# *Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate*

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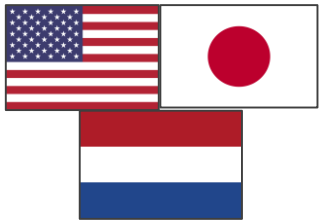
Innovative Insights: Unveiling the Advanced Methodology for Assessing GHG Emissions in Hydrogen Production
23 January 2024, Webinar

# IPHE: a Global Government-to-Government Partnership to Accelerate Hydrogen and Fuel Cell Deployments

**Formed in 2003**

**Chair**



**Vice-Chairs**

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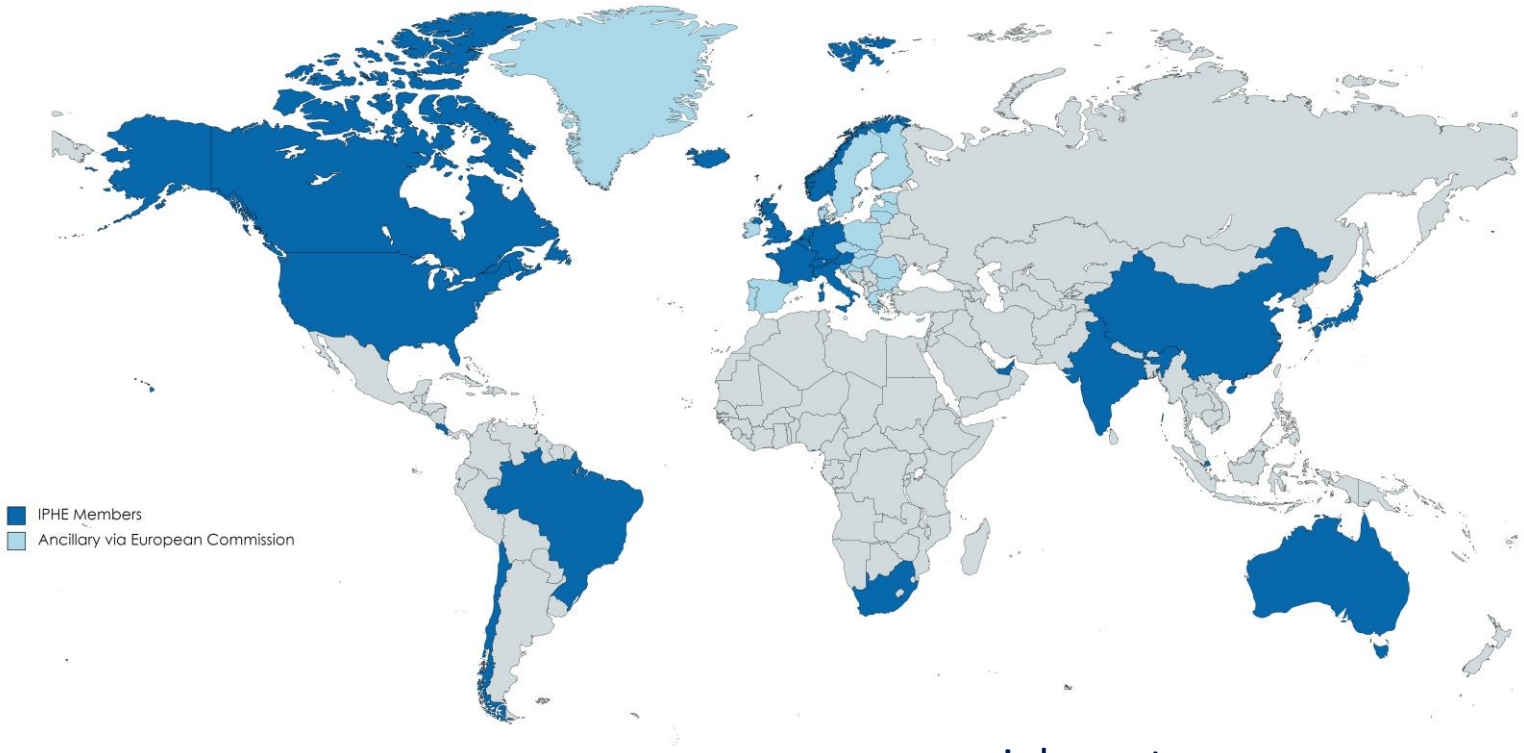


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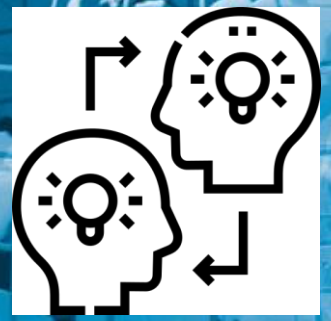
# IPHE: a Global Government-to-Government Partnership to Accelerate Hydrogen and Fuel Cell Deployments

## Our Priorities



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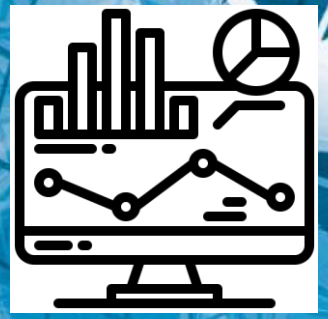
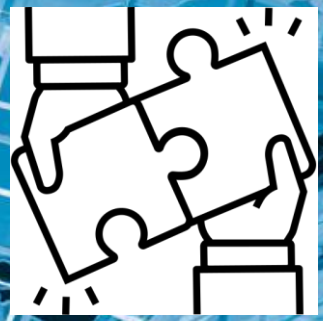


Monitor



Enable

Provide


# THE CREATION OF A GLOBAL MARKET

# Key Drivers: based on unique National Circumstances

- **Environmental Benefits – Climate Change**
  - Climate Change, Clean Air/Local Air Quality, Noise Pollution
- **Energy Security**
  - Security of Supply and Resource Diversity
- **Energy System Resiliency and Stability**
  - Effective Use of Variable Generation – grid services, storage at scale, and sector coupling
  - Distributed Generation Option
- **Economic Growth: Innovation & Technology Leadership**
  - Strength of the industry
  - Capacity of innovation
  - Skilled Jobs and Manufacturing Opportunities

# Key Challenges: Need to Get to a Global Scale

## 1. Innovation

- *Must get **low-carbon hydrogen cost competitive***
- ***Skilled workforces** from engineers to operators: initial cursus and lifelong trainings*

## 2. Infrastructure Investment

- **Installation of the massive production capacities**
- **Efficient Transmission/Transportation**

## 3. Policy and Regulatory Framework

- *Stable and strong Policy Signals*
- *Regulatory Certainty*
- *Market Transparency*

→ *Reduce uncertainties*
*Create trust*

# Implementing international regulations, codes and standards

# Key Drivers: Policy and Regulatory Framework to Facilitate International Hydrogen Trade

## What does “clean” hydrogen mean?

Words like “renewable”, “sustainable”, “clean” and “low carbon” are non-descriptive and thus have different meaning for different stakeholders

## How to create trust: it is “clean” hydrogen I am producing/buying/using?

**→ Hydrogen needs rules, not colors!**

## Hydrogen doesn’t care about color labels:

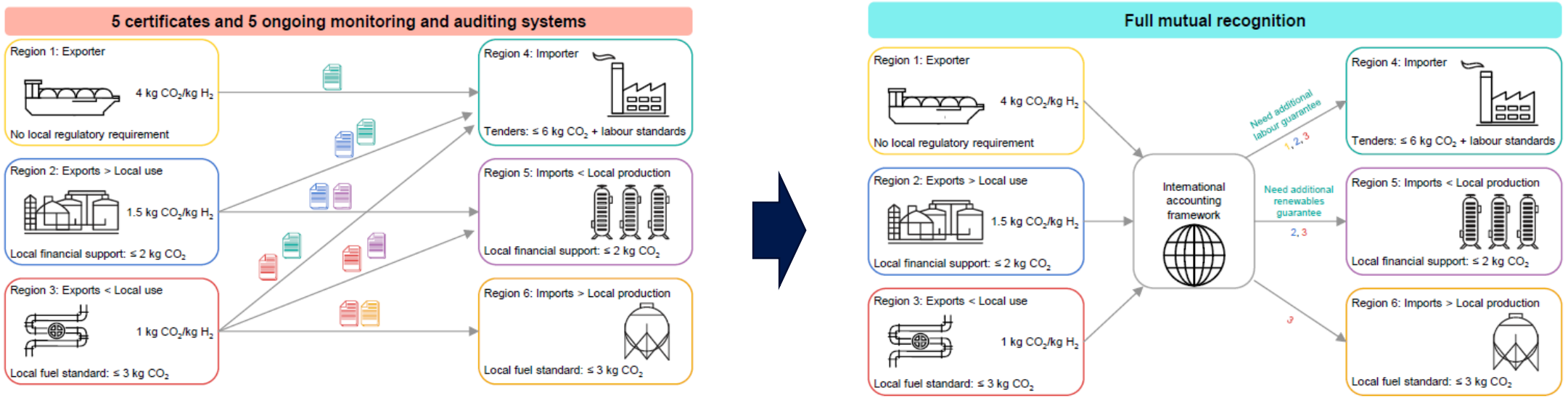
- Its molecule has the same properties regardless of the method of production
- Safety standards and regulations are color blind and technology agnostic
- Division and thus discrimination of production pathways by color coding is the wrong approach
- Decarbonisation is the key word!

# Toward mutual recognition of certification schemes

**COP 28**

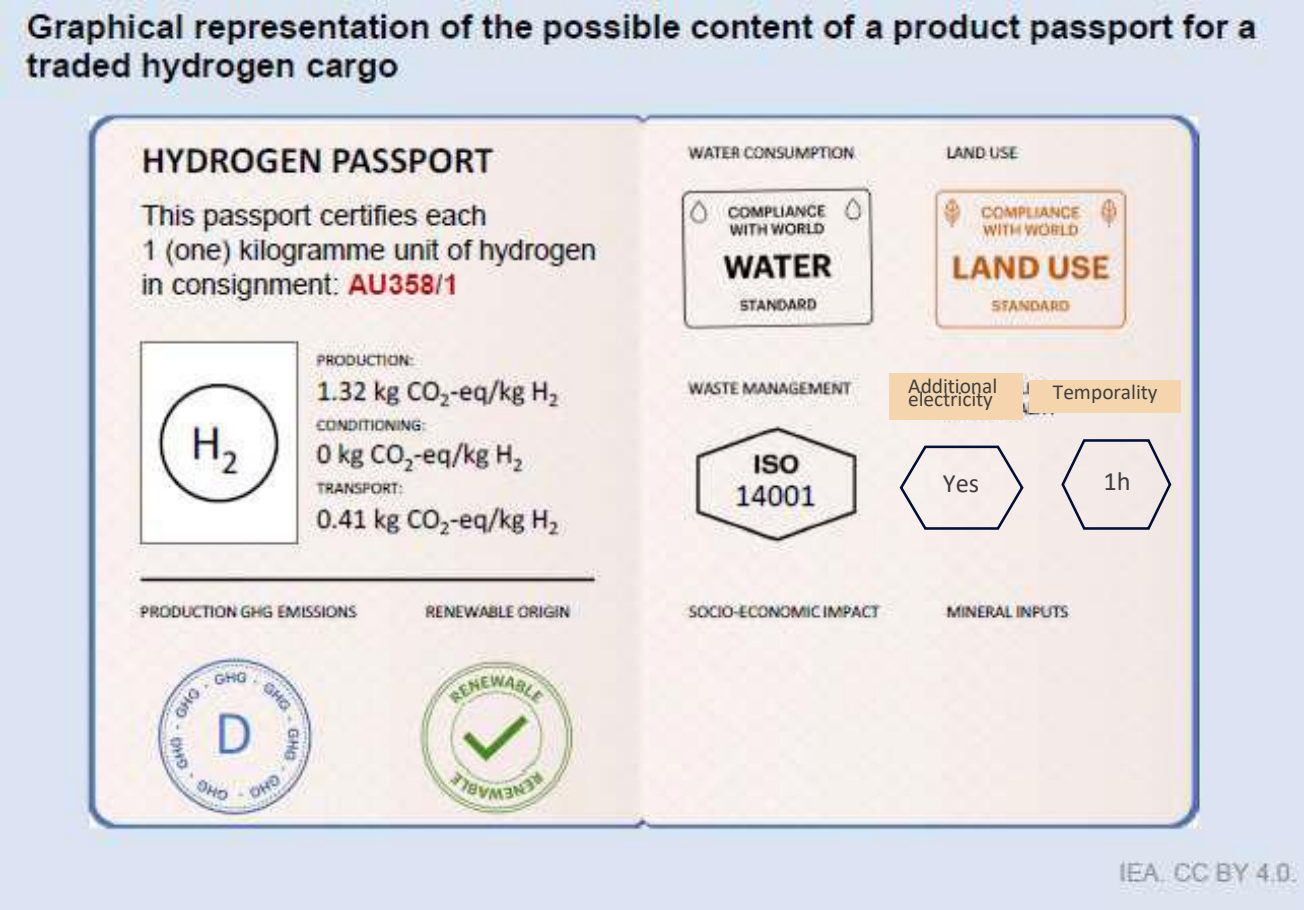
**H2 Ministerial**

***5 December 2023***




Source: IEA Towards H2 definitions based on their emissions intensity (2023)

# Toward mutual recognition of certification schemes




## Creation of a (digital) hydrogen passport

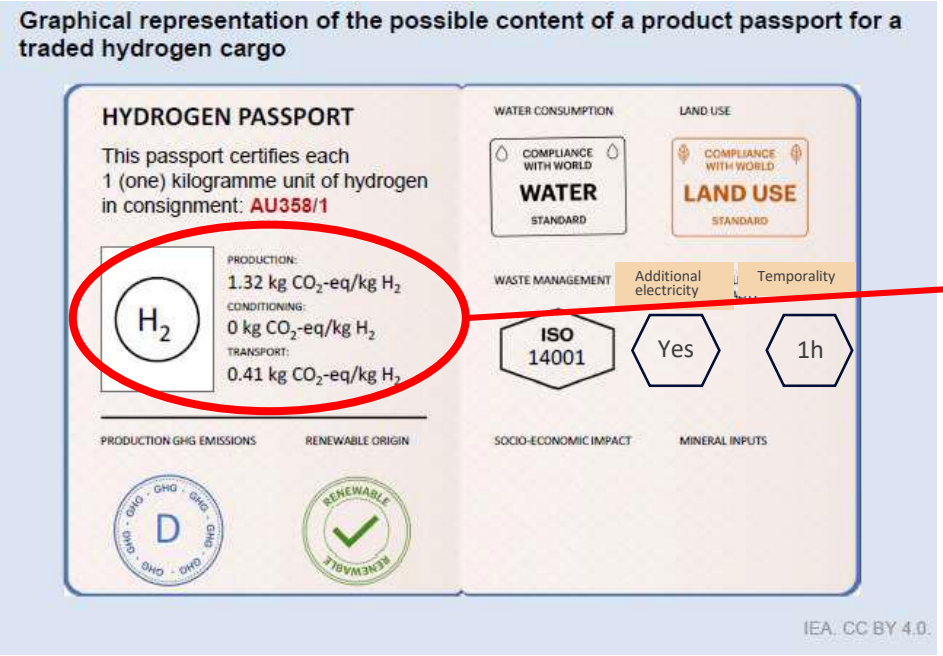
IEA's Hydrogen Product Sustainability Certificate Example

Source: Modified from IEA Towards H2 definitions based on their emissions intensity (2023)

Innovative Insights: Unveiling the Advanced Methodology for Assessing GHG Emissions in Hydrogen Production 23 January 2024

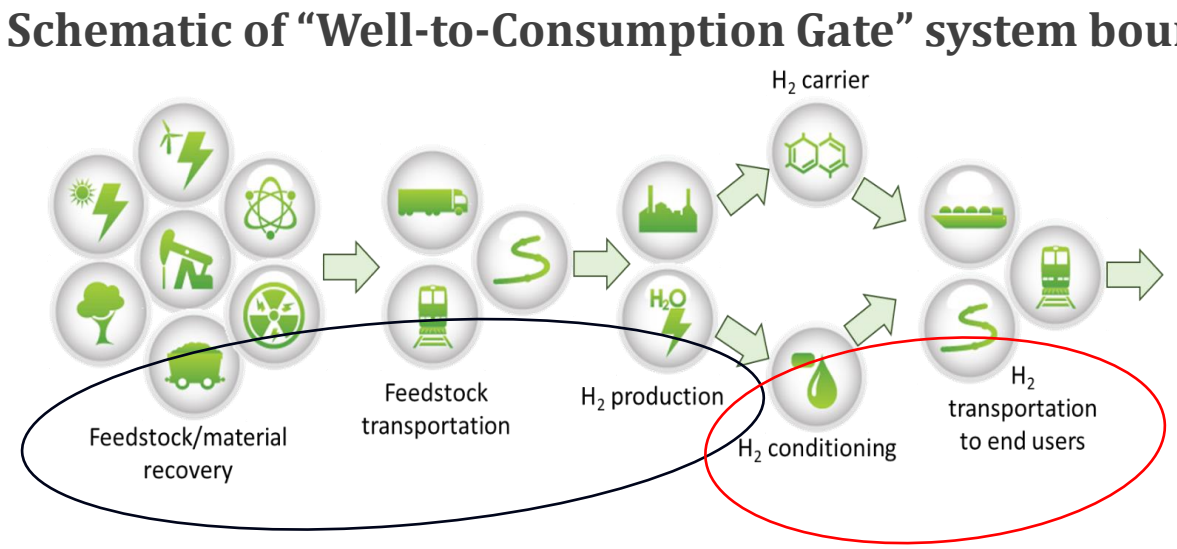
# Toward mutual recognition of certification schemes

## Creation of a (digital) hydrogen passport




Source: modified from IEA Towards H2 definitions based on their emissions intensity (2023)

## How to calculate these values?

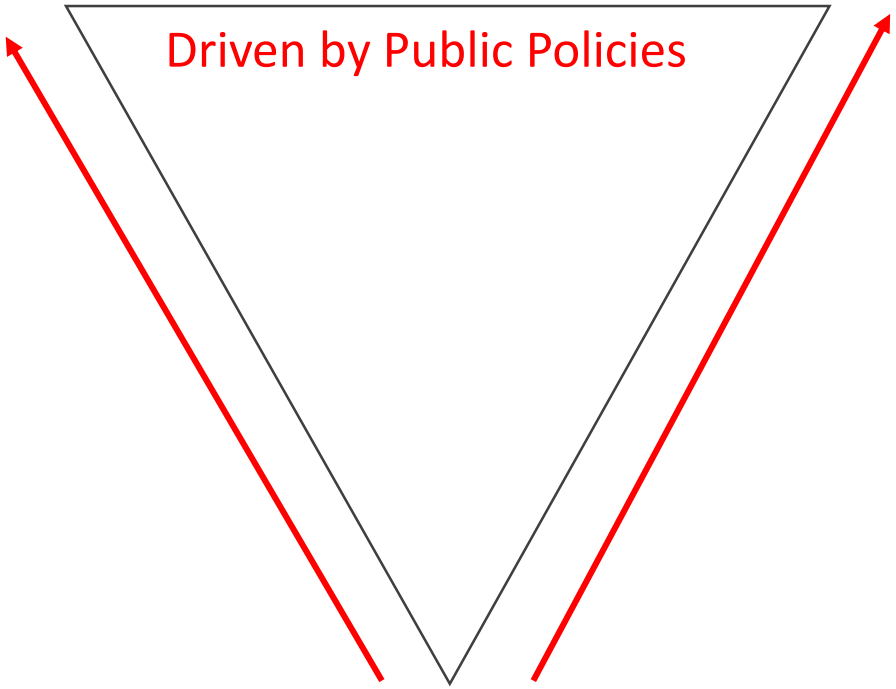


# Toward mutual recognition of certification schemes

## Classification is NOT Certification, NOT Methodology

### Classification

**Generic Grade or Label to reflect GHG footprint range. For stakeholder information only.**




### Certification

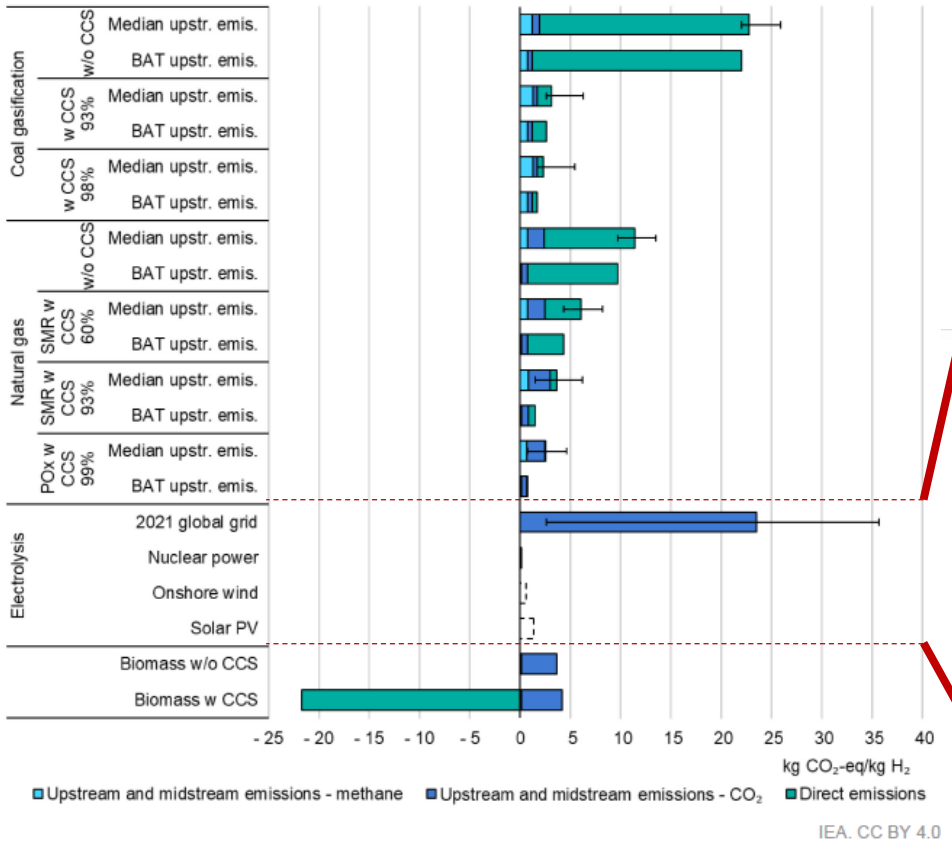
**Quantified GHG footprint per Methodology of H2 or carrier product issued by a Certification Body and verified by a Verification Body. Contains GO. Part of legal conditions of a supply contract. Compliance or disclosure scheme. Subject to mutual recognition.**

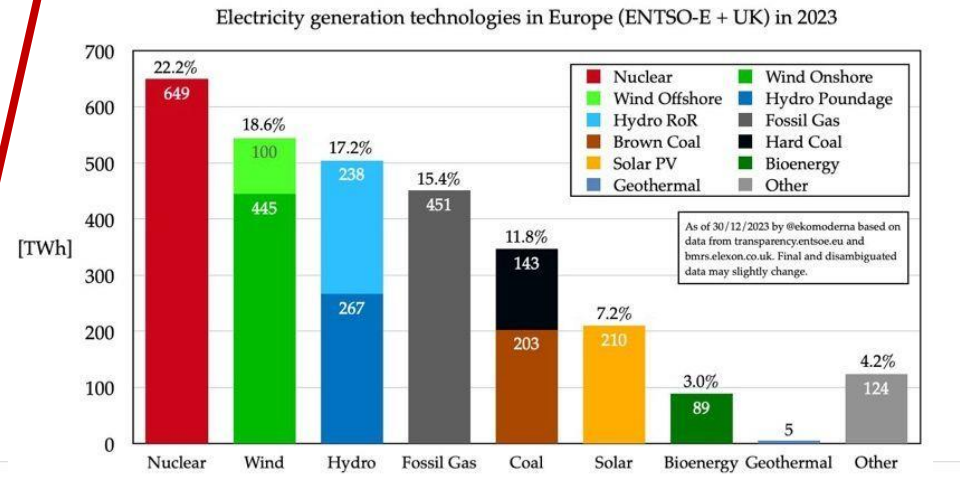
**Methodology for GHG Footprint Quantification**

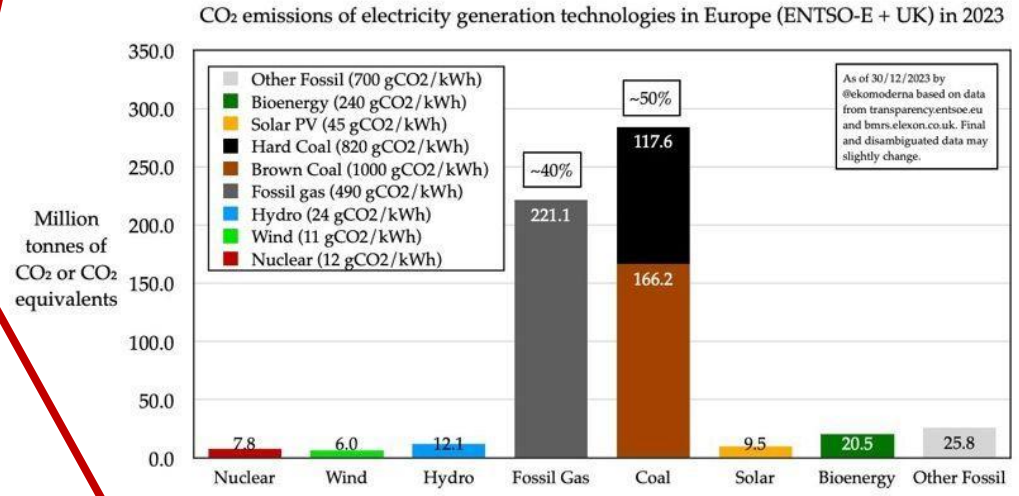
Source: Hydrogen Council

# “Clean” hydrogen based on its carbon footprint

**Figure 2.2 Comparison of the emissions intensity of different hydrogen production routes, 2021**




**The GHG Emissions associated with the Production of $H_2$ depend on:**

- **the primary energy**

  **AND**

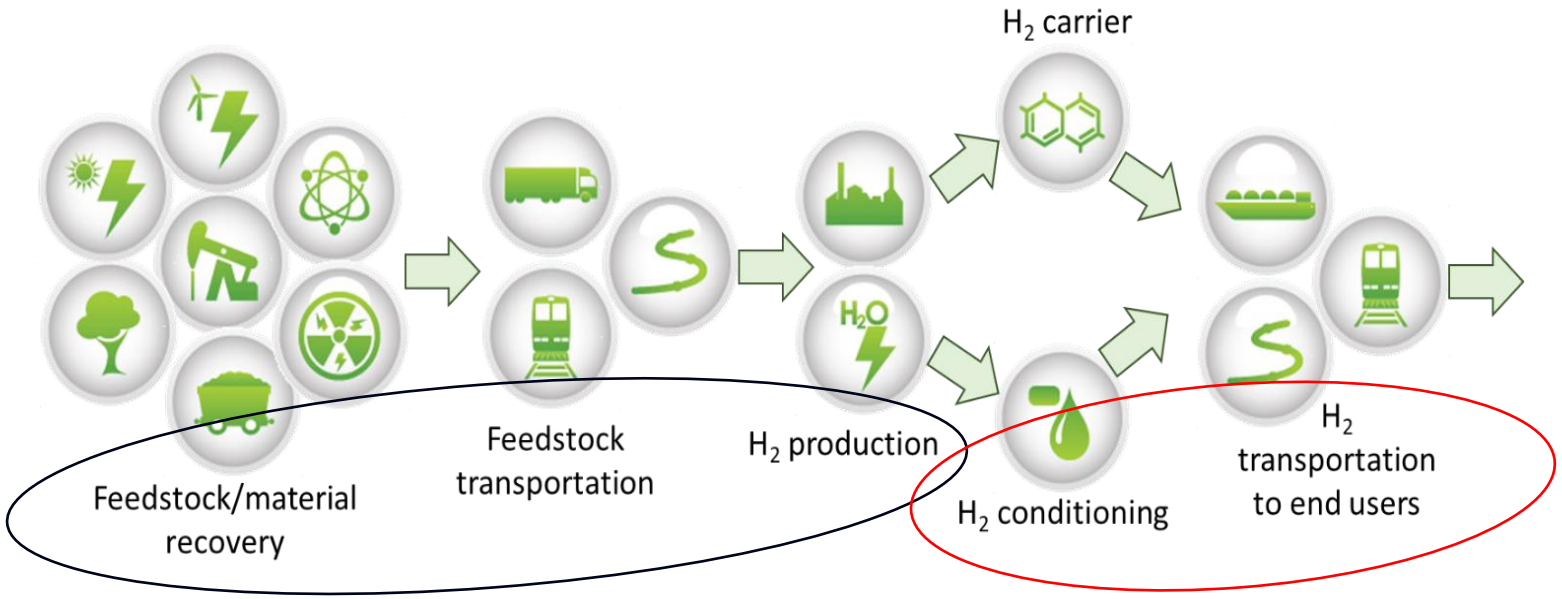
- **the production pathway**

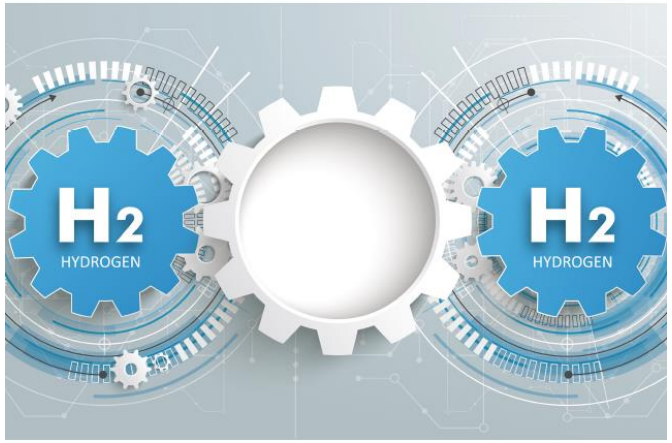
# “Clean” hydrogen based on its carbon footprint

**‘Quantification Methodology’ Working Paper Version 3** Co-leads France, EU, USA

- Published *Methodology for Determining the GHG Emissions Associated with the Production of Hydrogen Working Paper* Version 3 July 2023

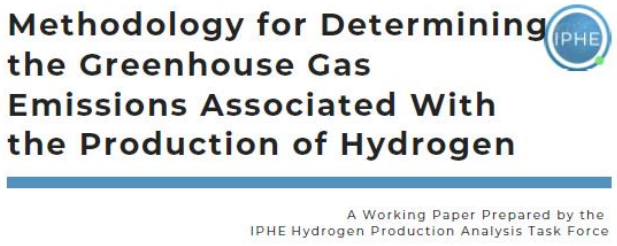
**Schematic of “Well-to-Gate” system boundary adopted**



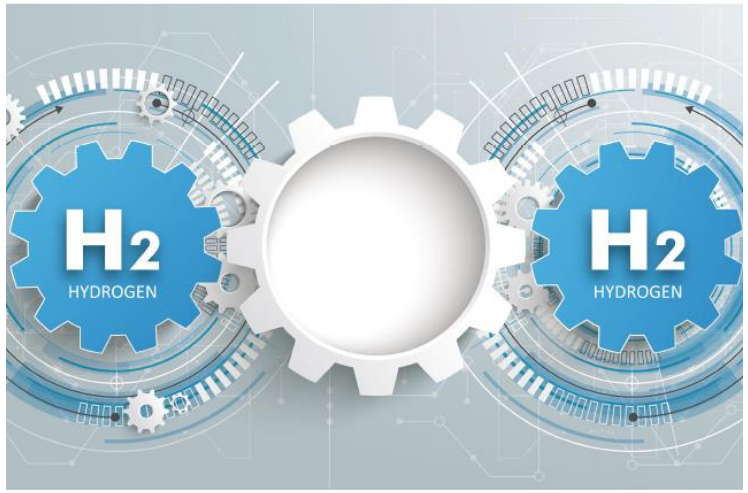

https://www.iphe.net/_files/ugd/45185a_8f9608847cbe46c88c319a75bb85f436.pdf

# “Clean” hydrogen based on its carbon footprint



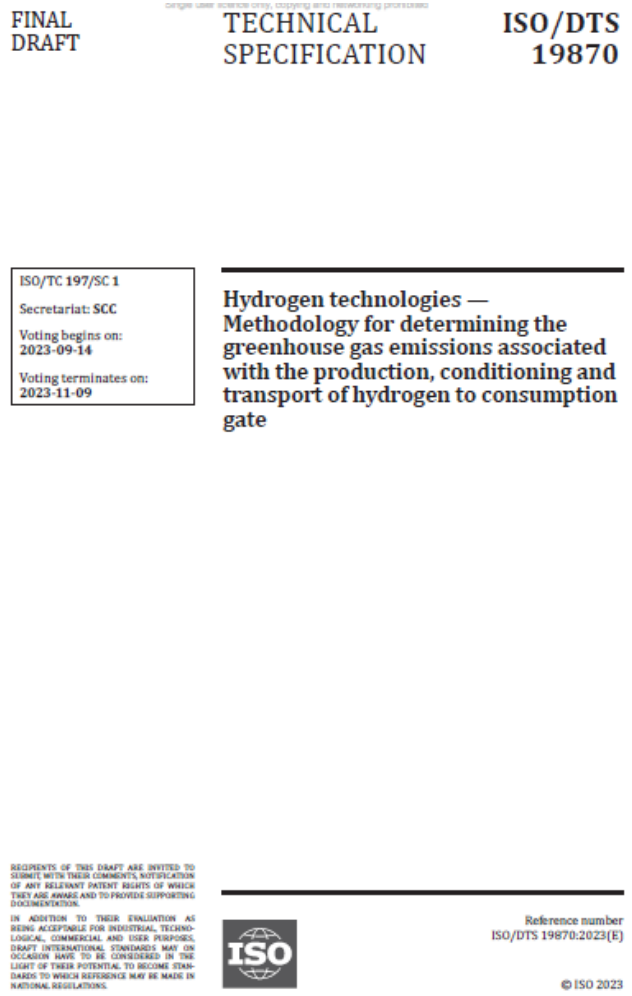

International Partnership for Hydrogen and Fuel Cells in the Economy

Start Jan 2020




VERSION 3 - JULY 2023


Nov 2023

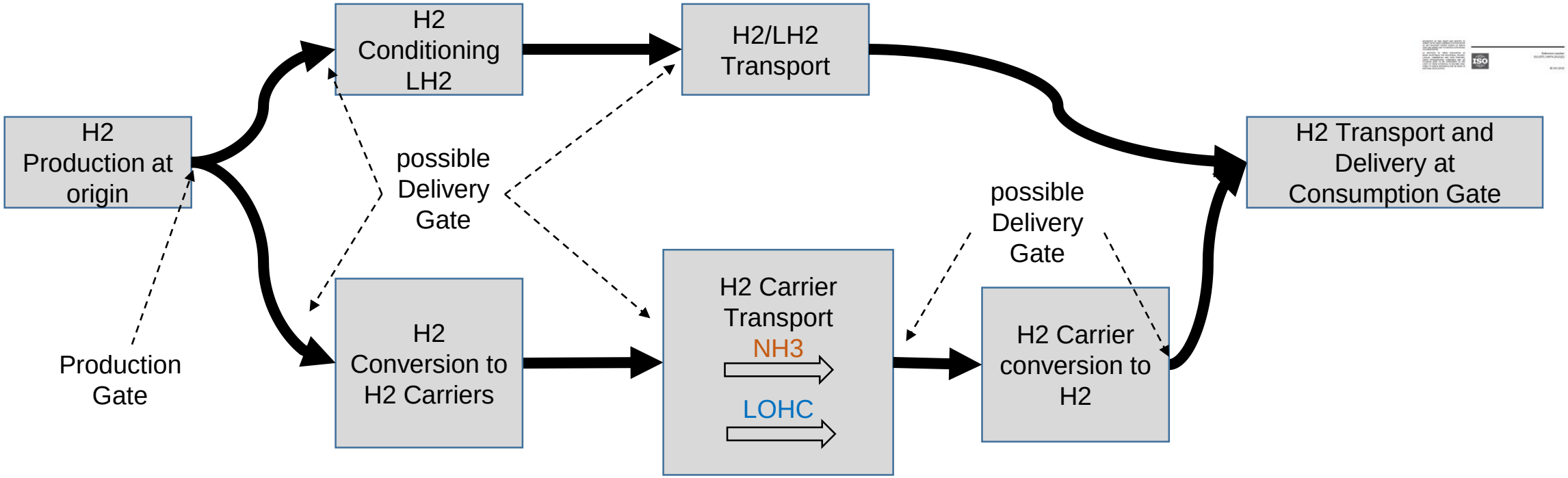



## COP 28 - H2 Ministerial

***5 December 2023***

# “Clean” hydrogen based on its carbon footprint

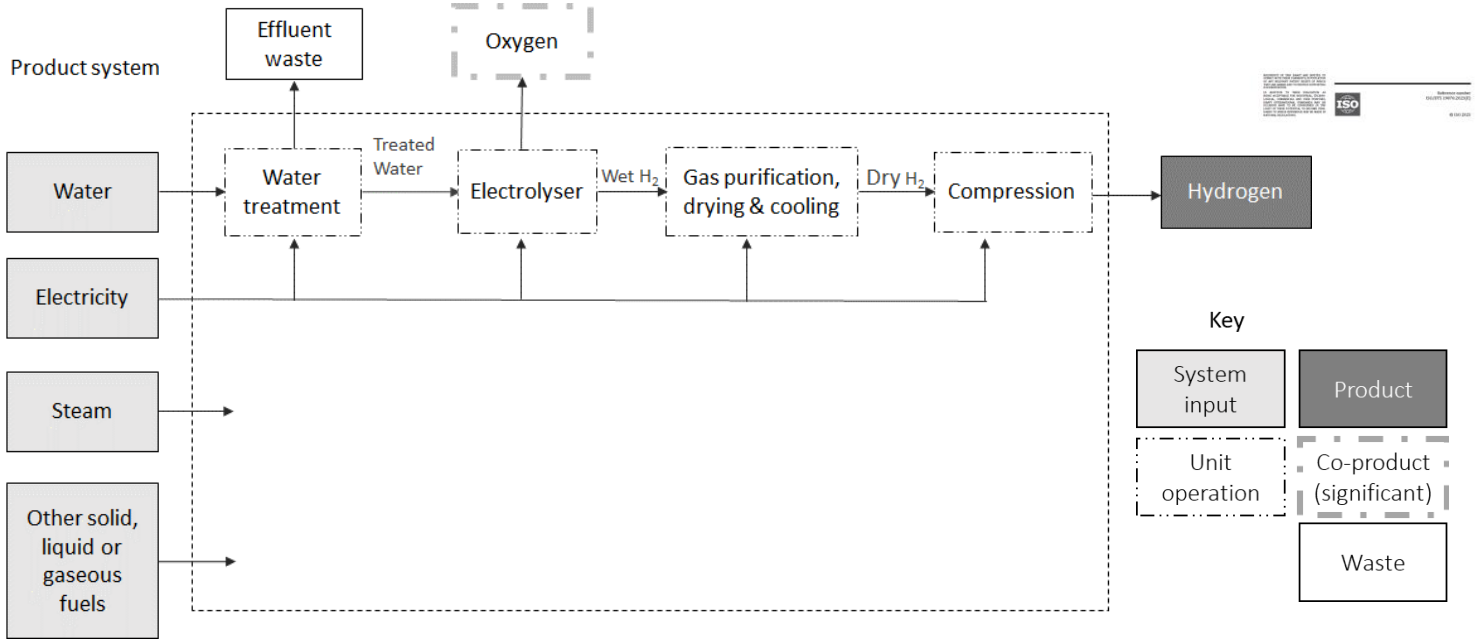
**ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)**

# “Clean” hydrogen based on its carbon footprint

**ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)**


- **Hydrogen Production Pathways**
  - Electrolysis
  - Steam Methane Reforming with CCS
  - Industrial By-Product
  - Coal Gasification with CCS
  - Biomass from waste
  - Auto-Thermal Reforming with CCS
- **Conditioning and Carriers of $H_2$**
  - Liquefaction
  - Ammonia
  - Liquid Organic Hydrogen Carriers



# “ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)

## Why do we need the ISO methodology for GHG emissions assessment of hydrogen?

- Countries across geographies have been introducing **national legislation** on hydrogen **making different policy choices** with respect to the types of hydrogen that they intend to deploy and support, in particular, based on **different GHG emissions intensity thresholds** (in *kg* $CO_2e$*/kg* $H_2$)

- GHG emissions thresholds for qualifying hydrogen as ‘clean’/ ‘low-carbon’/ ‘sustainable’ **vary across jurisdictions**.

- The **ISO methodology** (Technical Specification, ISO/TS 19870:2023) **provides greater transparency** on GHG emissions assessment of hydrogen **on a life-cycle analysis basis** and a common global benchmark to be able to compare different national approaches in a transparent manner.

# “ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)

## Does ISO methodology feature a threshold to qualify hydrogen as “clean” or “sustainable”?

- **NO.** GHG emissions thresholds for qualifying hydrogen as “clean”, “sustainable”, “renewable” or “low carbon” are **introduced in national legislation to reflect and serve the policy choices of countries**, including the preferred hydrogen production pathways, which may include renewables-/ nuclear- or CCS-enabled technologies.
- The range goes from 0.45 and 4 kg $CO_2$e/kg $H_2$ in the US Clean Hydrogen Production Tax Credit to qualify hydrogen as “clean” to 2.4 kg $CO_2$e/kg $H_2$ in the UK to qualify for the UK Clean Hydrogen Standard and 3 kg $CO_2$e/kg $H_2$ in the EU to qualify as “sustainable” in line with the EU Taxonomy for Sustainable Finance.
- **ISO methodology** therefore does not include any thresholds/ additional qualifications for hydrogen – it **provides an assessment framework for GHG emissions footprint on a life-cycle analysis basis covering hydrogen production, conditioning, and transport to delivery/ consumption gate**.

# “ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)

## Does ISO methodology consider methane emissions associated with natural gas production and transport, if hydrogen is produced from natural gas with CCS?

- **YES.** ISO/ TS19870: 2023 **covers all stages of the life-cycle analysis** - from cradle to delivery gate and therefore it includes upstream methane emissions for hydrogen produced from methane/ natural gas.

# “ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)

## Does ISO methodology consider capital goods’ (CAPEX) emissions?

- **YES.** ISO/ TS19870: 2023 **requests the users to report CAPEX emissions**.

- This data is requested **for information** to enable full LCA assessment **while ensuring comparability** of the present methodology with those used for the assessment of other energy vectors.

# “ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)

## Does ISO/ TS19870: 2023 consider additionality, temporal and geographical criteria for electricity?

- **NO. Additionality, temporal and geographical criteria are part of certification criteria.** The methodology is considering the emission factor of the electricity used to produce hydrogen.
- It can be either:
  - **On-site electricity generation**
  - **Electricity from the grid**
    - The electricity emissions reporting method proposed is consistent with ISO 14064-1:2018, Annex E. This approach includes dual reporting requirements consisting of a **location-based** (using mostly grid-average emission factor data) and **market- based** method (emissions from electricity that companies have purposefully chosen).
    - Provided that market based **contractual instrument and default emission factors** (residual mix) **meet proper quality criteria**, the market-based method should be used in priority to determine the emission factor of electricity used to produce hydrogen.

# “ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)

## Does ISO/ TS19870: 2023 consider hydrogen releases?

- **YES. Hydrogen releases would translate into an increase of the GHG footprint of hydrogen delivered** as the quantity of GHG emissions accounted considers the total amount of hydrogen produced.

- In addition, reporting of the quantities of hydrogen produced, stored, and delivered at each delivery gate up to consumption gate can provide visibility on hydrogen releases.

# “ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)

## What is the link between the ISO methodology and certification schemes for hydrogen?

- The ISO methodology can be **used to inform certification schemes** for hydrogen.
- A given certification scheme **used for evidencing the sustainability attributes of hydrogen**, such as the GHG emissions associated with hydrogen production and transport, may refer to one or multiple methodologies for GHG emissions assessment.
- The ISO methodology **provides a helpful global benchmark** to be able to compare and assess different national/ regional/ independent methodologies

# “ISO Methodology for determining the greenhouse gas emissions associated with the production, conditioning, and transport of hydrogen to consumption gate (ISO/TS 19870:2023)

## What is the role of ISO methodology for GHG emissions assessment of hydrogen for global investors?

The ISO methodology will play a critical role in **helping build trust in hydrogen as a new asset class**

- To **foster transparency** at global level for investors and end users
- To help **build consumer trust** and support bankable offtake
- To advance competition between different hydrogen pathways **based on their GHG footprint**
- To provide a **common global benchmark methodology** for all renewable and low-emission hydrogen pathways, enabling tool **to implement sovereign policy choices of countries at national level.**

# Conclusions

- Business-as-Usual is not sufficient given energy, climate and societal drivers. Crucial for governments to facilitate efficient and effective international hydrogen markets
- Robust, stable and transparent regulations, codes and standards are key
- IPHE has developed a methodology to quantify the GHG emission for hydrogen used as a seed document to develop the ISO TS 19870:2023 launched at COP28
- The Declaration of Intent towards mutual recognition of certification schemes signed by 37 countries at COP 28 will facilitate international hydrogen trade
- International collaborations and continuous and strong involvement of public and private stakeholders are crucial

# Thank you


International Partnership
for Hydrogen and Fuel Cells
in the Economy