International Partnership for Hydrogen and Fuel Cells in the Economy

Methodology for Determining the GHG Emissions Associated with the Production, Conversion/Conditioning and Transport of Hydrogen

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Executive Director

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Group of Experts on Renewable Energy - UNECE
Tenth session
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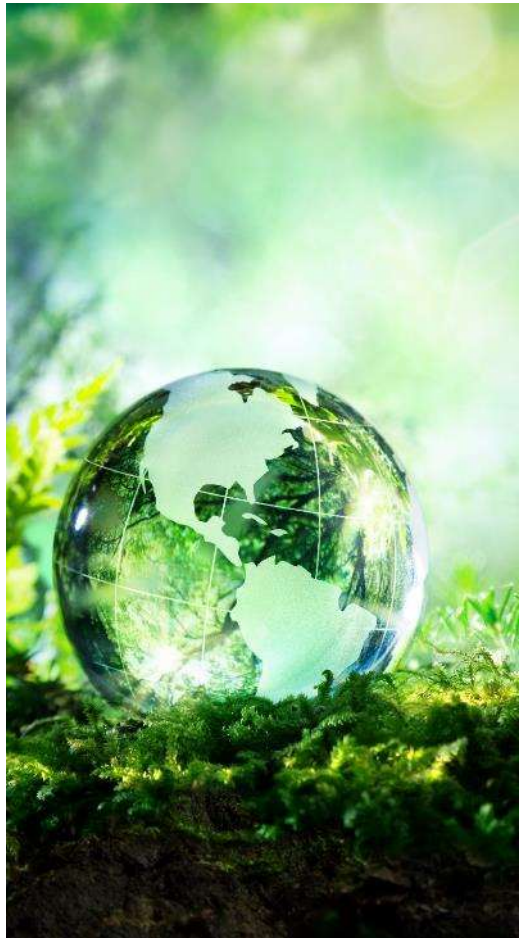


THE CREATION OF A GLOBAL MARKET

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

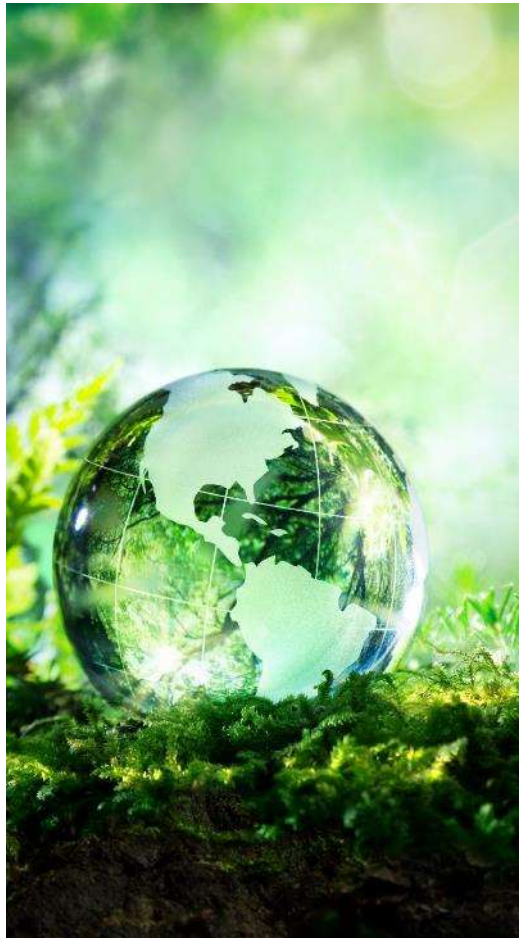
- *Must get **low-carbon hydrogen cost competitive***
- ***Skilled workforces** from engineers to operators: initial cursus and lifelong trainings*

2. Infrastructure Investment

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

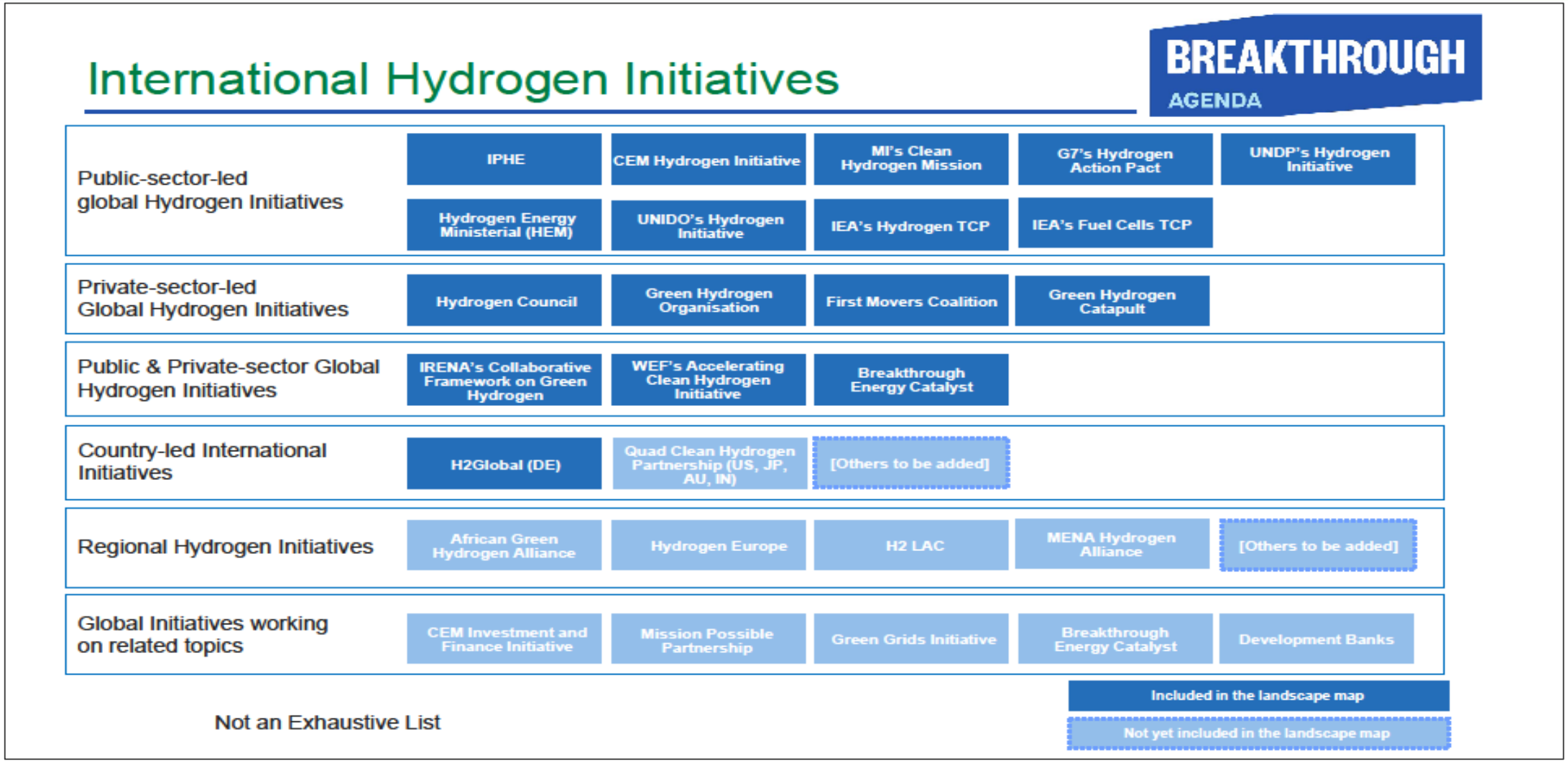
3. Policy and Regulatory Framework

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



THE ROLE OF INTERNATIONAL MULTILATERAL COLLABORATIONS

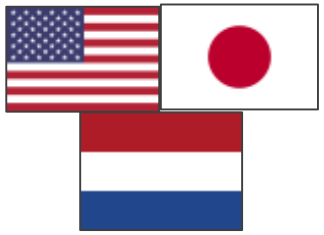
International collaborations and coordination are essential



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

Formed in 2003

Chair



Vice-Chairs

Priorities:

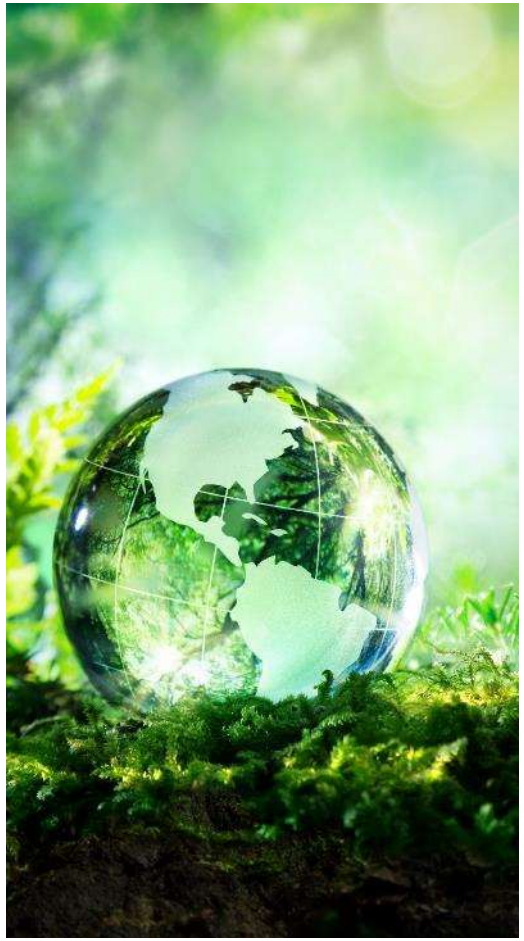
1. **Share Information on Latest Developments**
2. **Inform Future Government Policy**
3. **Foster Collaboration**

The IPHE addresses these Priorities by,

- **Coordinating and Sharing Information**
- **Regular Country Updates** – Country Profiles at www.iphe.net
- **Working Groups:**
  1. Regulations, Codes, Standards & Safety (RCSS) – TFs: Maritime & Bulk Storage
  2. Education & Outreach (E&O) – Early Career Network
- **Task Forces:**
  1. H_2 Production Analysis – Working Paper Ver 3 Published
  2. H_2 Trade Rules – Paper Published, Potential new work
  3. H_2 Certification Mechanisms
  4. Skills – Terms of Reference under Development

And coordinate with other International initiatives including IRENA, IEA, CEM/MI, WEF, H2 Council, and the Breakthrough Agenda

23 Countries & European Commission

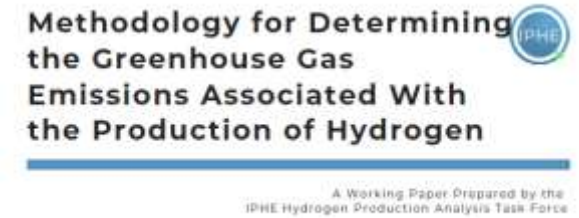


Implementing international regulations, codes and standards

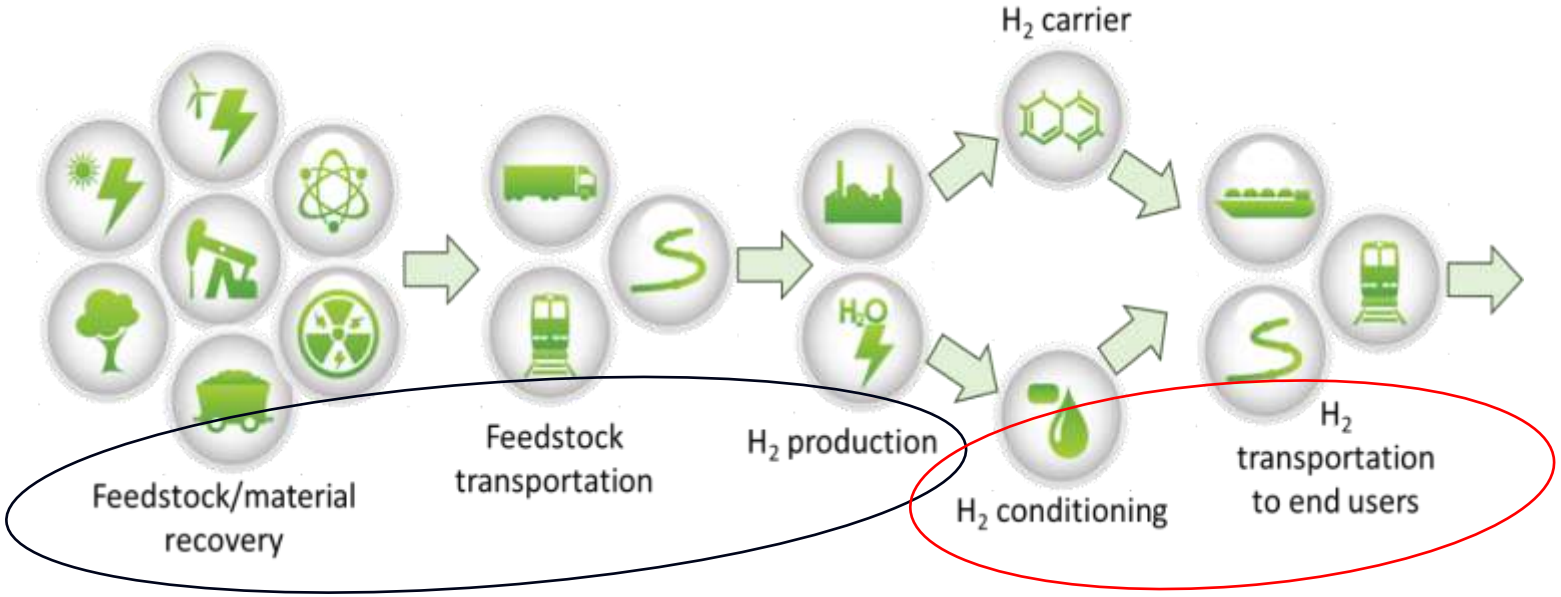
IPHE Hydrogen Production Analysis Task Force
What does “Clean Hydrogen” mean?

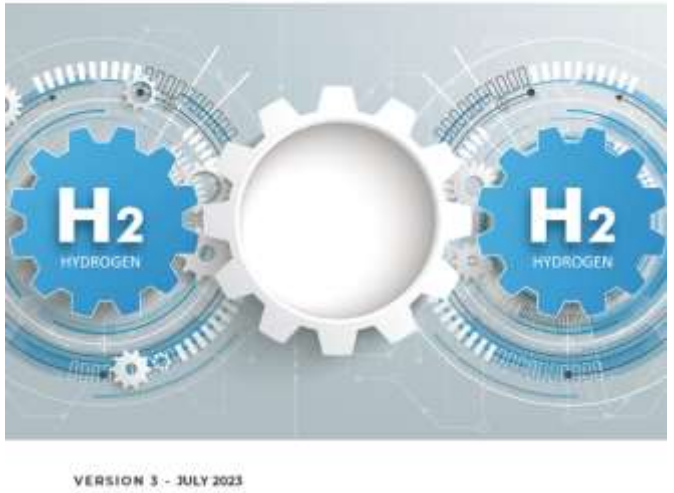
‘Quantification Methodology’ Working Paper Version 3 Co-leads France, EU, USA

- 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

Handed over to ISO TC197/SC1/WG1
Convener France, Project leader Brazil

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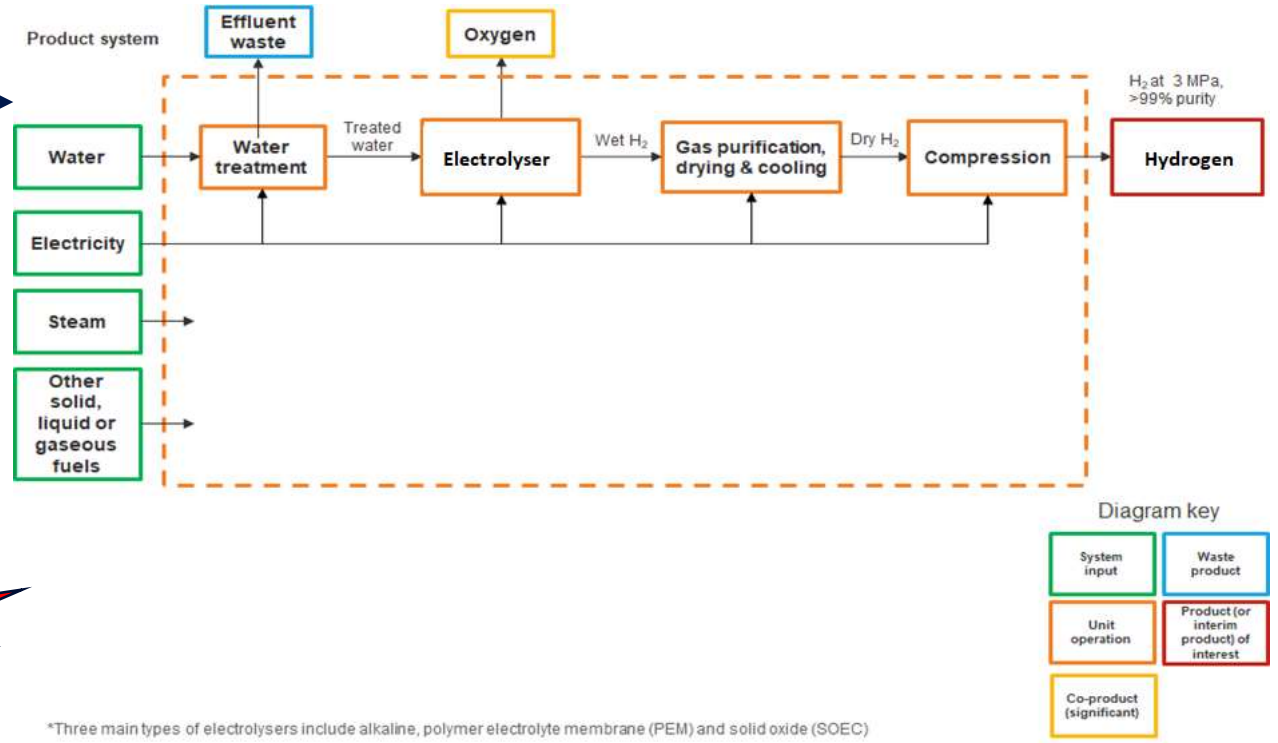
- **Hydrogen Production Pathways:**
  - Electrolysis
  - Steam Methane Reforming with CCS
  - Industrial By-Product
  - Coal Gasification with CCS
  - Biomass
  - Auto-Thermal Reforming with CCS
- **Conditioning and Carriers of H_2**
  - Liquefaction
  - Ammonia
  - Liquid Organic Hydrogen Carriers

New

- **Transportation of H_2**
  - Marine; Pipeline; Mobility – Train, Truck



*Three main types of electrolysers include alkaline, polymer electrolyte membrane (PEM) and solid oxide (SOEC)

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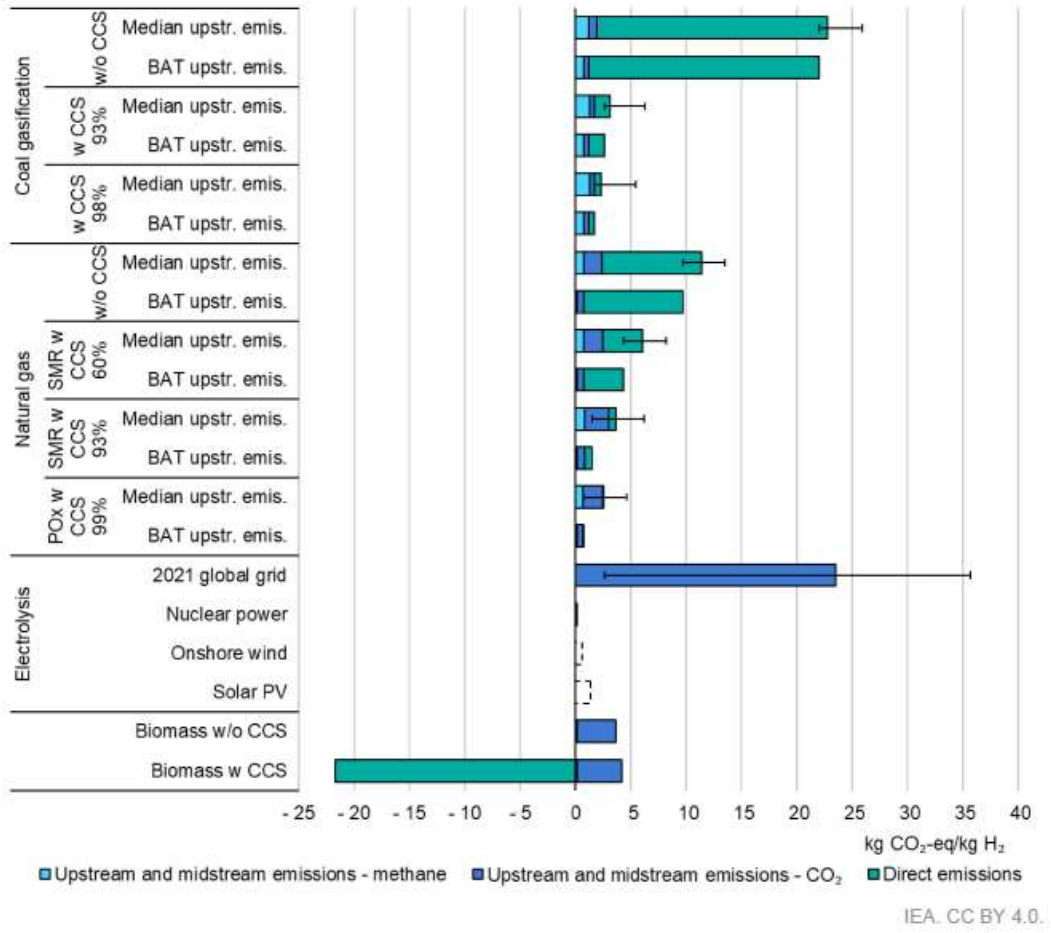
Figure 2.2 Comparison of the emissions intensity of different hydrogen production routes, 2021



The GHG Emissions associated with the Production of Hydrogen depend on:

- the primary energy

AND

- the production pathway

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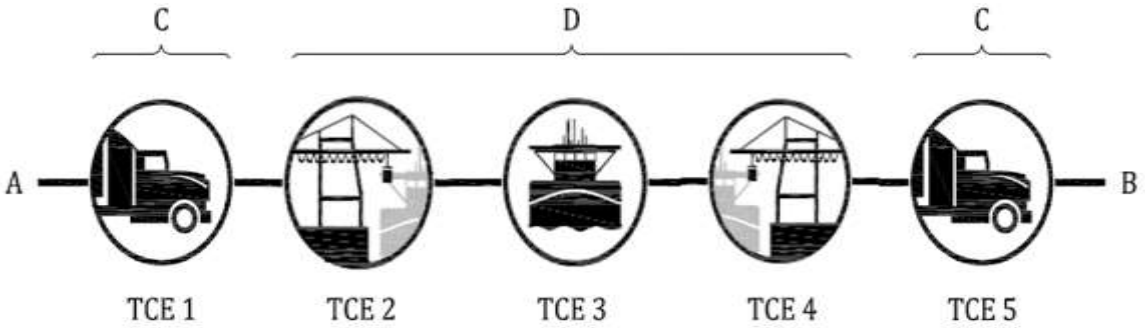
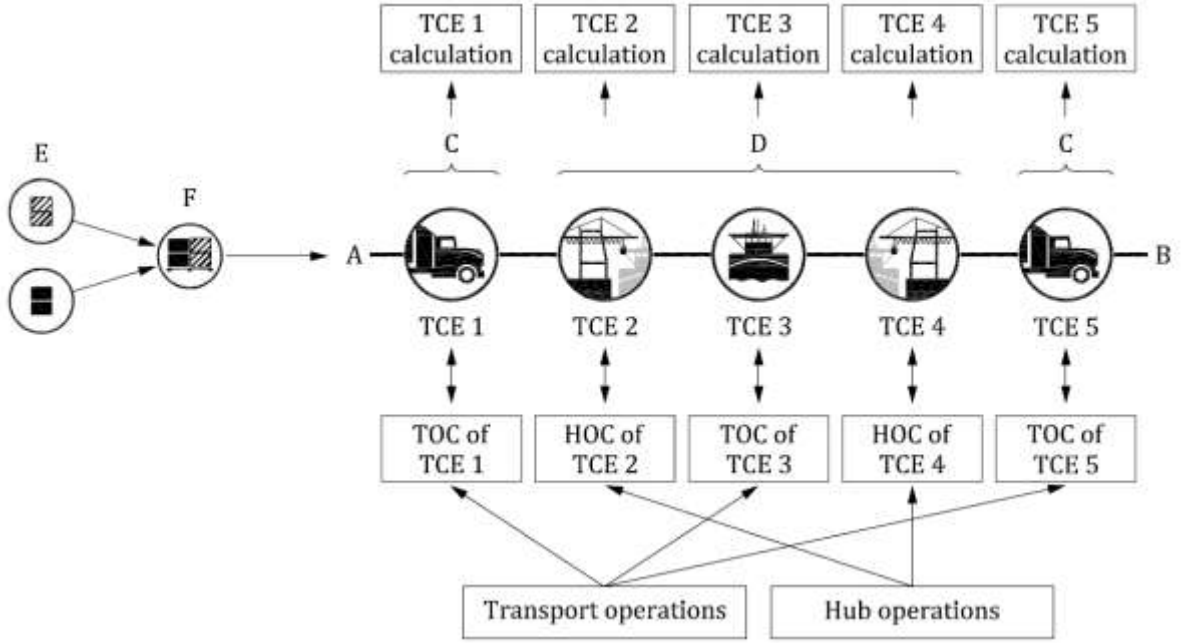
- **GHG Emission link to the transportation of Hydrogen and Hydrogen carriers**

Principles of Quantification of GHG Emissions Related to Transport Chains (TC), Transport Chain Elements (TCE), Transport Operation Categories (TOC) and Hub Operation Categories (HOC)

Illustrative example of a multi-element freight **transport chain** [modified from ISO 14083:2023]



Diagrammatic **relationship between operations and TCEs** for an example freight transport chain (modified from ISO 14083:2023)



Hydrogen Certification Mechanisms

Global hydrogen trade currently blocked by lack of mutual recognition of standards and risk of regulatory fragmentation

Multiple certification schemes are **emerging** across jurisdictions, with **more under development**…

…however standards are being developed independently, with no **mutual recognition** / **interpretability**…

…which causes a **risk of regulatory fragmentation, limiting** global and cross-border hydrogen **value chains and trade**

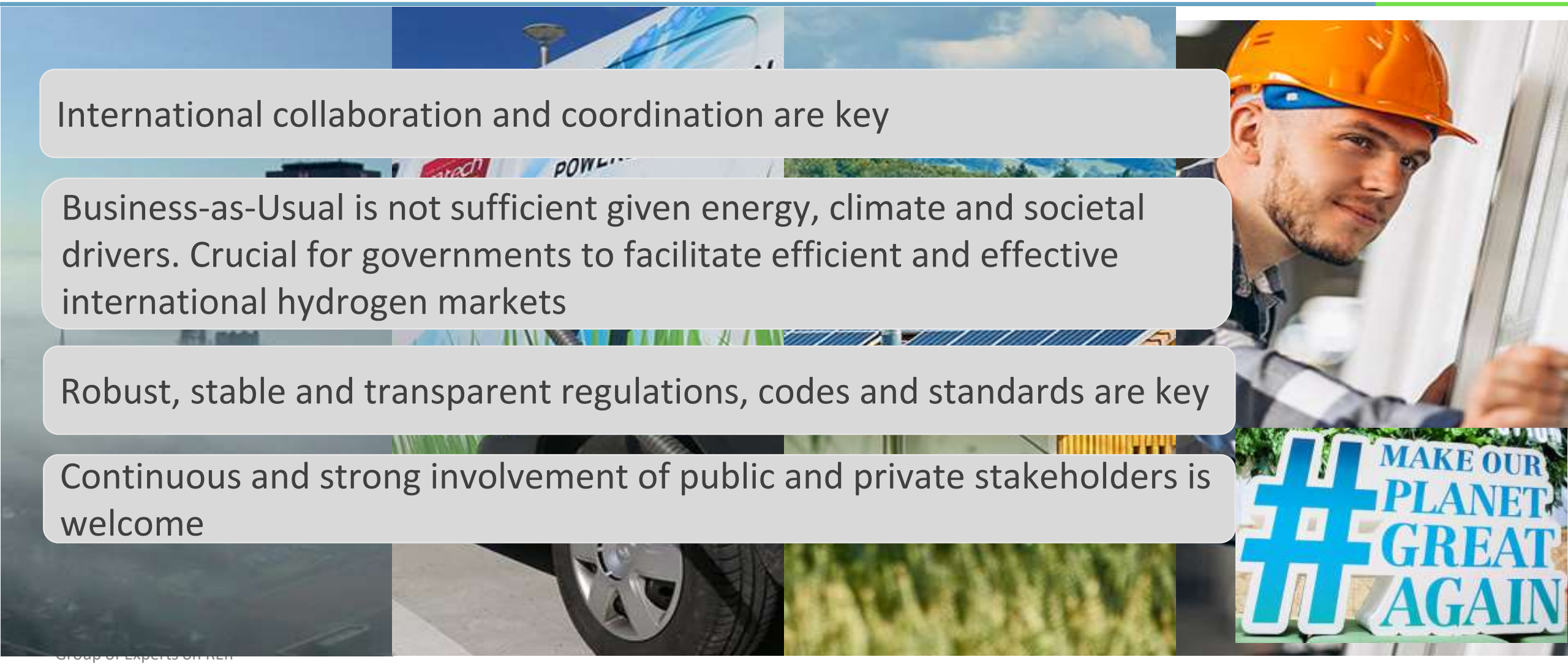
Conclusions: Hydrogen, the energy for today!

International collaboration and coordination are key

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

Continuous and strong involvement of public and private stakeholders is welcome



Thank you

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