The Green Hydrogen Standard

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Green Hydrogen Organisation

Green Hydrogen Standard

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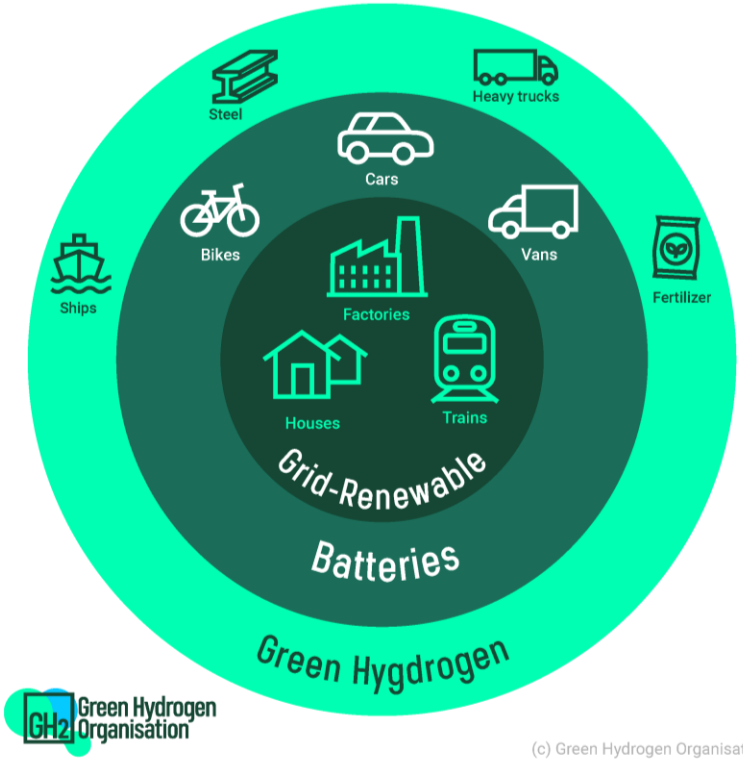
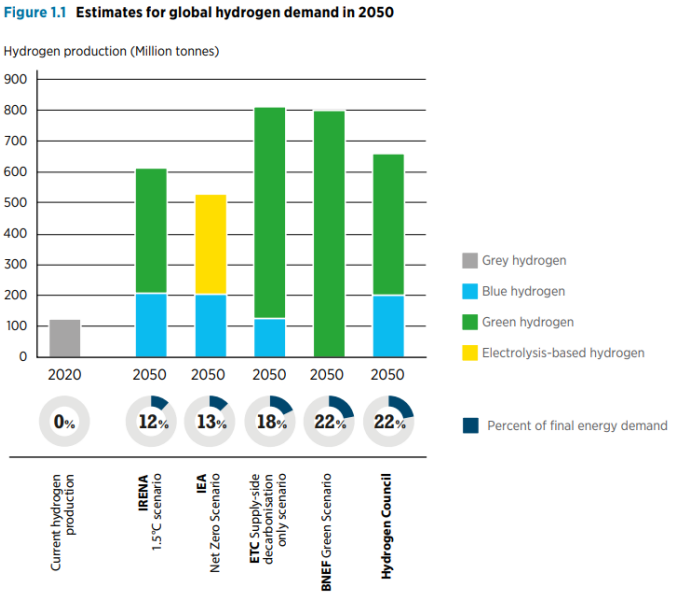
Why we need Green Hydrogen





“Renewable hydrogen is the only option strictly aligned with a reliably 1.5-degree energy sector pathway.”

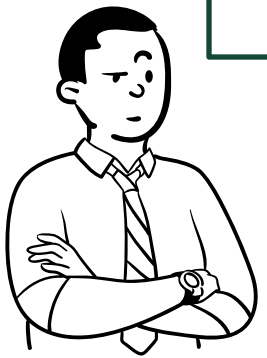
UN Climate Champions third guiding principle for climate-aligned hydrogen

Why we need a Green Hydrogen Standard

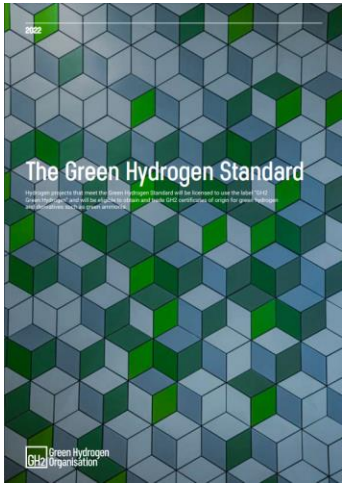
- Green hydrogen producers and customers need clarity and consistency in order to plan for the long term.
    - To secure government approvals and support
    - To sign offtake agreements
    - To secure financing
- Adherence to sustainability standards will strongly influence pricing and export opportunities. Customers and consumers want hydrogen that has close to zero-emissions and projects that contribute to sustainable development.

The **Green Hydrogen Standard** has been developed to meet this need.

Projects that meet the Standard will be licensed to use the label GH2 Green Hydrogen and will be eligible to obtain and trade GH2 certificates of origin for green hydrogen and derivatives such as green ammonia.



"I need green hydrogen to decarbonise. If I can't get a trusted green certificate, I won't buy it"

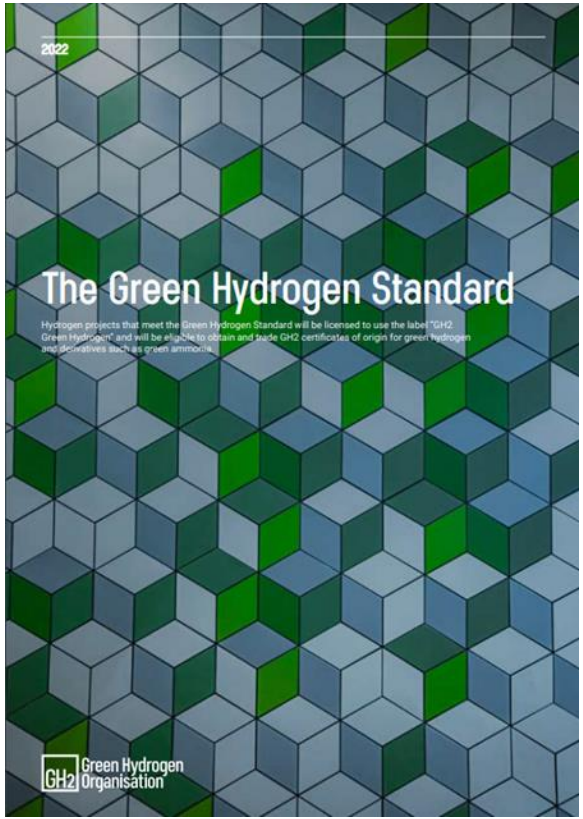


The Green Hydrogen Organisation

A global definition of green hydrogen: “Green hydrogen is hydrogen produced through the electrolysis of water with 100% or near 100% renewable energy with close to zero greenhouse gas emissions”.

Includes energy sourced from hydropower, wind, solar, geothermal, tide, wave and other ocean energy sources. Excludes nuclear. Excludes waste to energy, biomass*.

“Close to zero emissions” threshold of **< 1kg CO2e/Kg H2**. Includes “scope 1” emissions from production (including desalination), and “scope 2” emissions from on site or purchased renewable electricity.



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Key Features

The Standard requires that the environmental, social and governance consequences of green hydrogen production are addressed. General principles to ensure a focus on the most significant impacts and avoid duplication with national standards.

- Alignment with international best practices, including the IFC safeguard policies.
- Green hydrogen producers may count electricity taken from the grid as fully renewable if they have concluded one or more power purchase agreements (PPAs) and make use of credible guarantee of origin certification schemes (or similar proofs) where available.
- On “additionality”. Requires an assessment of the impact of grid-connected projects on the grid + the identification of technically feasible and cost-effective measures.

The Standard requires that the development opportunities and impacts of green hydrogen production and use are fully considered.

Standards and regulatory framework in India

All eyes are on India!

- A per kg emission threshold from India is eagerly anticipated.
- The Green Hydrogen Standard is max 1 Kg/CO2e.

Modular standards at state level

- Interesting to witness how India's standard will be customised at the State levels.
- Inter-state collaborations to host the Renewables and Green Hydrogen Economy.

A work in progress

- Significant efforts from the MNRE and the Bureau of Indian Standards.
- Pioneering efforts by involving other line ministries like Ministry of Road Transport and Highways, Ministry of Railways

International acceptance

- Aligning with global standards and regulations is essential to enter the international market successfully.
- Adoption of relevant international standards will be key to market penetration.

EU Pathways for producing renewable green hydrogen

Renewable fuels of non-biological origin (RFNBOs)

Direct connection
The electrolyser is directly connected to a renewable asset. The renewable asset must be **no older than 3 years.**

Grid connection
Renewable share of electricity in bidding zone where electrolyser is operating **> 90%** or consumption occurs during curtailment periods

Grid connection
Emissions intensity of electricity in bidding zone is **< 18 gCO2eq/MJ** (renewable PPA and time and geographical matching still apply)

Grid connection
Renewable PPA with contracted asset built within 36 months before the electrolyser

Adapted from Jake Stones, ICIS, The rules for producing renewable hydrogen, 13 February 2023

Conditions for producing renewable green hydrogen

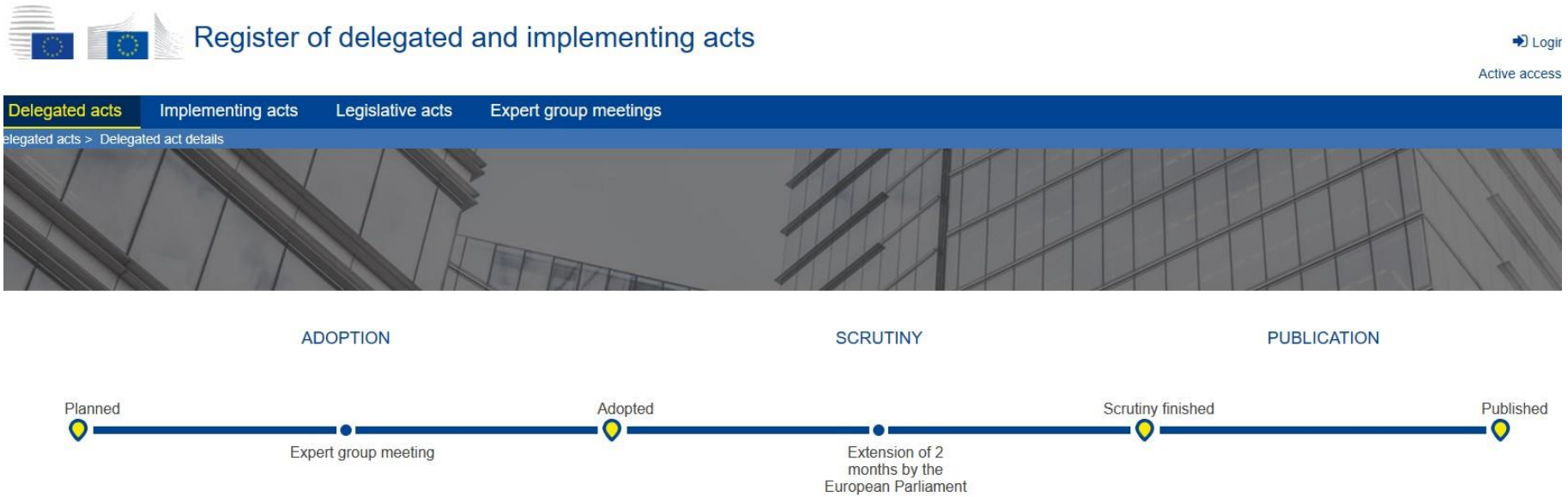
Renewable fuels of non-biological origin

Principles	Requirements	Exemptions/waivers
Additionality	Renewable asset built no more than 3 years before electrolyser production. No OPEX or CAPEX subsidy received.	Does not apply until 2038 if electrolyser comes into operation before 2028. Some exclusions to subsidy restrictions.
Time matching	Hourly from 1 January 2030	Monthly until 31 December 2029
Geographical matching	Same bidding zone or interconnected bidding zone if day-ahead market price is equal or higher.	Equivalent concepts for bidding zones (and curtailment periods) can be used in third countries.

Carbon intensity

3.38kg CO2e/kg H2

70% greenhouse gas emissions saving compared to fossil fuel comparator. Full life cycle including: upstream emissions, emissions associated with taking electricity from the grid, processing, transport to end-user.



Two Delegated Acts adopted by the European Commission on 10 February 2023 (original deadline 31 December 2021 under the EU Renewable Energy Directive). Entry into force on 10 July 2023.

Standards in producer and consumer countries

Producer country

Consumer country

Requirement	The producer (India) will need to meet hydrogen production standards in India.	The producer (India) and the customer (EU) will need to meet hydrogen consumption standards in the EU.
Attributes	• Government licensing / permitting • Accessing electricity markets • Access any production tax credits, subsidies).	• Definition of RFNBO* constrains what hydrogen products and derivatives are considered “renewable”. • Influences access to “demand side” incentives. • Influences applicability of taxes (e.g., CBAM).
Status	In India, these standards are still being developed. Government has been clear on the need for rigorous standards.	Two Delegated Acts adopted by the European Commission on 10 February 2023. Entry into force 10 July 2023.

Green Hydrogen Standard: A bridge between producer and consumer countries

A modular approach that covers different hydrogen products and applications.

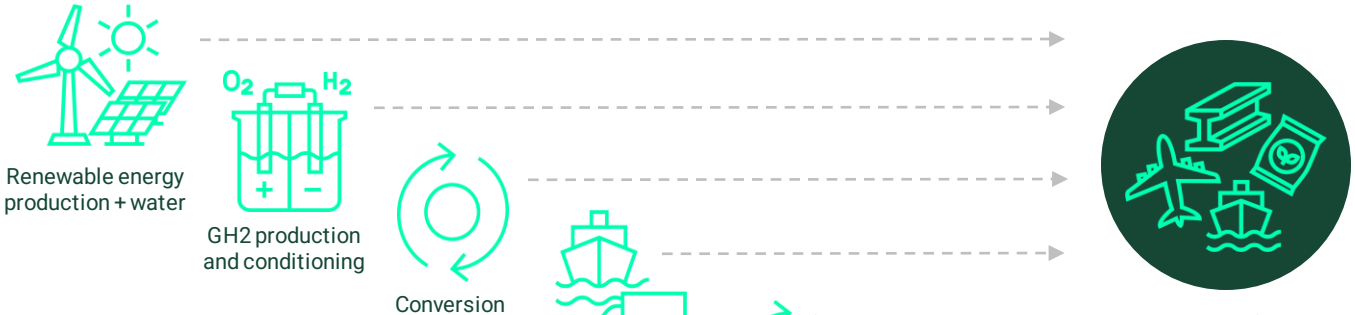
Bridge between markets, accommodating differences in national standards.

A global approach reduces costs and builds the confidence that is needed to develop global markets.

Producers can have their projects and products certified against a global standard. This includes verification of alignment with national standards and (optionally) the alignment with requirements in export markets.

Green Hydrogen Standard — modular application

Life cycle / system boundary modularity



National/Regulatory modularity

India – To be announced soon ☺

US-IRA

China Hydrogen Alliance

UK Low Carbon Hydrogen Standard

EU RED II

Methods

e.g., IPHE, GREET, I-REC ISO standards. Also some national standards (AUS)

"Non-discriminatory".
"how to measure?"
not "what is acceptable?"

Emerging global consensus.
However:

- Measuring fugitive methane (grey and blue)
- Measuring fugitive hydrogen
- Embodied / embedded emissions
- Transportation, storage and distribution
- Coverage of derivatives and "energy carriers", ammonia, methanol, SAF.

Standards

e.g., GH2, CertifHy, TUV SUD, Also: National standards (EU RFNBO)

"Normative".
Addresses "what is good / acceptable"

Increasingly fragmented:

- Different scope (technology neutral vs Green / Renewable only)…
- System boundaries ("Well-to-gate", or "well to wheel").
- Different thresholds
- Additional criteria (labour, additionality, etc).

Project Testing

e.g., GH2

Focus on derisking, regulatory alignment, promoting best practice.

Needs greater attention:

- Start early
- Balance global standards // national regulation // local impact and benefits

Project Accreditation

Examples: GH2, CertifHy, TUV SUD, BV, SAP, SGS, etc.
Also: National schemes

Some are hydrogen specific, other apply a generic GHG framework

- Very few projects are ready for formal testing & certification
- Established players SGS, DNV, SAP, TUV-SUD have their own proprietary approaches
- Limited coordination and harmonisation.
- Development of data standards

Certification

Examples: GH2, CertifHy. National certification schemes?

Various platforms under development, but almost zero trade.

- Involves a significant upfront investment. (Thin markets for ≈ 3 - 5 years).
- A key challenge is accommodating different chain of custody models (identity preservation vs mass balance vs book and claim).

Supporting early stage Green Hydrogen Projects

Objective: To accelerate Green Hydrogen Project development

- GH2 provides support for scoping / pre-feasibility studies. Access to best practice / guidance notes
- "Derisking" + supports engagement with government, host communities, investors, lenders, customers

Green Hydrogen Project Accreditation

Objective: To accreditation projects that meet the Green Hydrogen Standard.

- Engagement of an Independent Assurance Provider (IAP)
- Stakeholder engagement & Public Comment
- Review by GH2's Accreditation Body

Projects licensed to use the label **GH2 Green Hydrogen™**

Green Hydrogen Production Certification

Objective: Globally recognised certification of green hydrogen production, trusted by producers and consumers.

- Compliant projects are eligible to obtain and trade GH2 certificates of origin for green hydrogen and derivatives such as green ammonia.
- Mass balance vs Book and Claim options

Rapid Assessment Tool

Key steps:

- The project proponent presents the project concept, options under consideration, known risks & opportunities.
- GH2 presents the GHS, highlighting most common risks for GH project development.
- Identification of priority issues for more detailed investigation.
- Deep dives into priority topics, e.g.,:
    - upstream impacts associated with additional renewable energy development,
    - GHG emissions measurement,
    - additionality considerations,
    - water resource management,
    - alignment with national regulations / customer requirements. Etc.
- Presentation of findings and discussion on next steps.

Best suited to early-stage projects, where project design and documentation is still under consideration. Non-disclosure agreements, where required. Combines (virtual) desk review and workshops.

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