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Exploring the Long-Term Outlook for Hydrogen

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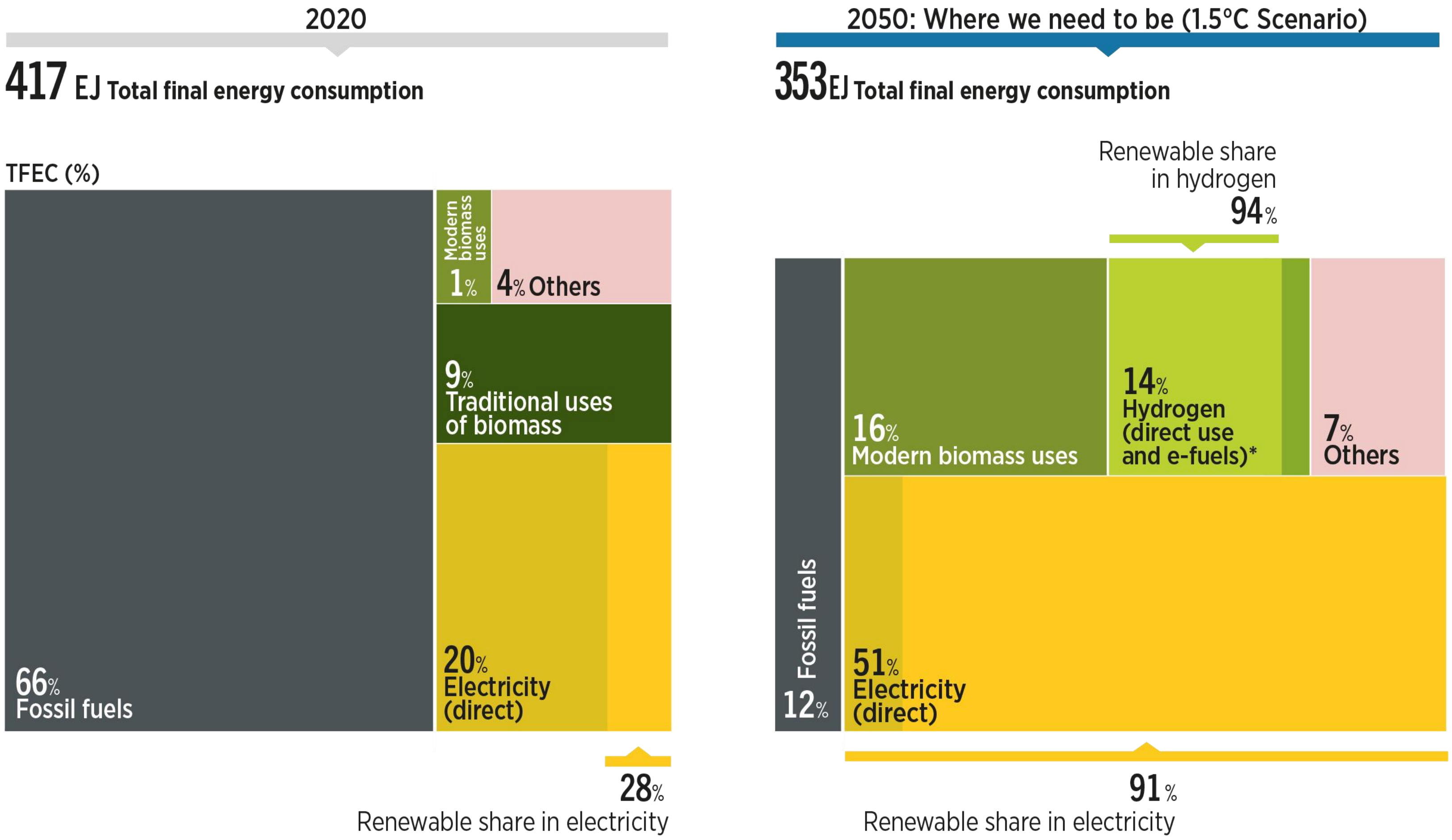
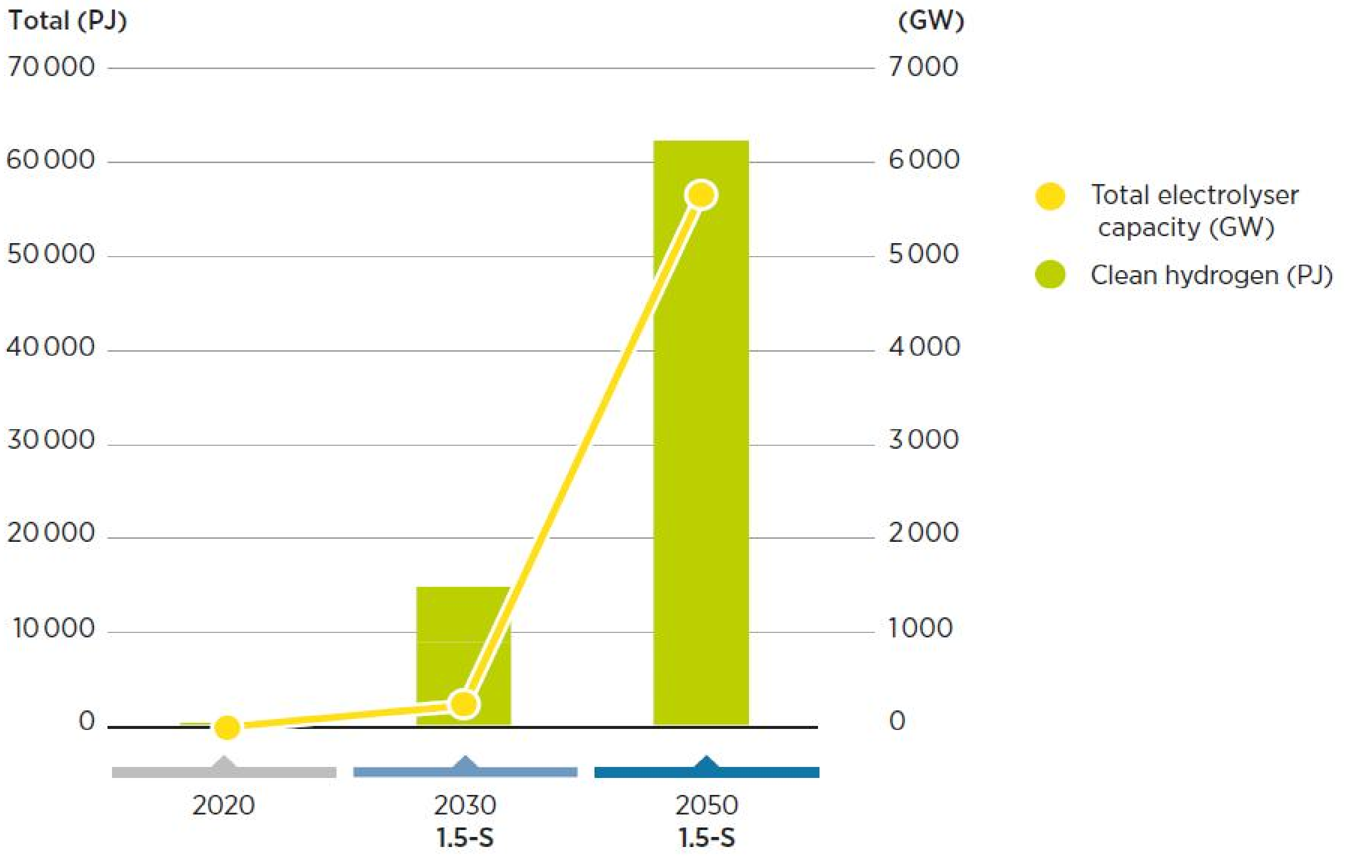
Hydrogen in IRENA's 1.5°C Scenario



Breakdown of total final energy consumption by energy carrier between 2020 and 2050 under the 1.5°C Scenario.

- By 2050, **electricity becomes the main energy carrier**, accounting for over 50% of total final energy consumption.
- Hydrogen could cover up **14% of total final energy consumption by 2050**.
- **94% of hydrogen consumption** is expected to **come from renewables**, indicating a growing reliance on clean energy sources.

Global hydrogen supply needs to grow six-fold

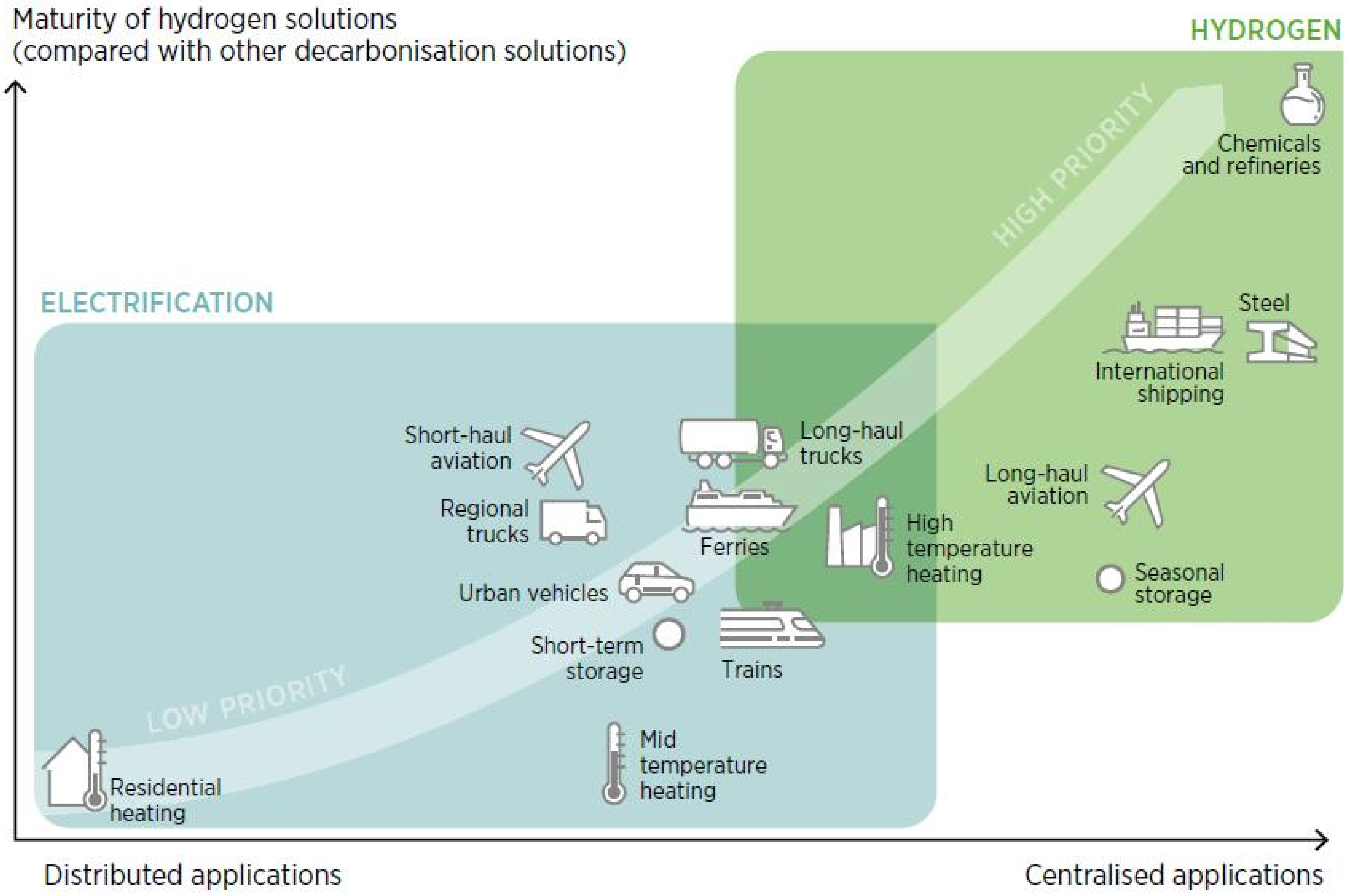


Notes: 1.5-S = 1.5°C Scenario; GW = gigawatt; PJ = petajoule.

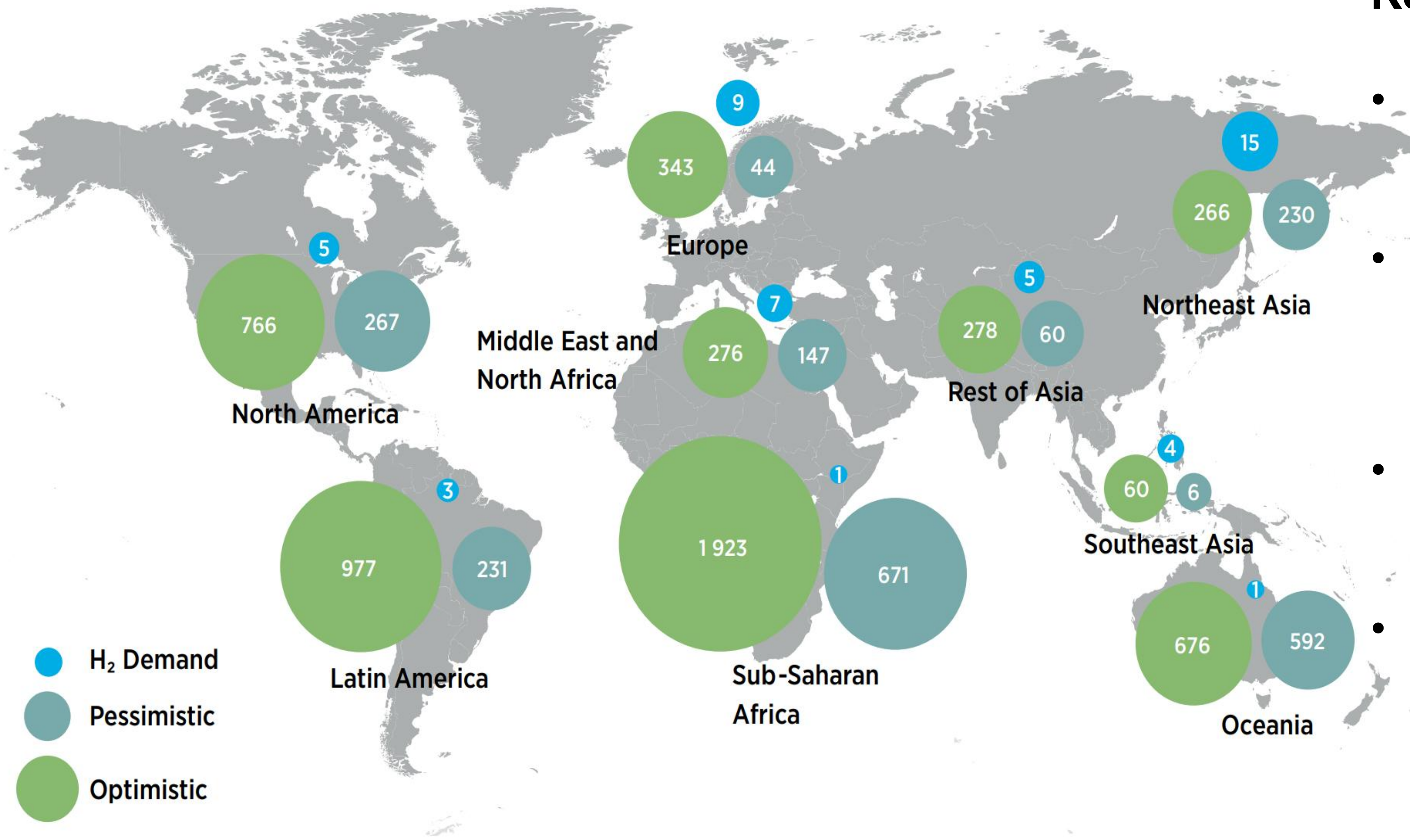
Global clean hydrogen supply in 2020, 2030 and 2050 in the 1.5^{o}C Scenario.

- Required: 6x grow in H2 supply from 90 Mt/y today to **~ 530 Mt/y in 2050**
- Electrolyzer capacity needs to grow to **~ 5 700 GW in 2050**
- Investments needs for green hydrogen and derivates will be **170 billion USD per year**

Clean hydrogen policy priorities



Global hydrogen supply



Key aspects:

- **75%** would be **domestically produced and consumed**.
- Of the total global hydrogen demand, **25% might be traded internationally**
- **55%** would be transported by (mostly retrofitted) **pipelines**.
- **45% of the internationally traded** hydrogen would be **shipped**, predominantly as ammonia, which would mostly be used as a feedstock **without being reconverted to hydrogen**.

Innovation drivers for green hydrogen trade

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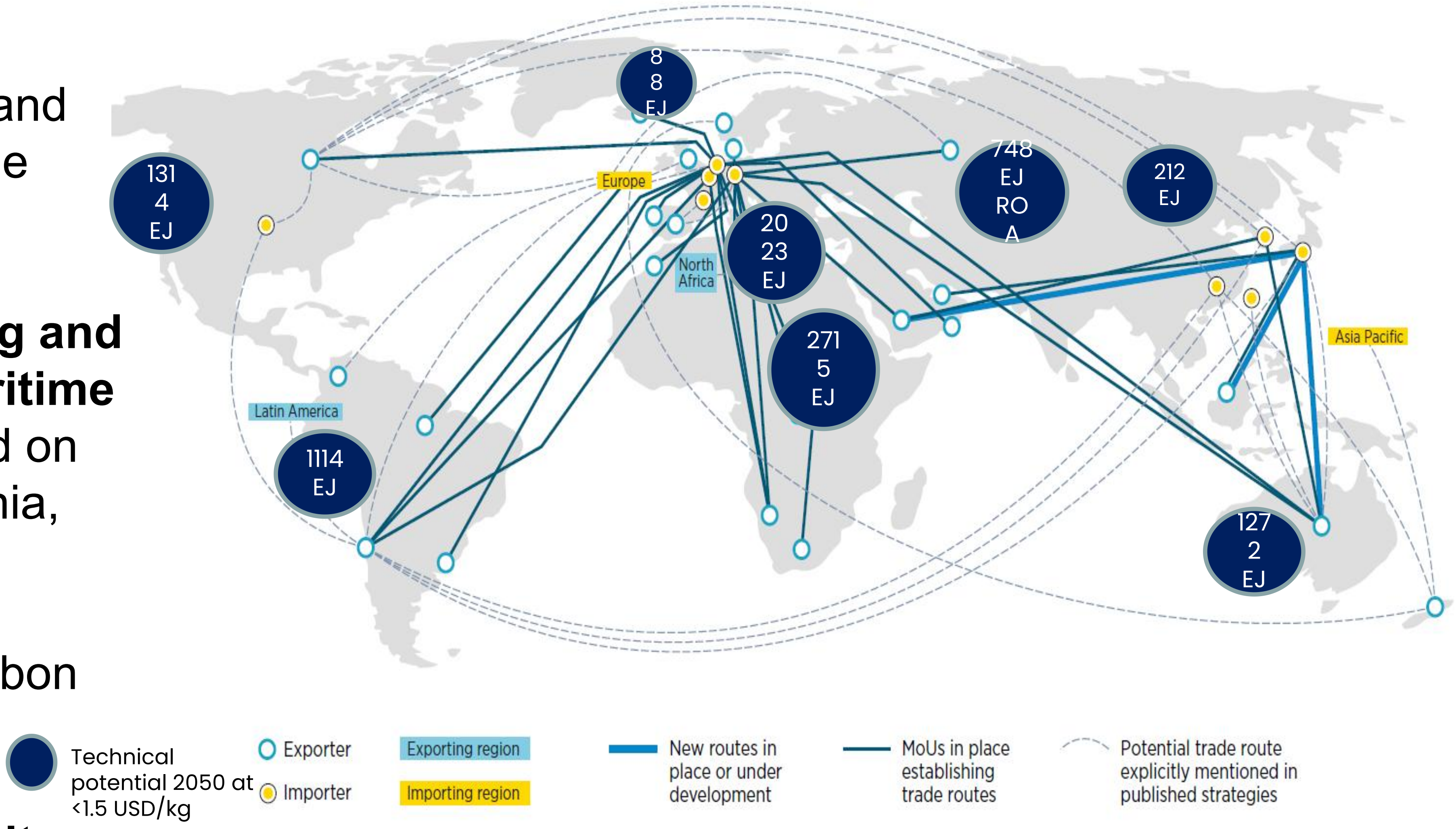
Key aspects:

- **Standards** for safety and performance in pipeline trade
- Infrastructure **planning and development for maritime transportation**, based on the H2 carrier (ammonia, methanol, LOHC)
- **Harmonisation** of carbon certification balancing **market growth** and **environmental integrity**



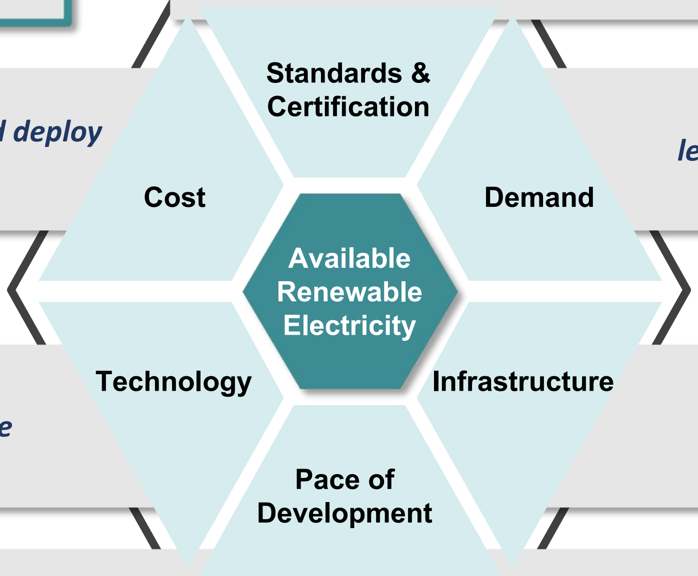
Measures to overcome barriers to hydrogen market development

Significant ramp up and deployment of renewable generation through ambitious targets, incentives and energy system design

Ensure clarity on standards both through a certification scheme and for development of assets across the value chain

Remove critical cost and regulatory barriers for production and deploy mechanisms to accelerate hydrogen demand

Drive critical mass demand through major hydrogen projects leveraging efficient allocation of capital, long-term certainty and sectoral targets for uptake



Focus on innovation and R&D to enable improvement on cost, efficiency and durability of the electrolyser and de-risking of the technology steps for global hydrogen trade

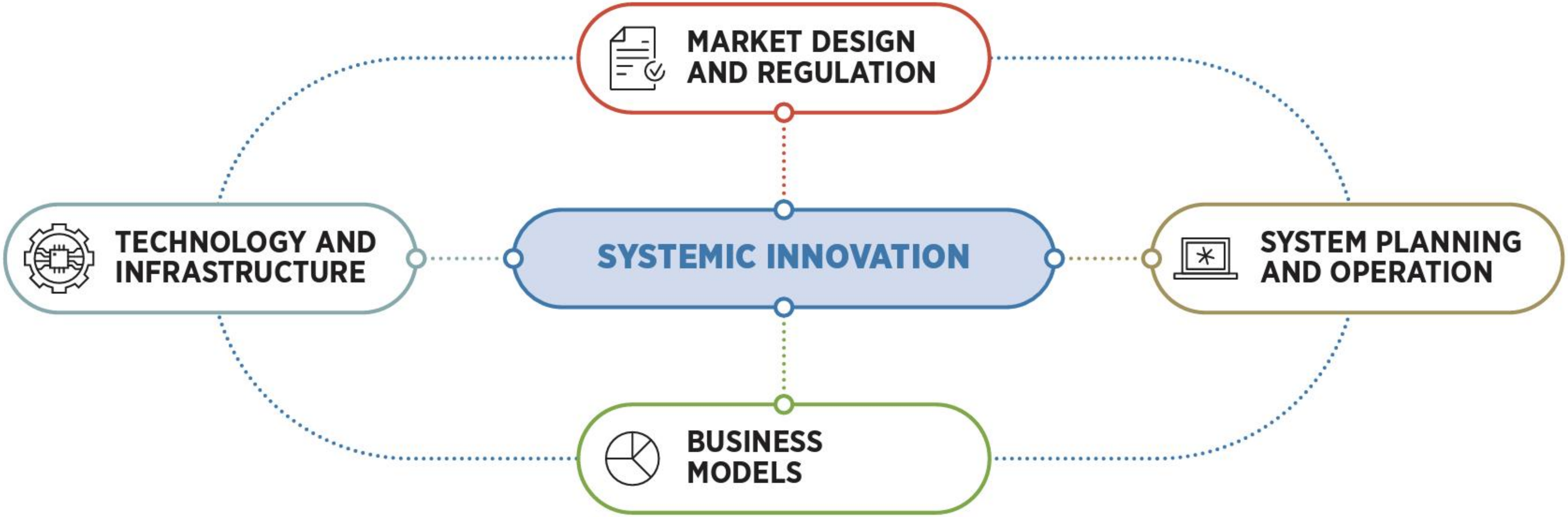
Ensure early ramp up of infrastructure development, including transport, storage, conversion and re-conversion facilities and repurposing of the existing natural gas infrastructure

Accelerate scale-up of electrolyser manufacturing and electrolyser sizes driving economies of scale

Available renewable electricity is the fundamental enabler to the Green Hydrogen market

Systems thinking for innovation and policy

It is only by matching and leveraging synergies in innovations in all parts of the power system and end-use sectors, and including all relevant actors and stakeholders, that successful solutions can be implemented on the



THANK YOU