



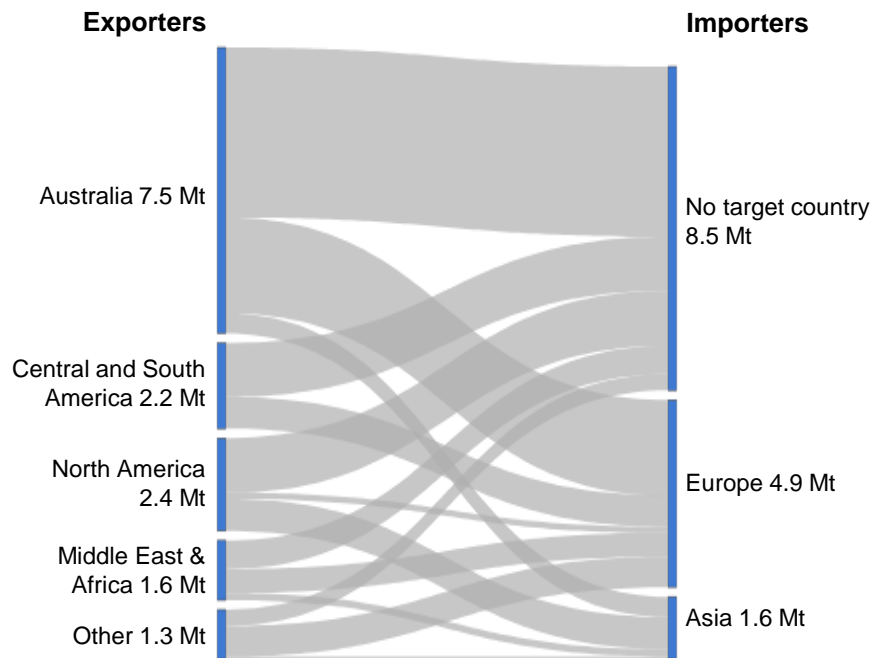
Towards hydrogen definitions based on their emissions intensity

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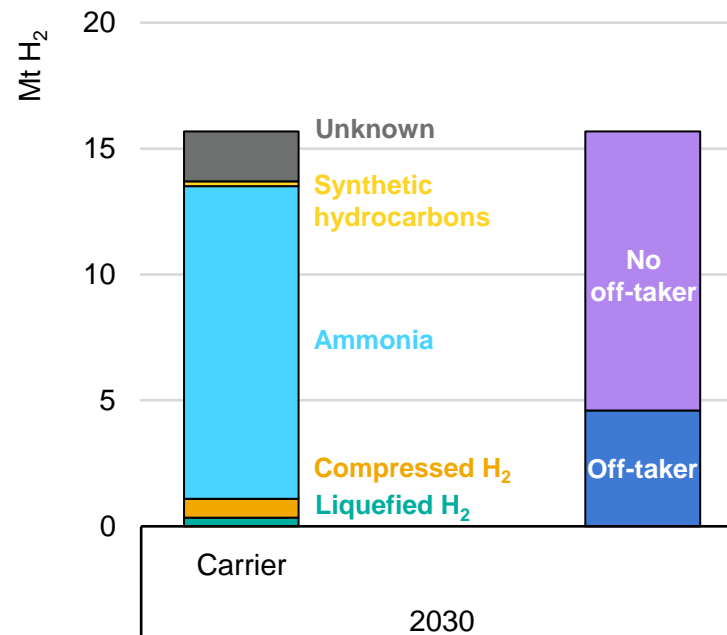
Third International Conference on Fuel Ammonia, Tokyo, 29 September 2023

Interest in hydrogen trade is growing, but barriers remain

Announced low-emission hydrogen trade flows in 2030



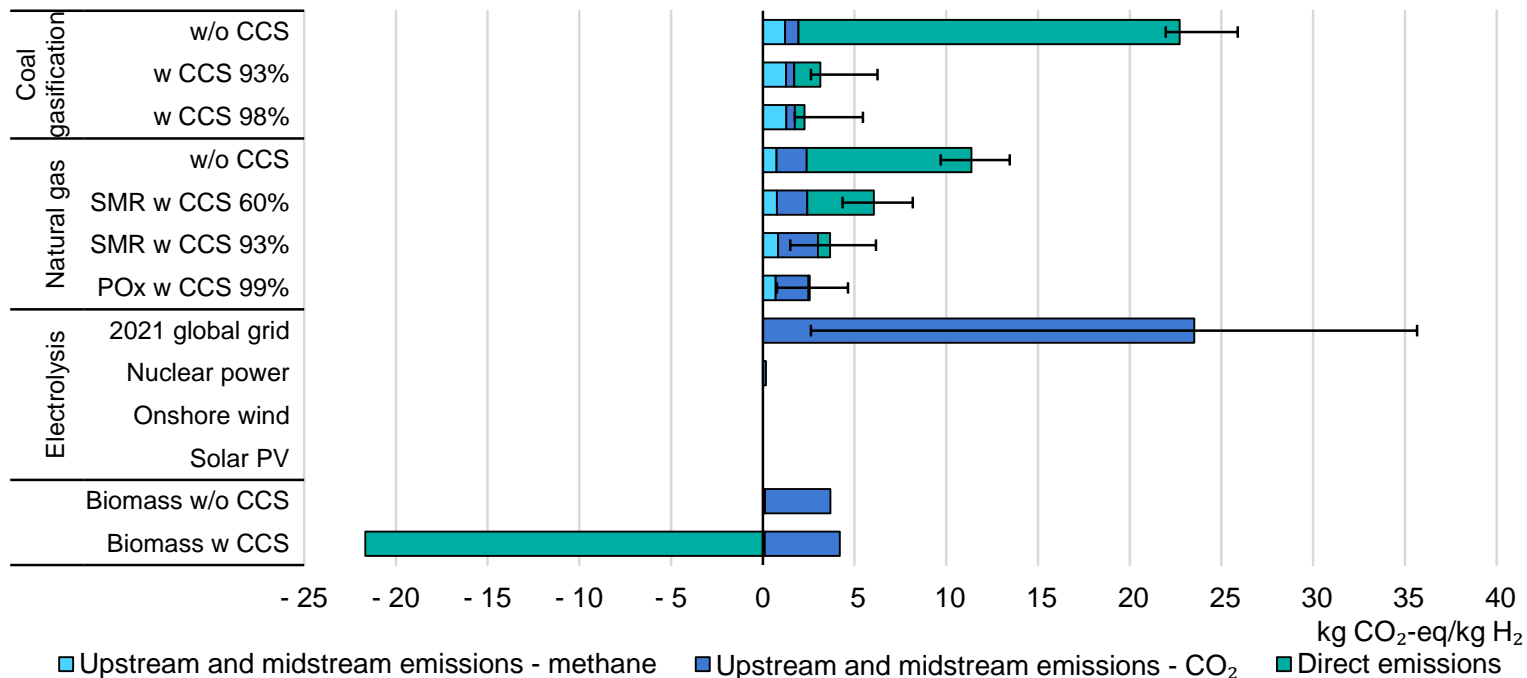
Low-emission hydrogen trade



Planned hydrogen exports could reach 16 Mt by 2030, though almost all projects are at early stages and less than one-third have identified a potential off-taker.

Transparency on the emissions intensity can facilitate investment

Comparison of the emissions intensity of different hydrogen production routes, 2021



Analysis based on the Methodology for Determining the Greenhouse Gas Emissions Associated with the Production of Hydrogen of the IPHE.

Using colours to refer to different production routes, or terms such as “sustainable”, “low-carbon” or “clean” hydrogen, obscures many different levels of potential emissions.

First steps on regulation and certification of hydrogen

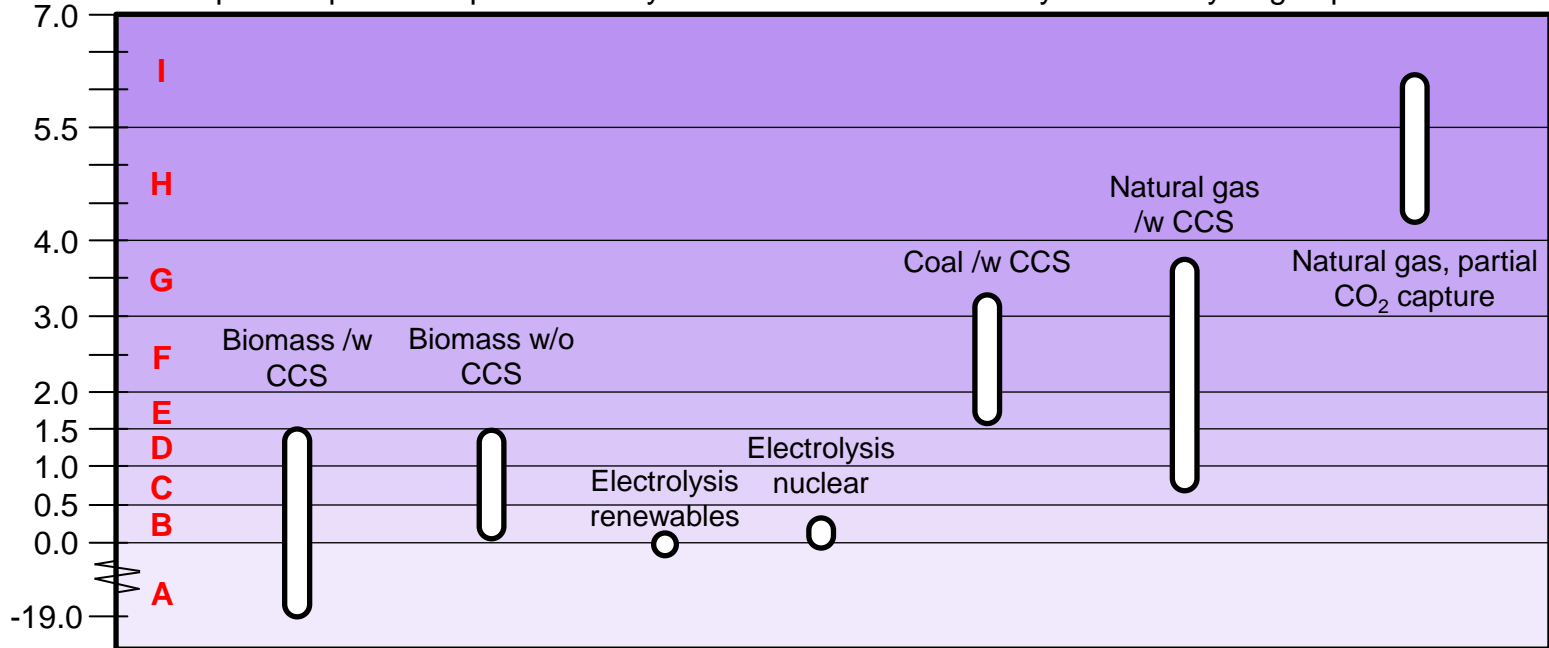
Selected existing and planned certification systems and regulatory frameworks for hydrogen and hydrogen-based fuels

Purpose	Name	Market / jurisdiction	System boundary	Product	Production pathways	Emissions intensity level (kg CO ₂ -eq/kg H ₂)
Regulatory	Low Carbon Hydrogen Standard and certification scheme	United Kingdom	Well-to-gate	Hydrogen	Electrolysis, natural gas with CCS, biomass and waste	2.4
Regulatory	Renewable Energy Directive II	European Union	Well-to-wheel	Hydrogen, Hydrogen-based synthetic fuels	Renewable electricity and low-carbon electricity	3.4
Regulatory	Clean Hydrogen Production Tax Credit	United States	Well-to-gate	Hydrogen	All	0.45-4 (various tiers)
Regulatory	Clean Hydrogen Investment Tax Credit	Canada	Well-to-gate	Hydrogen and ammonia	Electrolysis, natural gas with CCUS	0.75-4 (various tiers)
Regulatory	Ordinance No. 2021-167	France	Well-to-gate Including manufacturing	Hydrogen	All	3.38
Voluntary	Guarantee of Origin certificate scheme	Australia	Well-to-gate	Hydrogen, hydrogen carriers	Renewable electricity	-

Using emissions intensity of hydrogen production, based on an agreed methodology, in regulation and certification can enable certain interoperability and minimise market fragmentation

Using simple scales for ease of communication

Example of a potential quantitative system for emissions intensity levels of hydrogen production



The ranges indicate the variability for upstream and midstream emissions with the upper value showing the world median and the lower value the best available technologies

Feedback from non-expert stakeholders indicates that using a smaller set of clear categories could make emissions levels more understandable, alongside the precise numbers

1. Work towards an international emissions accounting framework for hydrogen and hydrogen-based fuels, putting a workable system in place
2. Foster dialogue in the IPHE to address any outstanding methodological or accounting issues
3. Develop interim measures for the implementation of the framework
4. Open a dialogue with other relevant countries, including but not limited to major potential exporters and importers of hydrogen and hydrogen-based fuels
5. Outline institutional requirements for an effective international emissions accounting framework

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