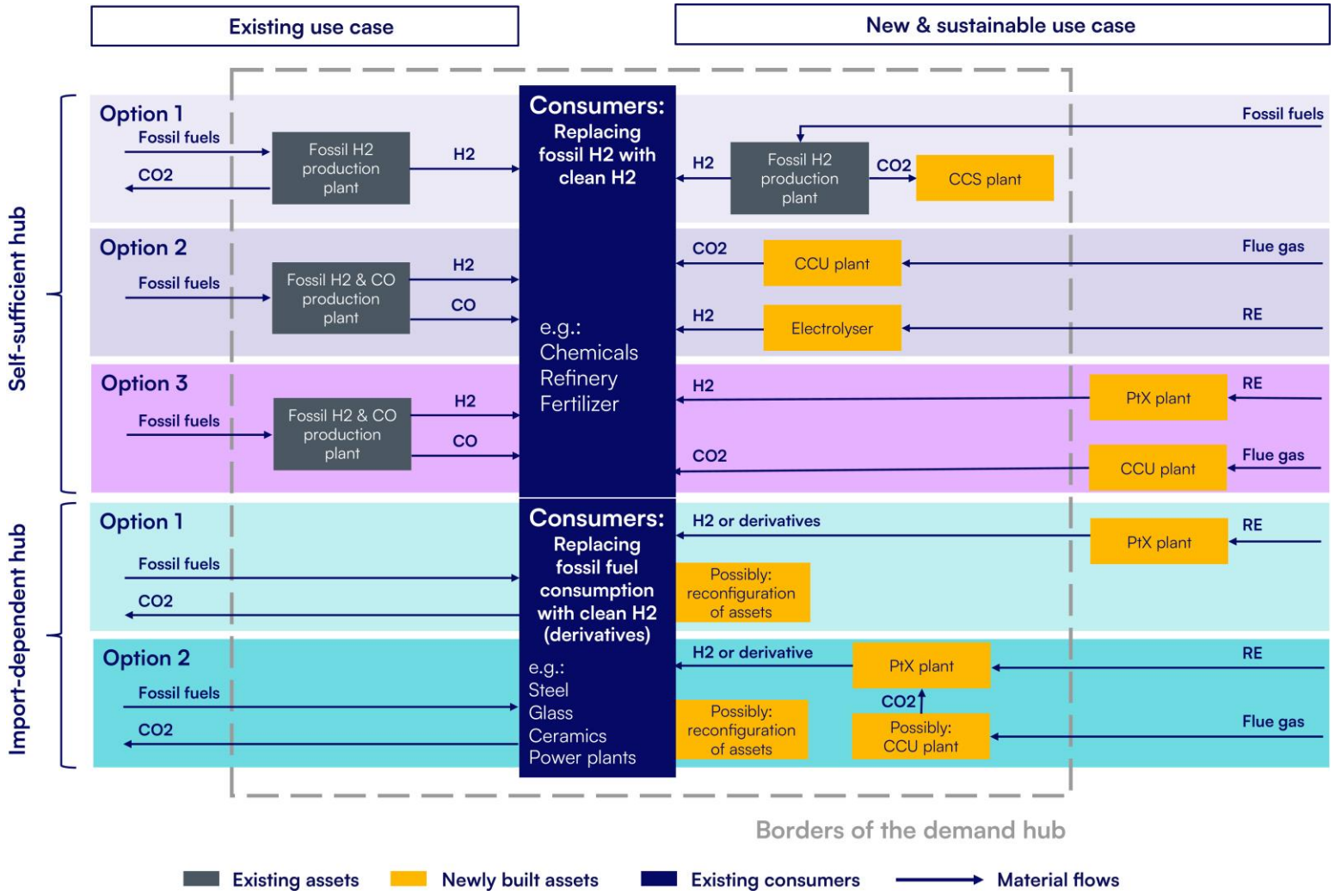
IMPORT-DEPENDENT HUBS

- Focus investment in the development of import terminals and/or transport corridors

The development of a **trade hub** is not directly related to offtake and thus an optional feature

H2Global

Combining demand hub types with different use cases
results in distinct transformation pathways



H2Global

Different transformation pathways
need different solutions

Challenge	Self-sufficient hubs	Import-dependent hubs
Cost-of-difference	• CAPEX for CCUS assets or other captive supply assets • OPEX with reference to additional electricity cost	• CAPEX for industrial assets • OPEX with reference to previously used fossil fuel
Supply security	• Ensuring sufficient local production and direct connection with offtakers	• Collective procurement from external supply, import coordination
Infrastructure	• Within-hub pipelines	• Import terminals, long-distance/mid-stream pipelines

H2Global

Case studies

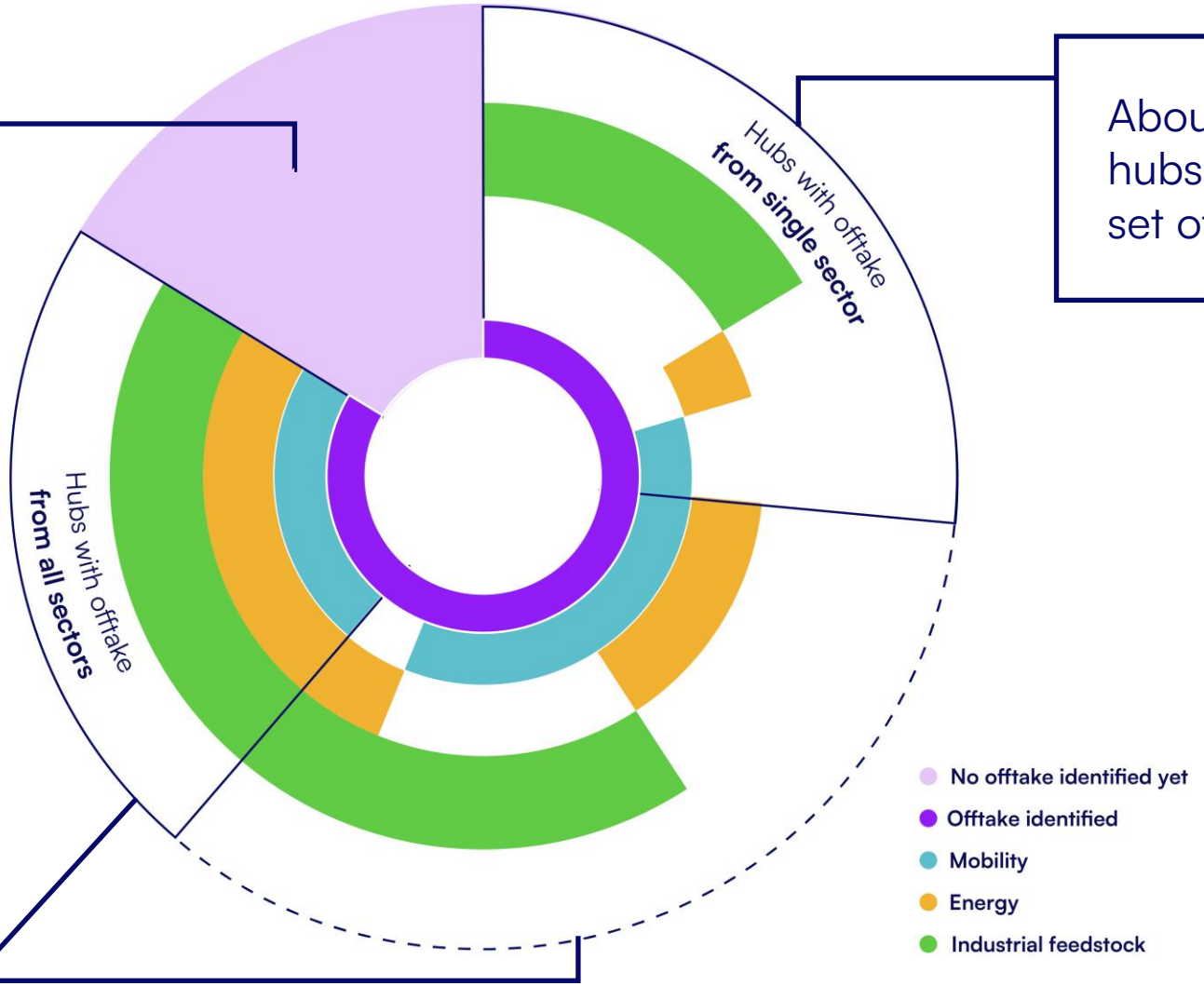
H2Global

An overview of hydrogen hubs in the world highlights a diversity of strategies

Many hydrogen hubs do not specify the offtake sectors they target

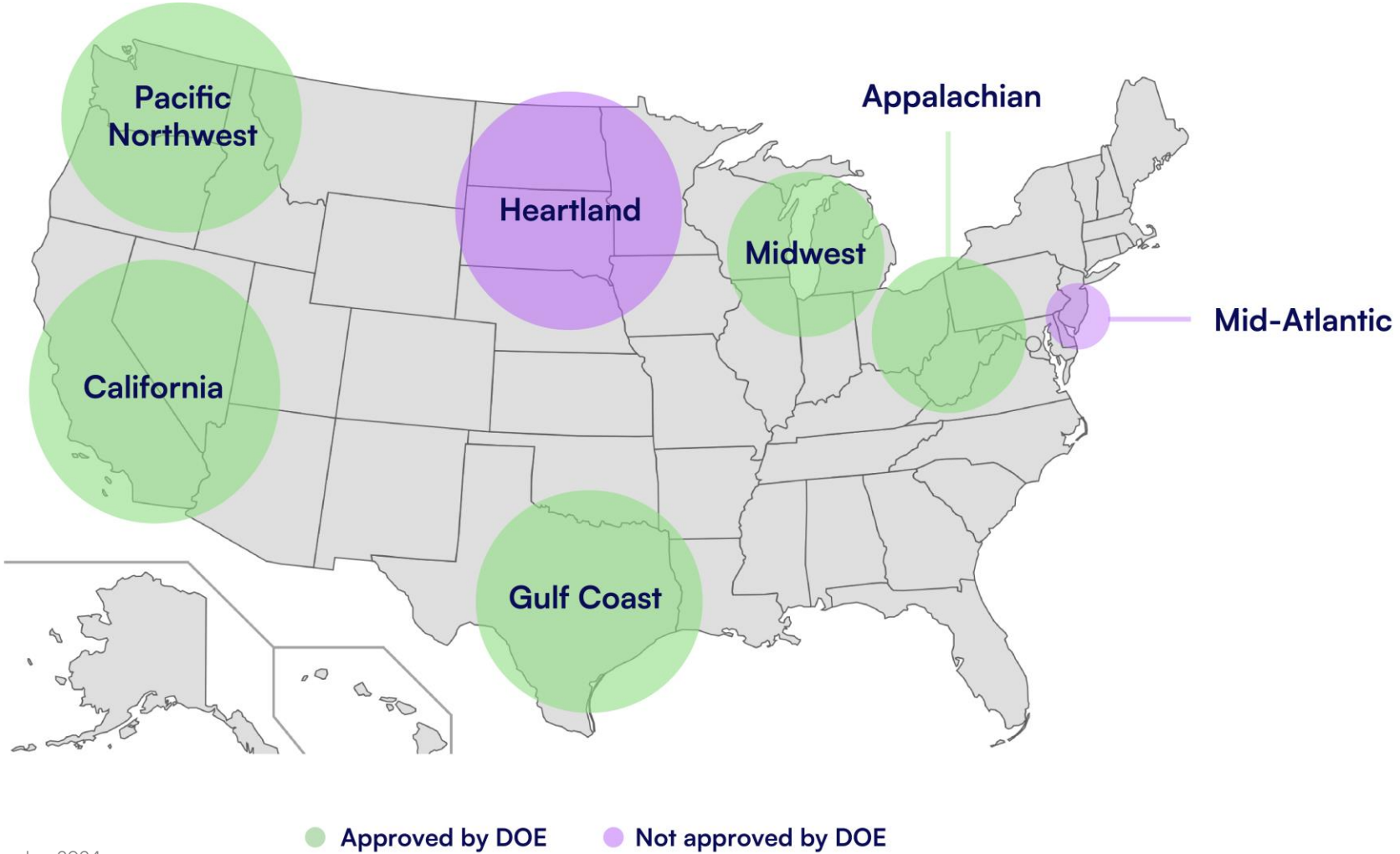
About a quarter of hubs target a narrow set of offtakers

More than half of the hubs aim for offtakers from two or three sectors



H2Global

US Hydrogen Hubs program
emphasizes self-sufficient hydrogen demand hubs



THE PROGRAM

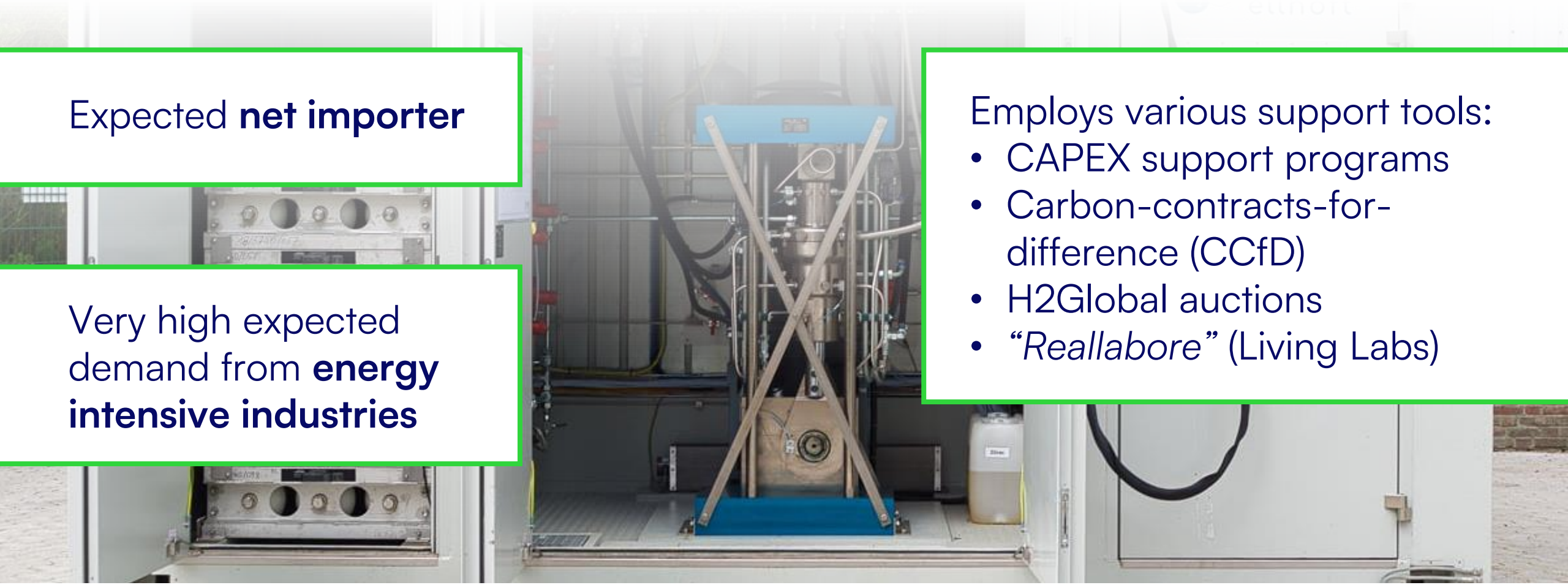
- Hubs are expected to be self-sufficient
- Five out of seven hubs have been approved
- Hubs have different approaches to supply
- Electrolysis-based supply is mostly connected to new uses

CAVEAT

US hubs span distances that resemble, or are equivalent to, small countries.

H2Global

Germany supports cost-of-difference for individual offtakers
& experimentation in a hub-like format



Expected **net importer**

Very high expected demand from **energy intensive industries**

Employs various support tools:

- CAPEX support programs
- Carbon-contracts-for-difference (CCfD)
- H2Global auctions
- *"Reallabore"* (Living Labs)

H2Global

India supports the establishment of domestic anchor demand and exports

Aims for **self-sufficient supply** and **export**

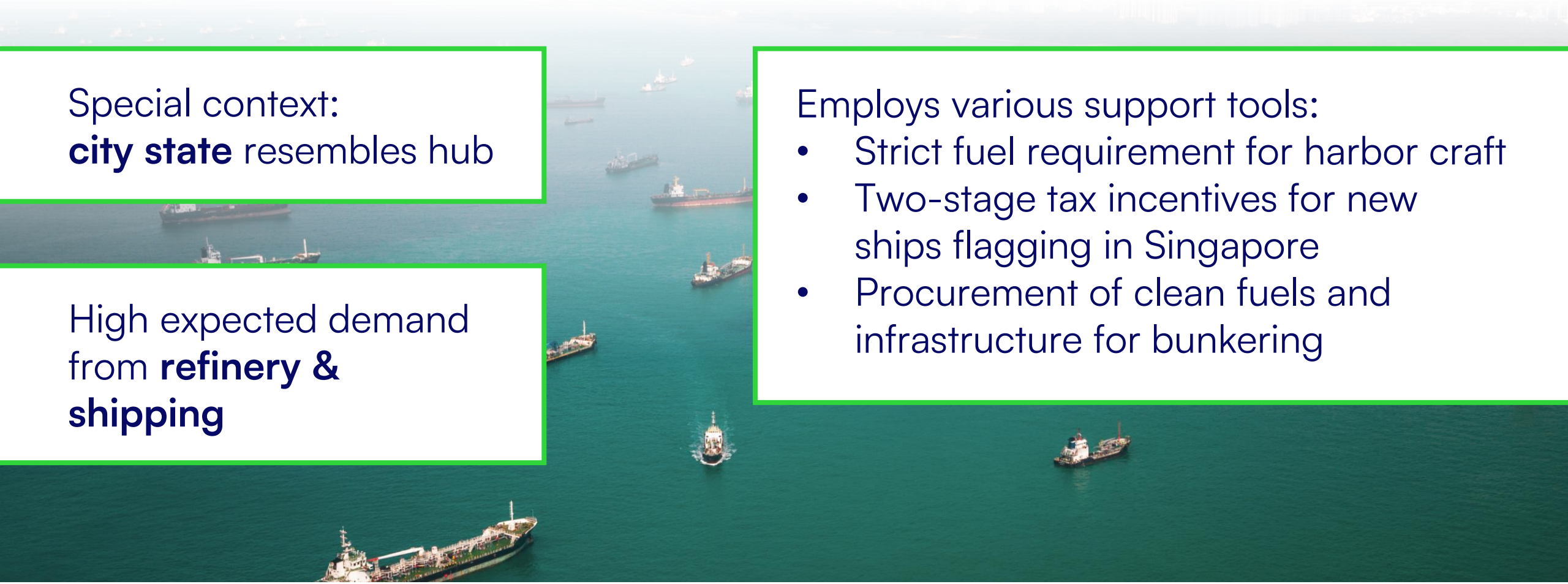
High expected demand from **energy intensive industries**

Employs various support tools:

- Quotas for select industries
- Limited direct financial support for offtakers
- Demand aggregation through auctions
- India Hydrogen Alliance, with European Investment Bank support, introduced five self-sufficient hubs' concept

H2Global

Singapore focuses on the maritime sector
and to a less extent on refining



Special context:
city state resembles hub

High expected demand from **refinery & shipping**

Employs various support tools:

- Strict fuel requirement for harbor craft
- Two-stage tax incentives for new ships flagging in Singapore
- Procurement of clean fuels and infrastructure for bunkering

H2Global

Takeaways

1. US hubs focusing on offtake from the transport sector were quicker to gain approval due to lower volumes and lower cost-of-difference.
2. The US hubs tend to connect electrolysis-based supply with new uses, and low-carbon hydrogen primarily to replace existing use cases.
3. Case studies reveal that several governments have yet to employ coherent hub programs.
4. The focus of hub-related programs varies widely from supporting full value chains, to anchor demand, to experimentation.

H2Global

Recommendations

H2Global

Recommendations

Challenge	Self-sufficient hubs	Import-dependent hubs
Cost-of-difference	— Support capital expenditure (CAPEX) for carbon capture, usage and storage (CCUS) assets and local renewable hydrogen production. — Support operational expenditure (OPEX) for operational costs of CCUS and sourcing sustainable energy.	— Support CAPEX for reconfiguring industrial assets to consume clean hydrogen. — Support OPEX for procuring clean hydrogen as a fossil fuel replacement.
Infrastructure access	— Invest in short-distance pipelines to connect production and consumption within the hub.	— Provide CAPEX for mid- and long-distance pipelines and terminals to facilitate hydrogen imports.
Supply security	— Monitor local production and incentivize increased capacity to meet demand.	— Develop infrastructure to connect the hub with domestic or international hydrogen production sources.
Value-chain coordination	— Create matchmaking platforms for within-hub supply chains.	— Support collective procurement through auctions and international cooperation with exporting countries.
Flexibility needs	— Implement fallback options to allow companies flexibility during fluctuating hydrogen availability.	
Research & development needs	— Support experimental regulation (e.g., reallabor/living-lab models) to foster new business models and innovative hydrogen solutions.	
Ease of doing business	— Establish one-stop shops for permitting and administrative procedures within the hub to streamline setup for new projects.	

H2Global

Follow us on LinkedIn

@H2Global Foundation

@HINT.CO GmbH

Jan Klenke

H2Global Stiftung
Program Lead

Trostbrücke 1
20457 Hamburg
+49 40 36197 500
jan.klenke@h2-global.org