

UNECE Committee on Sustainable Energy 10th Session of the Group of Experts on Gas *Geneva, March 23-24, 2023* ISO Standards for Hydrogen

Safety & Sustainability

Dr. Andrei V. Tchouvelev, Chair, ISO/TC 197/SC 1



**ISO/TC 197 Plenary Week
Sydney, Australia, December 5-9, 2022**



26TH ISO/TC 197 PLENARY MEETING 第26次国际标准化组织氢能技术委员会全体会议



ISO/TC 197 Hydrogen Technologies

SC 1 Hydrogen at Scale and Horizontal Energy Systems

Scope of ISO/TC 197:

Standardization in the field of systems and devices for the production, storage, transport, measurement and use of hydrogen

Scope of ISO/TC 197/SC 1:

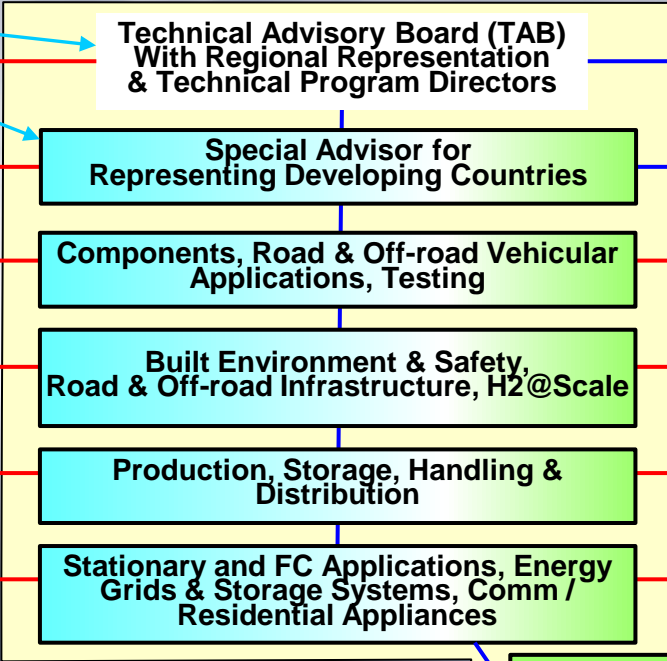
Standardization of large-scale hydrogen energy systems and applications including aspects of testing, certification, sustainability and placement, and coordination with other relevant standardization bodies and stakeholders

ISO/TC197 High Level Organization Chart



Shared TAB co-chaired by TC197 and SC 1 Chairs, and Special Advisor

TC197 Hydrogen Technologies Secretariat and Chair



SC1 H2@Scale & Horizontal Energy Systems Secretariat & Chair

WG
1, 5, 18, 19, 20, 22, 23, 30, 31, 33

WG
24, 29, 35

WG
15, 17, 21, 25, 26, 34

WG
27, 28

WG
Off-road, Testing

WG
Off-road, H2@Scale

WG
Pipelines, Multifuel

WG
Energy Storage...

Sustainability of H2 Technologies (GHG, H2GO, Certification)

WG 1

AHG Rail

WG 2

— Administrative reporting for relevant deliverables
— Technical input, coordination and collaboration

ISO/TC 197 & SC1 Division of Scope



ISO/TC 197 Focus

- ✓ Basic Requirements for Hydrogen Technologies
 - Production
 - Storage
 - Handling
 - Built environment
 - Protocols and components including road vehicles and their fueling infrastructure



(Toyota website)



ISO/TC 197 / SC1 Focus

- ✓ Applications' requirements of Hydrogen technologies at large scale and in horizontal energy systems with H2 as a central link
- ✓ Coordination with TCs & stakeholders on:
 - Renewables and Energy Storage/Grid Balancing
 - Multi-fuel systems
 - Sustainability aspects (GHG, H2GO, Cert)
 - Testing and certification of H2 components
 - Rail, maritime, aviation applications
 - Residential applications



(Toyota website)



(Toshiba website)

ISO/TC 197 Working Groups



WG	Title	ISO
WG1	Liquid hydrogen - Land vehicles fuel tanks	13985 revision
WG35	Liquid hydrogen - Land vehicle fueling protocol	13984 revision
WG27	Hydrogen fuel quality	14687 revision
WG29	Basic considerations for the safety of hydrogen systems	TR15916 revision
WG5	Gaseous hydrogen land vehicle refuelling connection devices (up to and above 120 g/s flow)	17268-1, -2 rev.
WG36	Gaseous hydrogen land vehicle refuelling connection devices – Cryo-compressed H2 gas - <i>pending</i>	17268-3
WG19	Gaseous hydrogen fueling station – Dispensers	19880-2
WG21	Gaseous hydrogen fueling station – Compressors	19880-4
WG22	Gaseous hydrogen fueling station – Hoses	19880-5
WG23	Gaseous hydrogen fueling station – Fittings	19880-6
WG31	Gaseous hydrogen fueling station – O-rings	19880-7
WG28	Gaseous hydrogen fueling station – Hydrogen quality control	19880-8
WG33	Gaseous hydrogen fueling station – Sampling for fuel quality analysis	19880-9
WG18	Gaseous hydrogen land vehicle fuel tanks and TPRDs	19881, 19882 rev.
WG15	Cylinders and tubes for stationary storage	19884
WG24	Gaseous hydrogen – Fuelling protocols for hydrogen-fuelled vehicles	19885-1, -2, -3
JWG30	Gaseous hydrogen land vehicle fuel system components	19887
WG34	Hydrogen generators using water electrolysis – Industrial, commercial, and residential applications	22734-1 revision
WG32	Hydrogen generators using water electrolysis – Test protocols for performing electricity grid services → To be moved to SC 1 as WG 2 (expect NWIP from Germany for TS)	TR22734-2 5 TR → TS

Scope of ISO Methodology



- ❑ In order to develop an international hydrogen market, it is needed to agree asap on common definitions, certification schemes...
 - ✓ but at first to agree on a **mutually agreed methodology** for determining the greenhouse gas (GHG) emissions associated with the Production, Conditioning and Transport of Hydrogen to Consumption Gate.

ISO/WD 19870:2023
ISO TC 197/SC 1/WG 1
Date: 2023-01-14

Methodology for determining the greenhouse gas emissions associated with the production and transport of hydrogen

Méthodologie pour déterminer les émissions de gaz à effet de serre associées à la production et au transport d'hydrogène

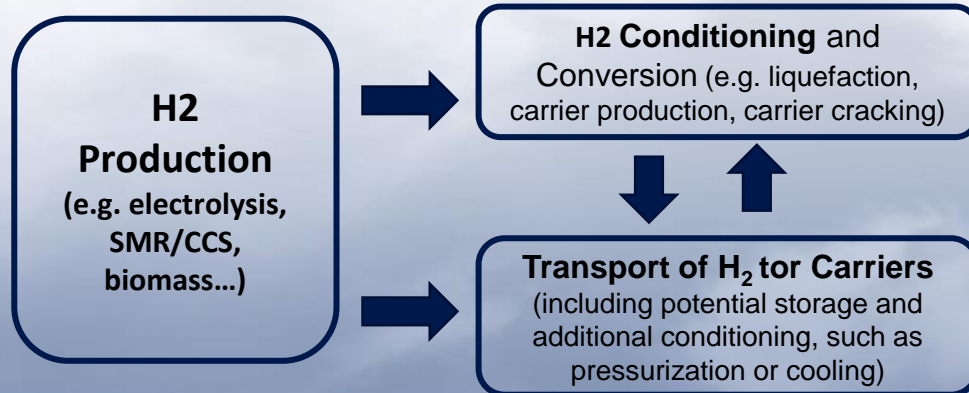
(The scope of this document is to establish a methodology and analytical framework to determine the GHG emissions related to a unit of produced hydrogen up to the consumption gate)

WD stage

Warning for WDs and CDs

This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard. Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

General approach selected



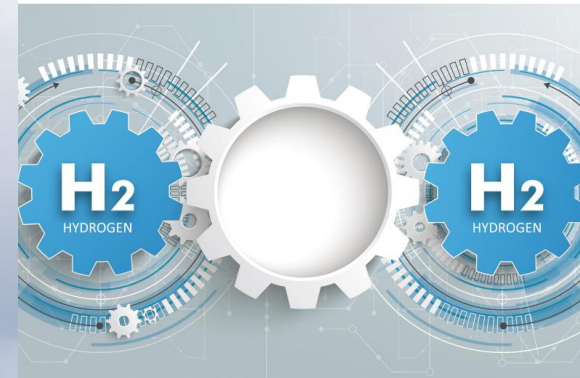
General Guiding Principles

1. **Inclusive** – methodologies should not exclude any potential primary energy even if not all production pathways may be covered at a first stage
2. **Flexible** – approaches must allow for unique circumstances and hence flexible
3. **Transparent** – methodologies must be transparent in approach and assumptions to build confidence
4. **Comparable** – approach should be comparable between the different production pathways **AND** with the approach used by other technologies to help allow for ‘apples to apples’ comparisons on emissions
5. **Practical** – methodologies must be practical, facilitating uptake by industry and use in the market.



Methodology for Determining the Greenhouse Gas Emissions Associated With the Production of Hydrogen

A Working Paper Prepared by the
IPHE Hydrogen Production Analysis Task Force



VERSION 2 - NOVEMBER 2022

Accounting Frameworks Developed



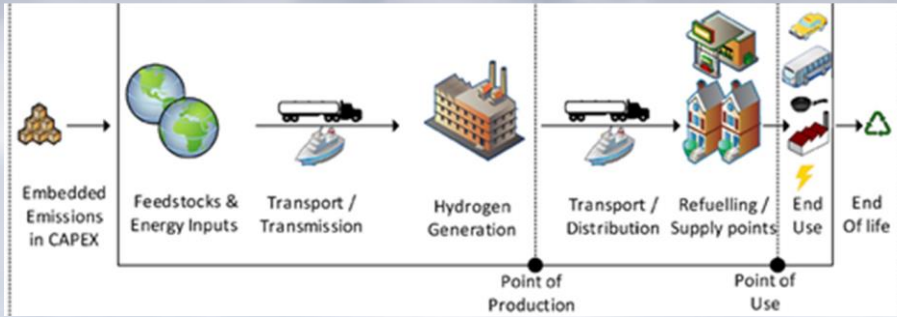
Phase 1: H2 production



Phase 2

2a) H2 conditioning

2b) H2 transport



In Scope

Extraction of feedstock, and delivery



H₂ Production Process
Delivery and storage of H₂



Energy produced onsite



Purchased energy

Methodology for Determining the Greenhouse Gas Emissions Associated With the Production of Hydrogen

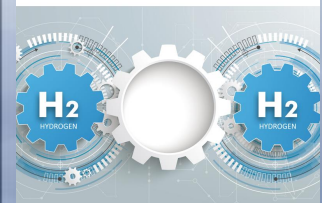


A Working Paper Prepared by the IPHE Hydrogen Production Analysis Task Force

Out of Scope

Manufacturing of equipment throughout supply chain (e.g. H₂ production plant, power generators)

Other sources of indirect emissions (e.g. associated with corporate travel, water use, waste disposal)



ISO/TC 197 Hydrogen Technologies

SC 1 Hydrogen at Scale and Horizontal Energy Systems



AHG H2@Rail – blueprint for other applications based on ISO/TC197 docs

- Under SC 1 together with IEC/TC 9 and ISO/TC 269
- Objective: develop and implement the roadmap for H2 standards for rail applications
- Implementation plan – set a number of JWG's under SC 1 as follows – partner TCs provide NPs and nominate convenors:
 - Fueling connection devices (nozzle & receptacle), [ISO 17268-4](#) together with ISO/TC 269
 - On-board GH2 storage containers, [ISO 19881-2](#) together with IEC/TC 9
 - On-board fuel system components, [ISO 19887-2](#) together with IEC/TC 9
 - GH2 rail vehicle fueling protocol, [ISO 19885-4](#) together with IEC/TC 9
 - GH2 rail refueling station, [ISO 19880-10](#) together with IEC/TC 9

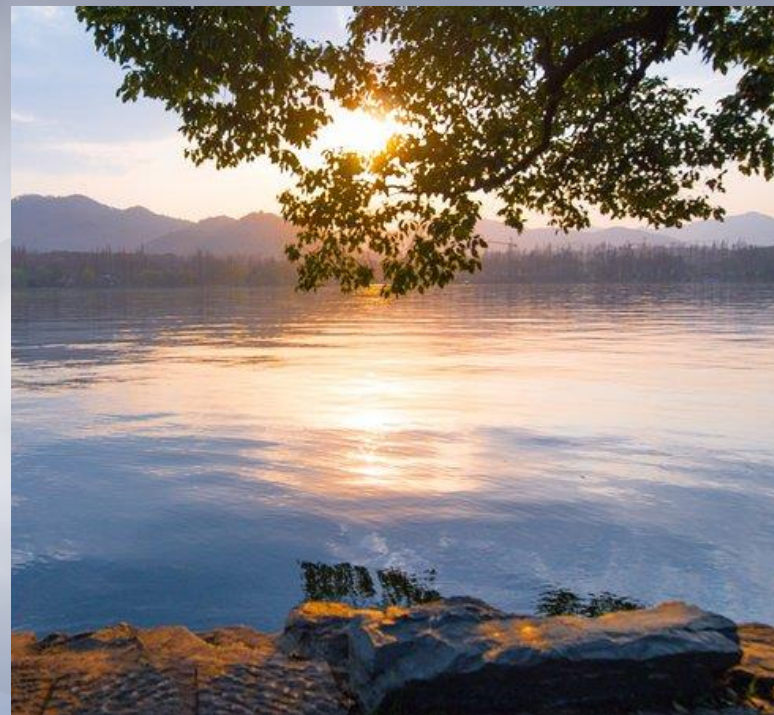
Traditional Areas – Areas where Flammable and Combustible materials may be present

IECEX provides a single global solution for assessment + Certification of Equipment/Services/Persons



- ❑ Key Role in the new Emerging Hydrogen and Fuel Cell Economy
- ❑ According to World Energy Council by 2025, hydrogen strategies can be expected to cover countries representing over 80% of global GDP
- ❑ Logical extension to IECEX past coverage of Ex Equipment in Hydrogen areas
- ❑ IECEX Expert WG 19 “Hydrogen Technologies” current focus:
 - Personnel Certification of Competence according to ISO TC 197 and IEC TC 105 Standards (eg ISO 15916 *Basic considerations for the safety of hydrogen systems*)
 - Certification of Equipment associated with Hydrogen dispensing systems
 - Certification of Stationary and Portable Fuel Cells (IEC 62282 series).

Thank you for your time!



Hydrogen cooling the Earth