WHEN TRUST MATTERS

The role of Clean Energy Commodities in decarbonizing Asia Pacific

Breaking barriers: making green hydrogen commercially viable

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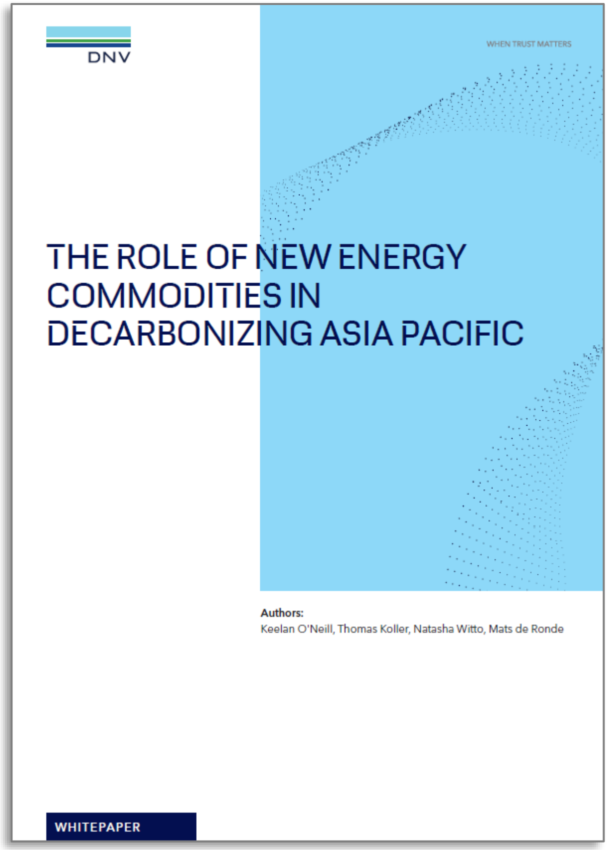
Presentation focus areas

1 **What should be the role of Clean Energy Commodities in decarbonizing Asia?**

2 **What is the trajectory we are currently on?**

The launch of DNV's latest white paper in APAC

- Renewables and electrification will play the major role in delivering the energy transition but hard-to-abate industries such as aviation, steel and chemicals will need additional decarbonization options to provide greater flexibility to meet their emissions targets.
- Hydrogen, ammonia and sustainable fuels are required as well as emissions mitigation commodities such as carbon capture and storage.
- The creation and trading of these commodities will be integral in APAC's energy transition but will require a massive rollout of new infrastructure and trade networks.
- DNV explores what these new trade flows will look like and how they will be realized.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WHEN TRUST MATTERS

THE ROLE OF NEW ENERGY COMMODITIES IN DECARBONIZING ASIA PACIFIC

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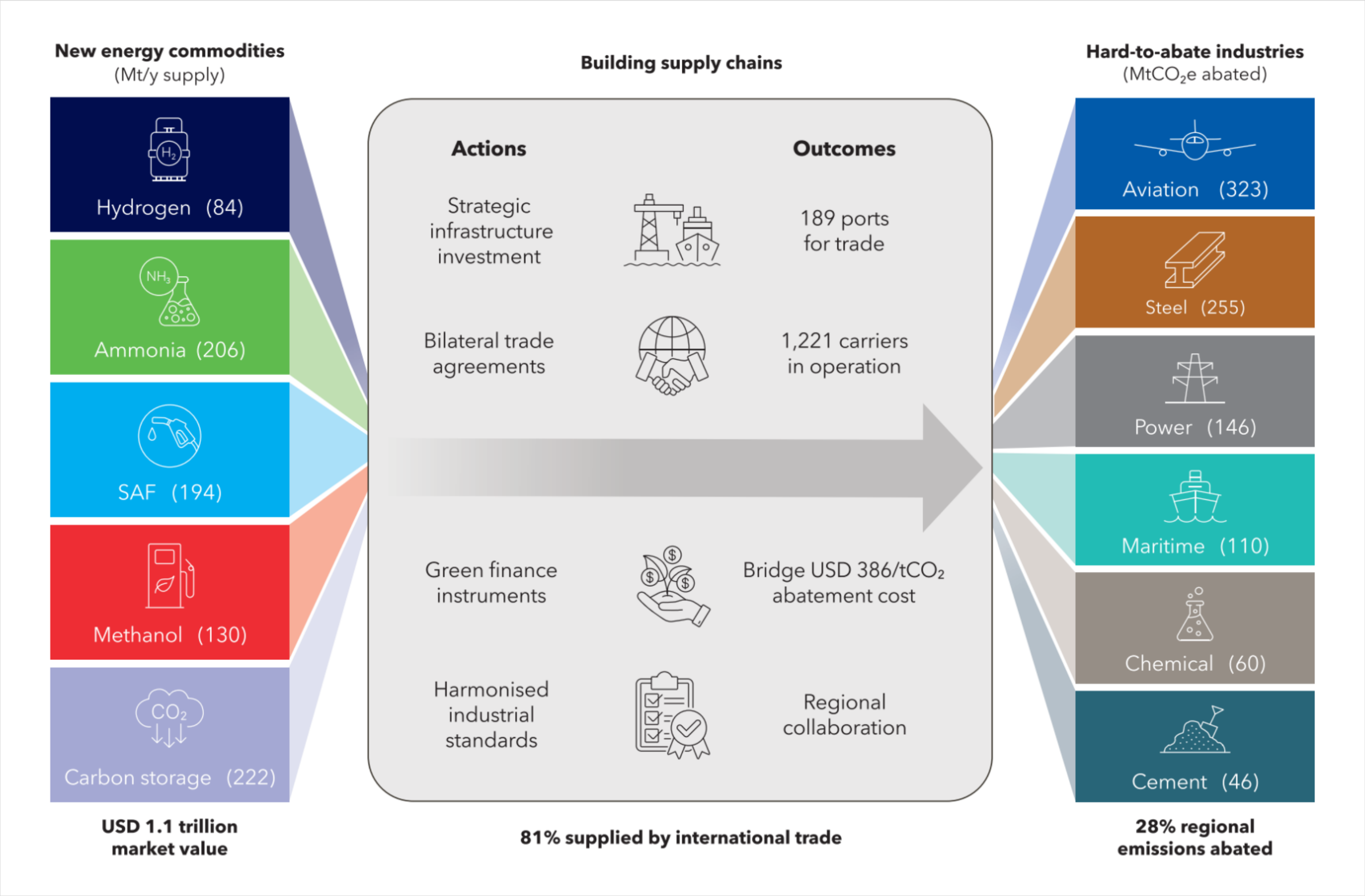
WHITEPAPER

Scope of the study

A novel analytical model to evaluate the role of new energy commodities in reaching a net zero economy in 2050



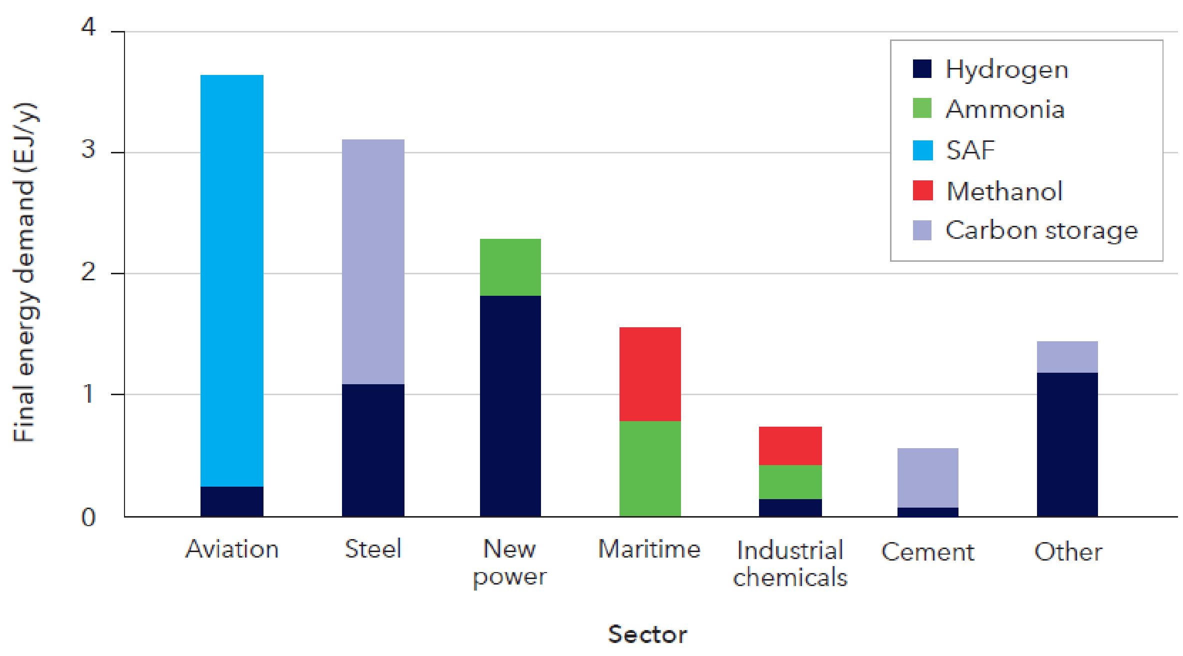
The paper explores the new trade flows required to supply new energy commodities to centres of demand and how they will be realized. It determines the quantities of these new commodities needed to enable the economies of the APAC region to decarbonize and how these volumes will be split between countries and sectors.

We assess the supply chains for the commodities in terms of infrastructure, trade flows and costs, and explore the challenges in deploying new energy commodities and the policy mechanisms that could support their uptake.

CEC demand by industry sector

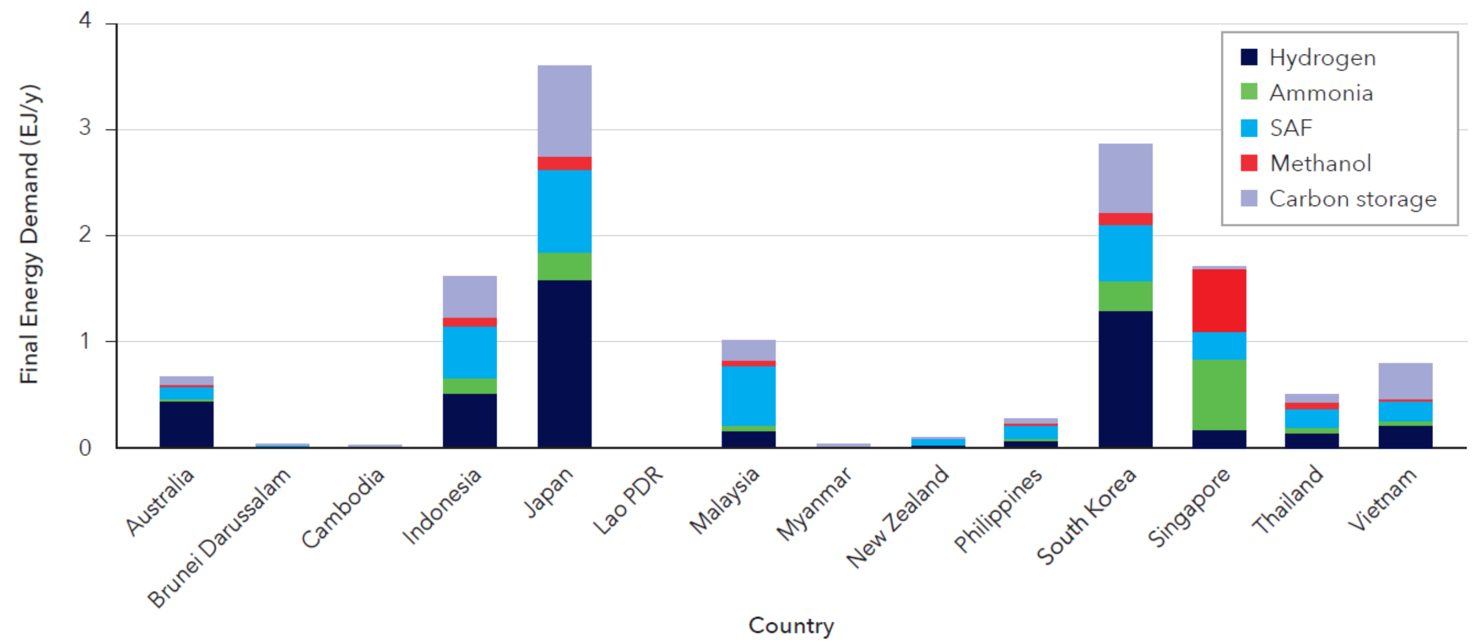
Key findings:

- Aviation will have the largest demand, with SAFs supporting regional growth in the sector while reducing emissions.
- Steel has high potential demand, principally for hydrogen to enable new green steel plants and CCS to decarbonize traditional steel production.
- Demand in power and maritime will also be considerable.
- Hydrogen has the potential to be used in nearly all sectors and should be seen as a critical and versatile commodity for the future.



CEC demand by country

- All countries require some level of CECs for the energy transition with the bulk of demand coming from four countries: Japan, South Korea, Indonesia and Singapore.
- Japan and South Korea have the largest overall requirements (27% and 22% of the regional total). They also have a similar distribution of needs including high levels of hydrogen (for new power) and sustainable aviation fuels. Both countries are already pursuing strategies and policies to support the adoption of CECs.



Trade flow case studies

Import-oriented Singapore

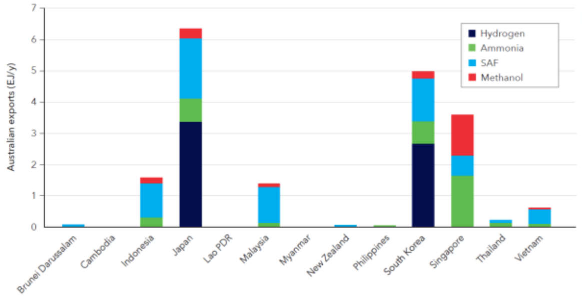
- As the world’s largest bunkering hub, Singapore will have considerable demand for ammonia and methanol for the maritime industry.
- Other key sources of demand are aviation (SAF) and new power (hydrogen and ammonia).

Net self-sufficient Indonesia

- Indonesia is expected to be self-sufficient in hydrogen production with opportunities to export small volumes to neighbouring countries.
- Aviation and maritime sectors will require imports though there is potential to develop waste biomass into biofuels such as SAF and methanol.

Export-oriented Australia

- With its high renewables capacity factor, Australia can produce highly competitive CEC products.
- Exports from Australia to Japan, South Korea and Singapore represent 65% of all CEC trade in the region.



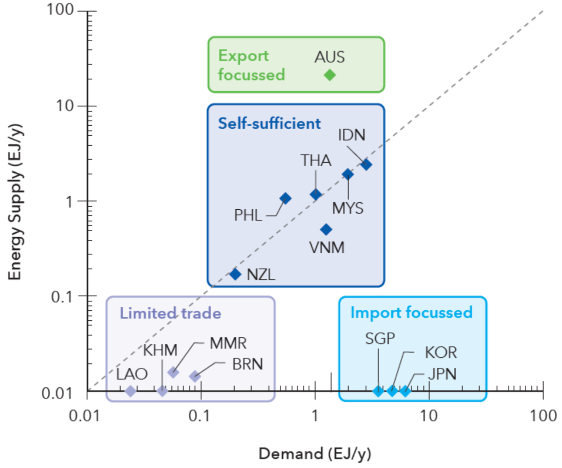
Results

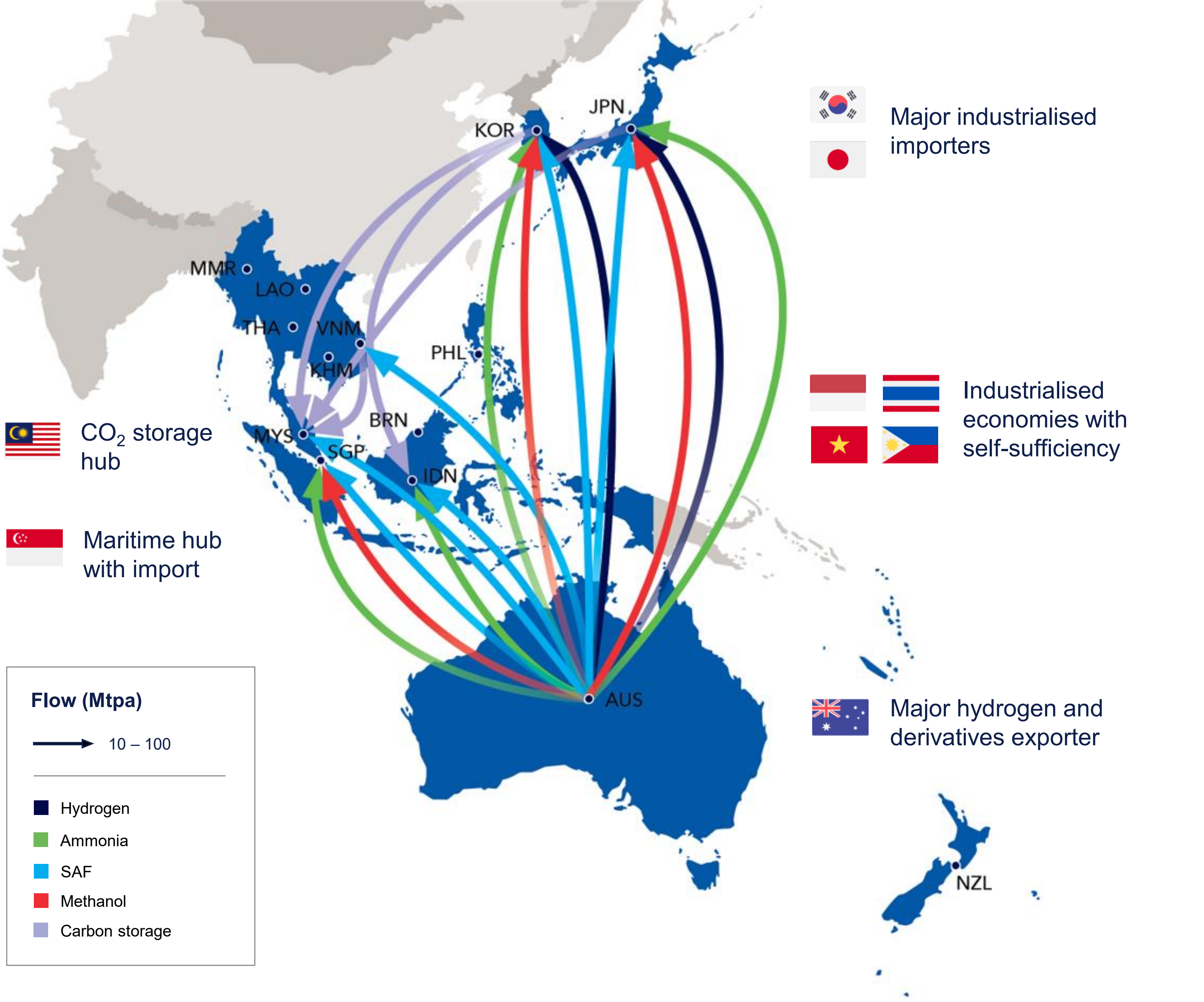
We map trade of new energy commodities across APAC.

New energy commodities are modelled by country as well as by sector.

Different countries are expected to have particular trade dynamics, whether export, import focused or self-sufficient.

Trade dynamics





Infrastructure required for the CEC economy

Solar

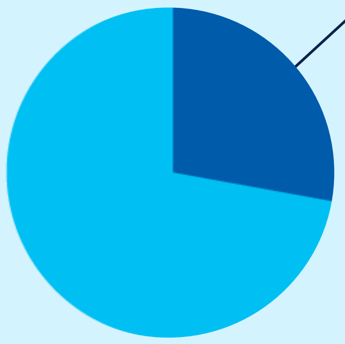
4.7 TW
12 million panels

Ships

1,221 carriers

Waste biomass

26% of
total sustainable
fuels demand



Wind

5.4 TW
2.7 million turbines

Terminals

189 terminals

Electrolysers

4.7 TW

Lands use

1.5% area

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Clean Energy Commodities: Key insights

Objective

Forecast the supply and demand for new energy commodities in Asia Pacific to enable net zero goals

Analysis performed

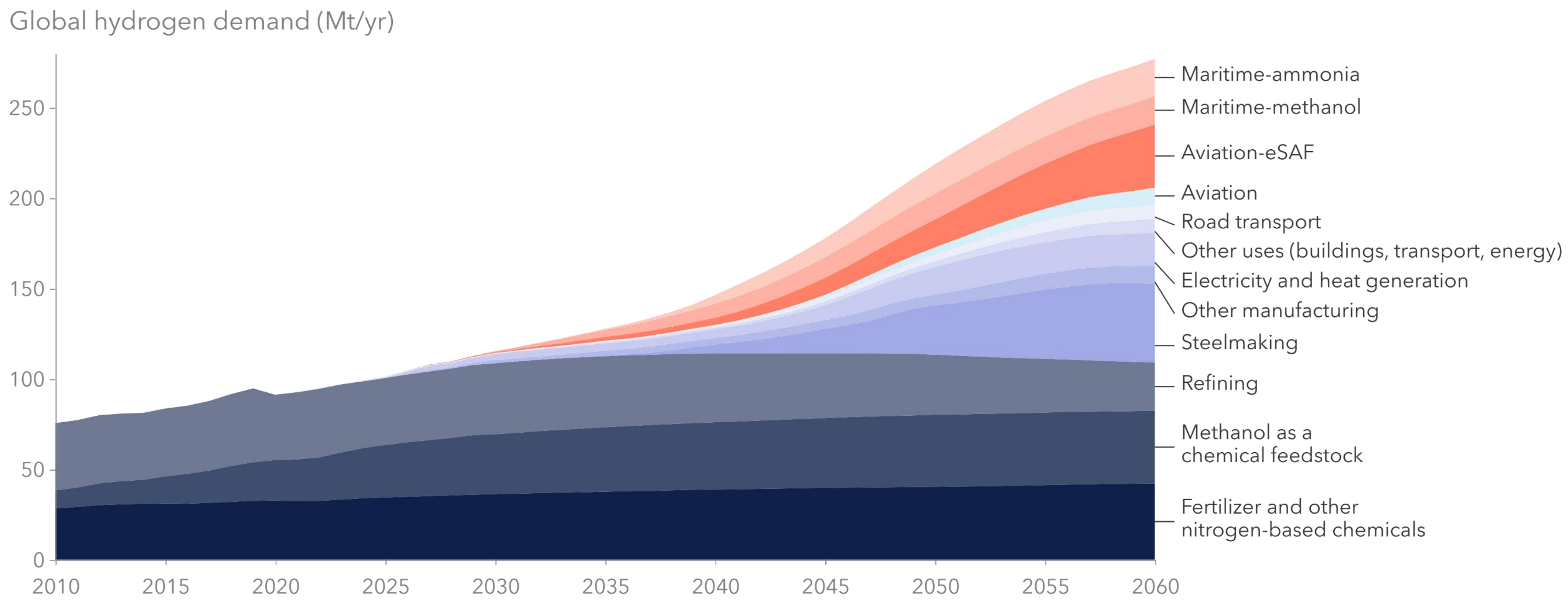
- Trade flow dynamics which support lowest cost deployment
- Evaluated the infrastructure needed to develop the NEC economy
- Policy needs to be developed as key enabler to achieve our objectives

Clean Energy Commodities (CECs)

Key takeaways

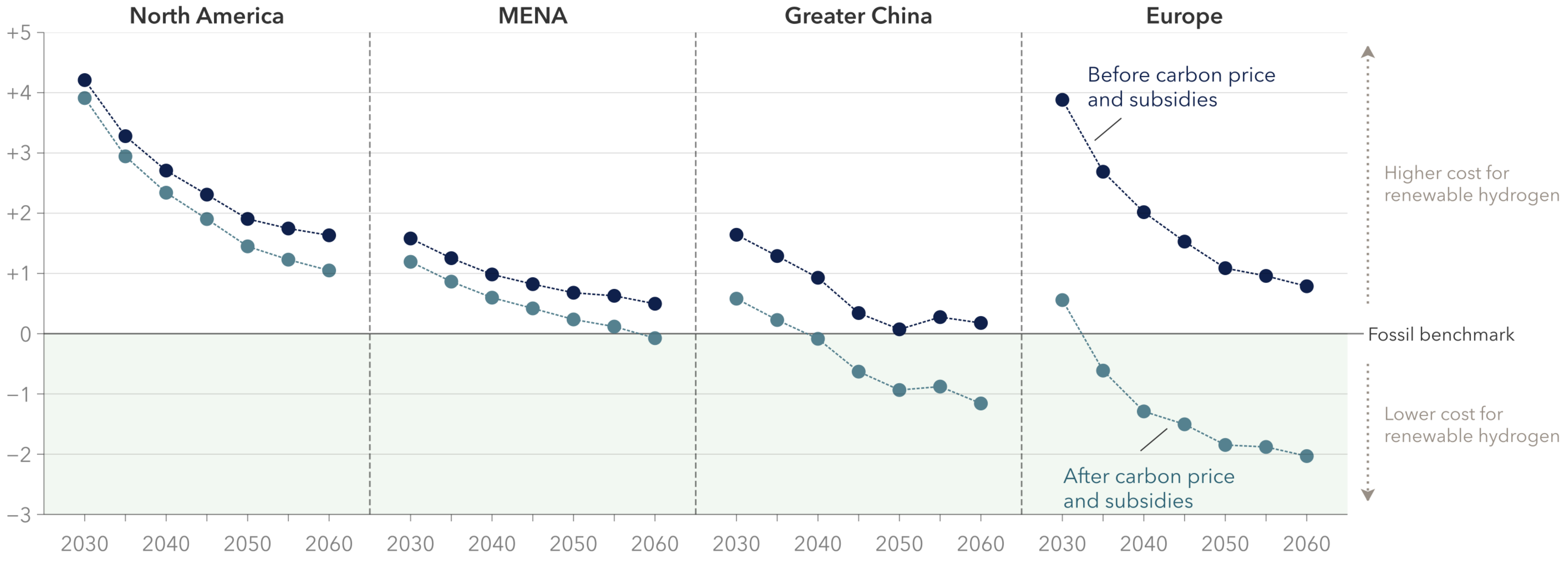
- CECs contribute to **28% of emissions reduction** – primarily in hard-to-electrify sectors
- **81% of supply** derived from international trade
- **10 TW** of renewable capacity required to produce the low carbon molecules
- Average cost of **USD 386** to reduce 1 tonne of CO_2e (marginal abatement cost)

Total hydrogen demand grows 170%, and diversifies



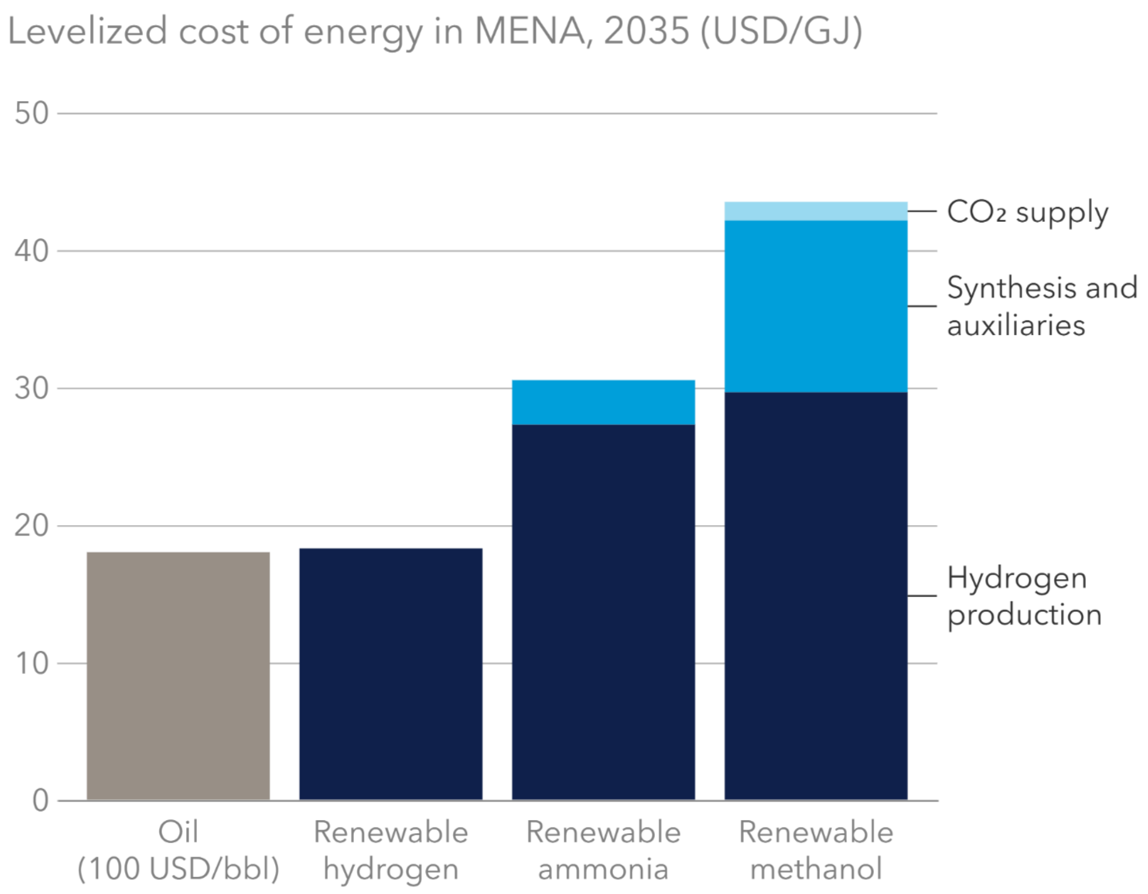
Regulation and policies are crucial for further scaling

Cost gap between unabated fossil and renewable hydrogen (USD/kg)

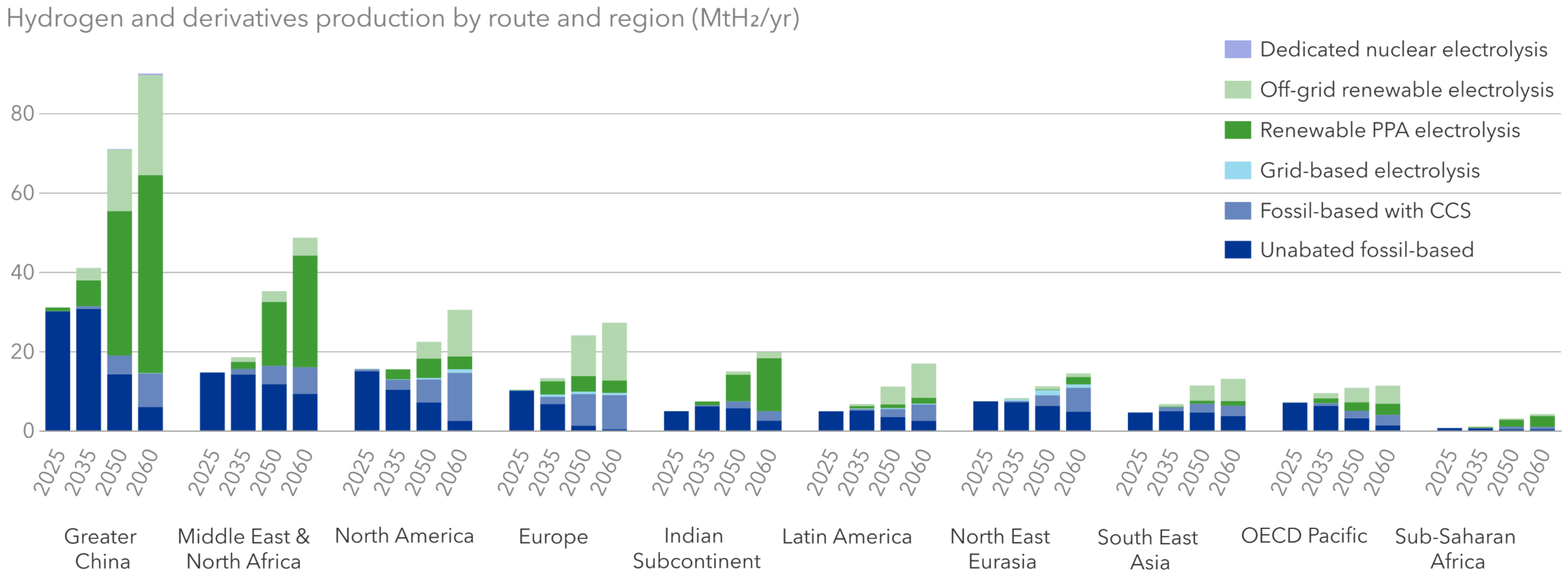


Derivatives have a big premium, even in favourable regions like MENA

- Conversion adds substantial cost through synthesis CAPEX, auxiliary systems, and efficiency losses.
- The use of renewable ammonia increases the cost of delivered energy by roughly 50% relative to pure hydrogen.
- For carbon-based e-fuels, the cost uplift is significantly larger due to additional cost for sourcing carbon-neutral CO_2.

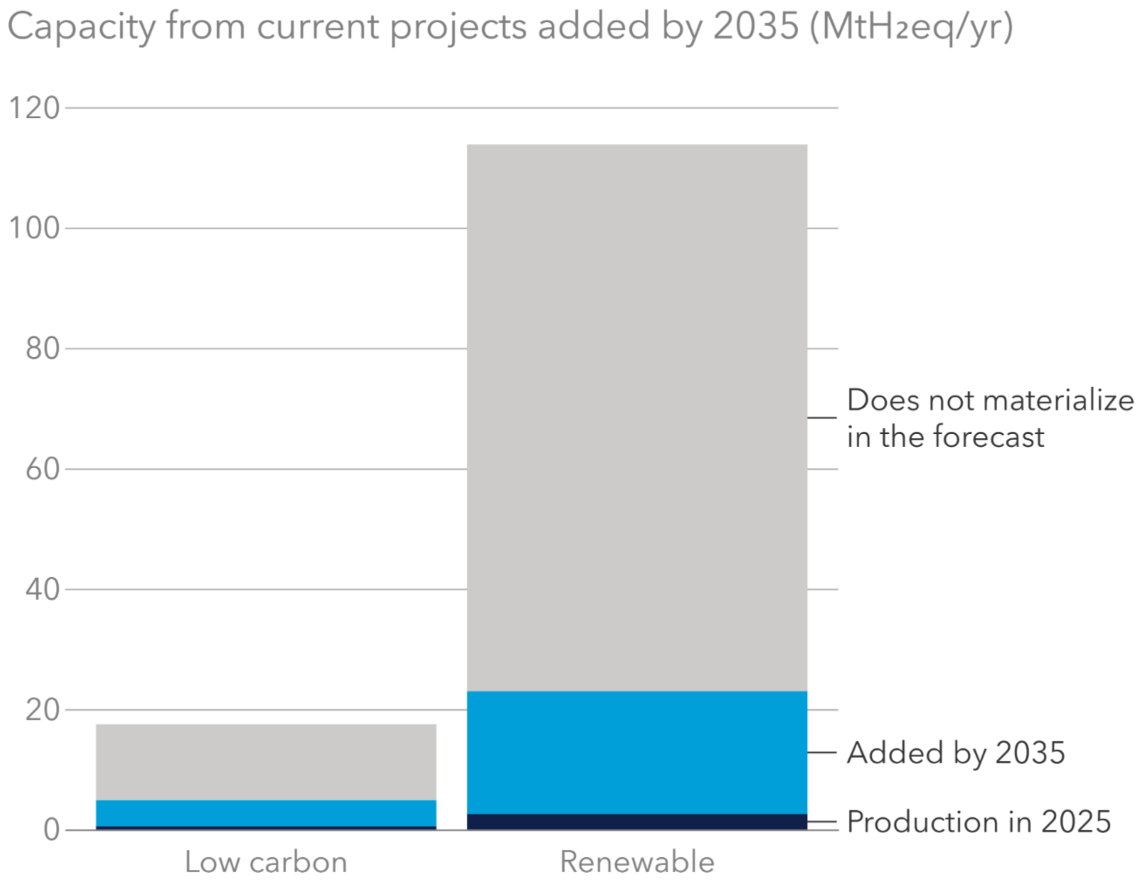


Renewable hydrogen dominate regional production mixes, except North America and North East Eurasia



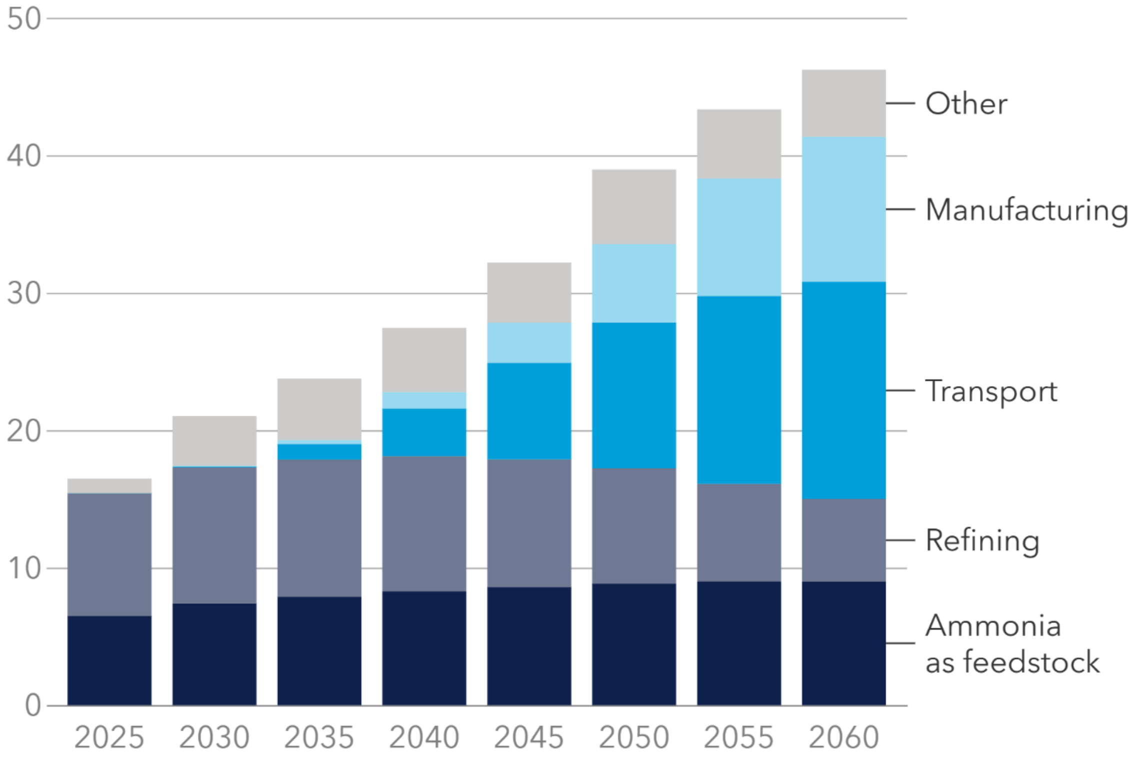
20% of total announced nominal capacity materializes

- Only projects from the DNV Alternative Fuels Insight (AFI) database that can be matched to identifiable demand in our forecast are assumed to materialize.
- Earlier-stage announcements or projects lacking credible offtake are assumed to be delayed or cancelled.
- Out of a total nominal announced capacity of 130 MtH_2/yr we estimate that nearly 25 MtH_2/yr of additional hydrogen and derivatives production will materialize from the known project pipeline by 2035.

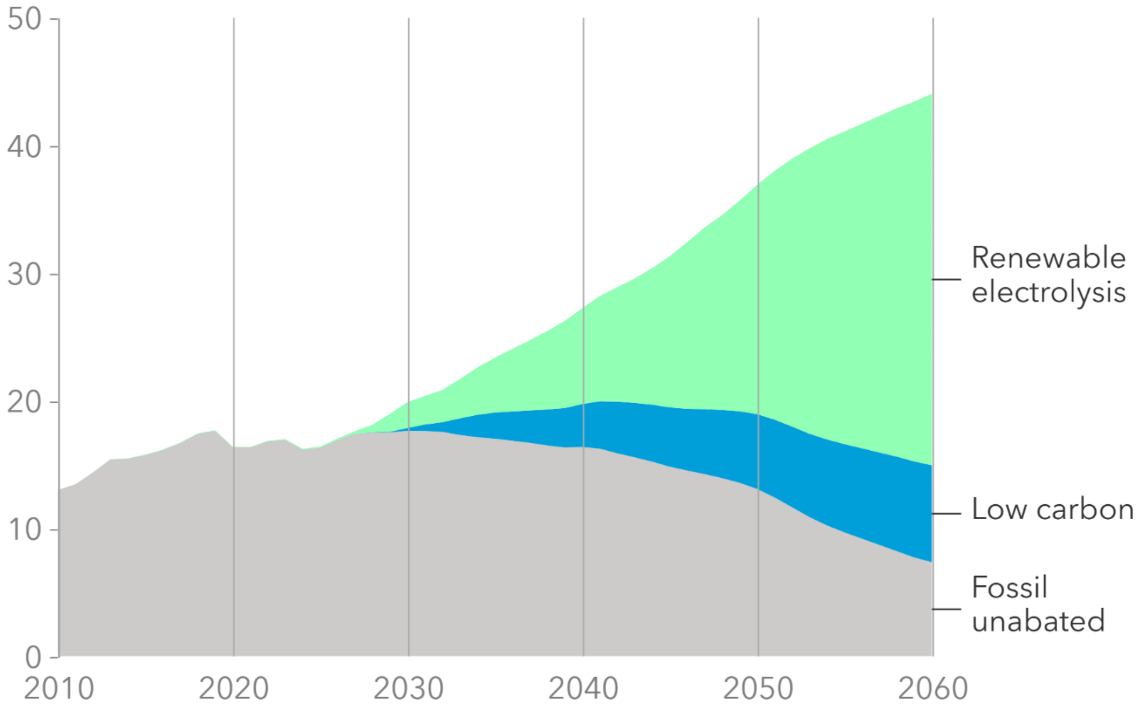


APAC – Strong growth but potential held back by lack of adequate policy

APAC hydrogen demand by sector (MtH2/yr)



APAC hydrogen production by route (Mt/yr)



Low-carbon hydrogen: all production with carbon capture and storage

Policy requirements to drive CEC uptake in APAC

Cost differential to fossil fuels

- High marginal abatement cost of USD 386/t CO_2e
- Cost bridging policy options such as carbon prices, subsidies and mandates have relative merits depending on country and sector

Infrastructure planning

- Major development of infrastructure, including renewable capacity, ports, ships, pipelines
- Public sector led hubs & zones can support shared infrastructure
- Social concerns, including land use and safety, must be considered

Access to finance

- Enable sufficient and targeted access to capital through blended finance, combining public and private funding
- Support green bonds and sustainability-linked loans to mobilize investment in renewable and low-carbon technologies

Harmonized standards

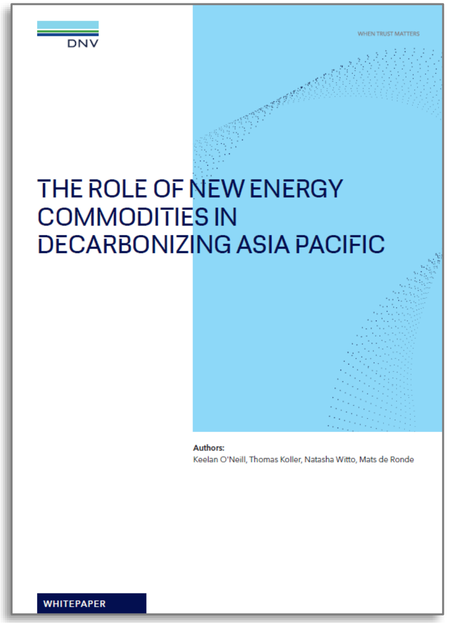
- Align regional standards for safety, environmental, and technical aspects of emerging energy commodities like hydrogen and ammonia
- Create definitions for “low-carbon” and “renewable” fuels, aligned with global bodies (e.g., IMO), to support investment and certification

Scan the QR codes to download your personal copies

Energy Transition Outlook 2026: Hydrogen to 2060

https://tinyurl.com/eto2026hydrogen

The role of new energy commodities in decarbonizing Asia Pacific



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