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Technical Standards For Hydrogen: An International / European Perspective

CHS Webinar: Global Codes and Standards
21 / 07 / 2021

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Contents

- Technical standards
  - Existing
  - Under development
- Co-ordination activities towards development of future standards

Background: Where are relevant standards developed:

Internationally, regionally, nationally – examples below:

- Internationally, through involvement with ISO, IEC, or in Europe through involvement with CEN, CENELEC (via national standards organisation)
- Through other international bodies: NFPA, SAE, EIGA, EI, etc.
- Through national associations / organisations: E.g. CGA, BCGA, CSA, IGEM…

Background: Reason for International standards:

- Give overview and understanding of best practice(s) that can be taken to address typical requirements (for example, from regulations and/or regulators and permitting bodies) in context of specific technologies
- Give improved confidence in acceptance of products designed for use around the globe

bsi.

How International standards facilitate global trade

International standards are a vital tool in ensuring products and services are interchangeable and compatible across borders, removing barriers to trade, reducing production and supply chain costs and building confidence in business services and protecting consumers.

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ISO/TC 197: Hydrogen Technologies

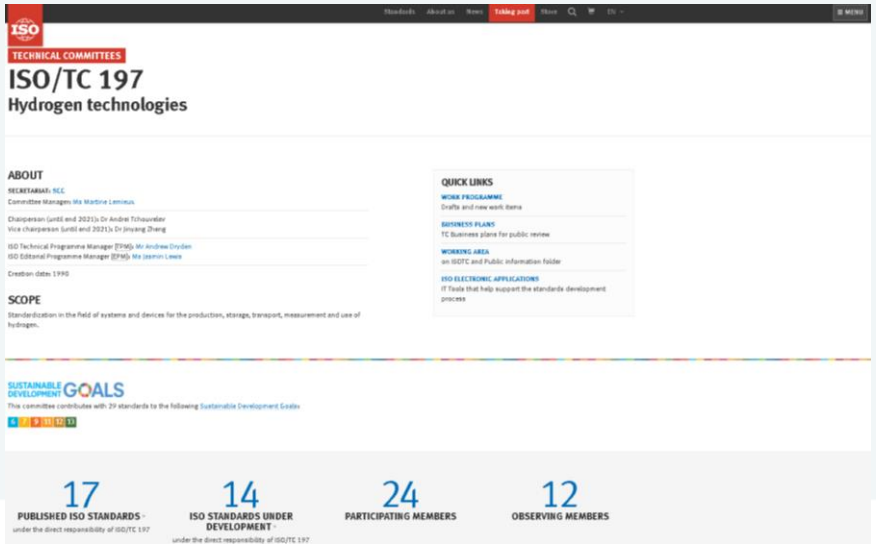
SCOPE

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

Secretariat: SCC (Standards Council of Canada)
Current Chair: (until end 2021) Dr Andrei Tchouvelev (Canada)
Next Chair: (from 2022) Tetsufumi Ikeda (Japan)

- 17 published standards
- 14 standards under development
- 24 participating members
- 12 observing members

https://www.iso.org/committee/54560.html



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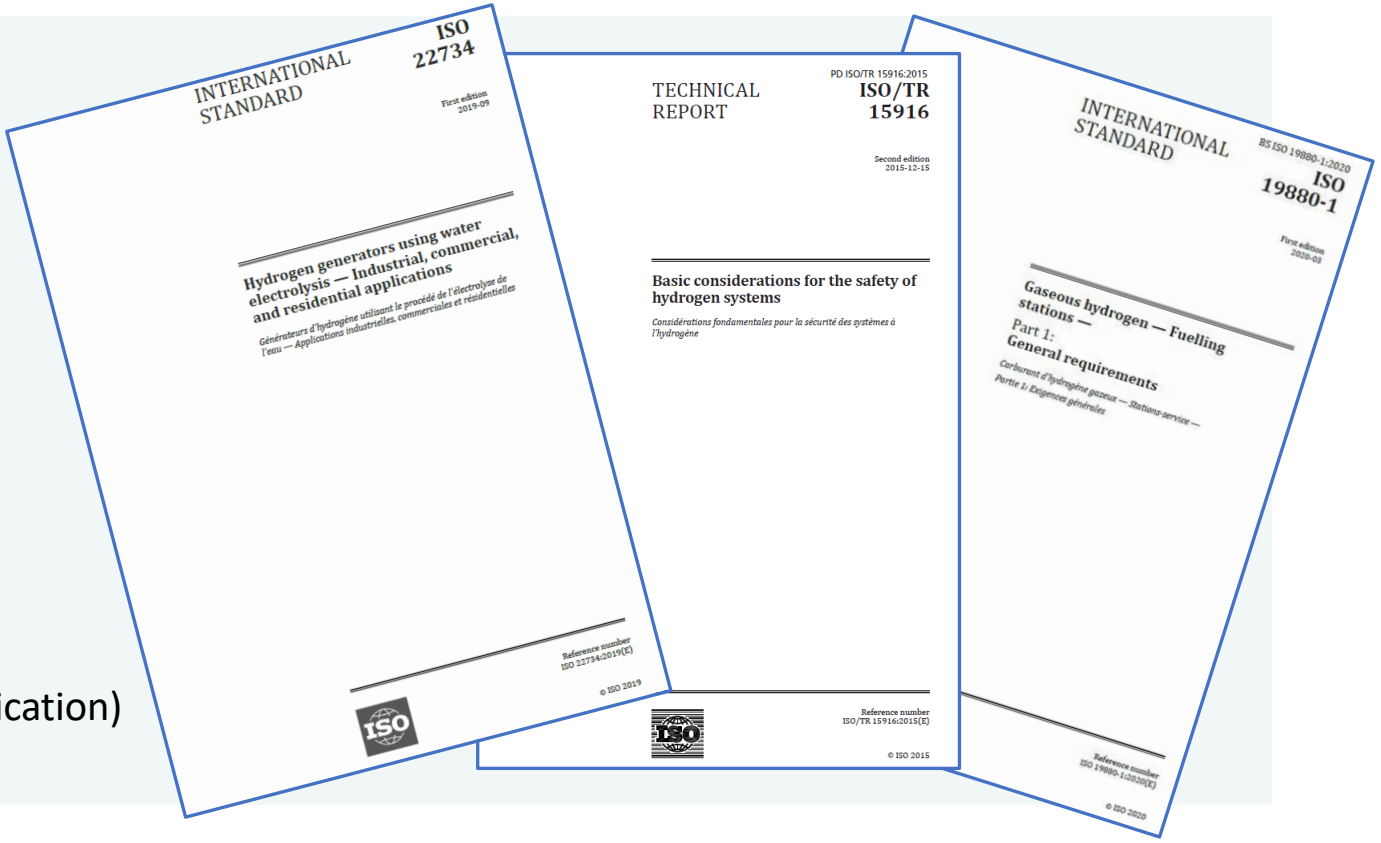
ISO/TC 197: Hydrogen Technologies

RECENT AND CURRENT STANDARDS ACTIVITY:

- General hydrogen standards
- Hydrogen vehicles (high pressure system)
- Hydrogen refuelling stations
  - General safety
  - Specific equipment & components
  - Refuelling protocols
- Hydrogen quality
- Hydrogen production (reformers, electrolysers, purification)
- Other



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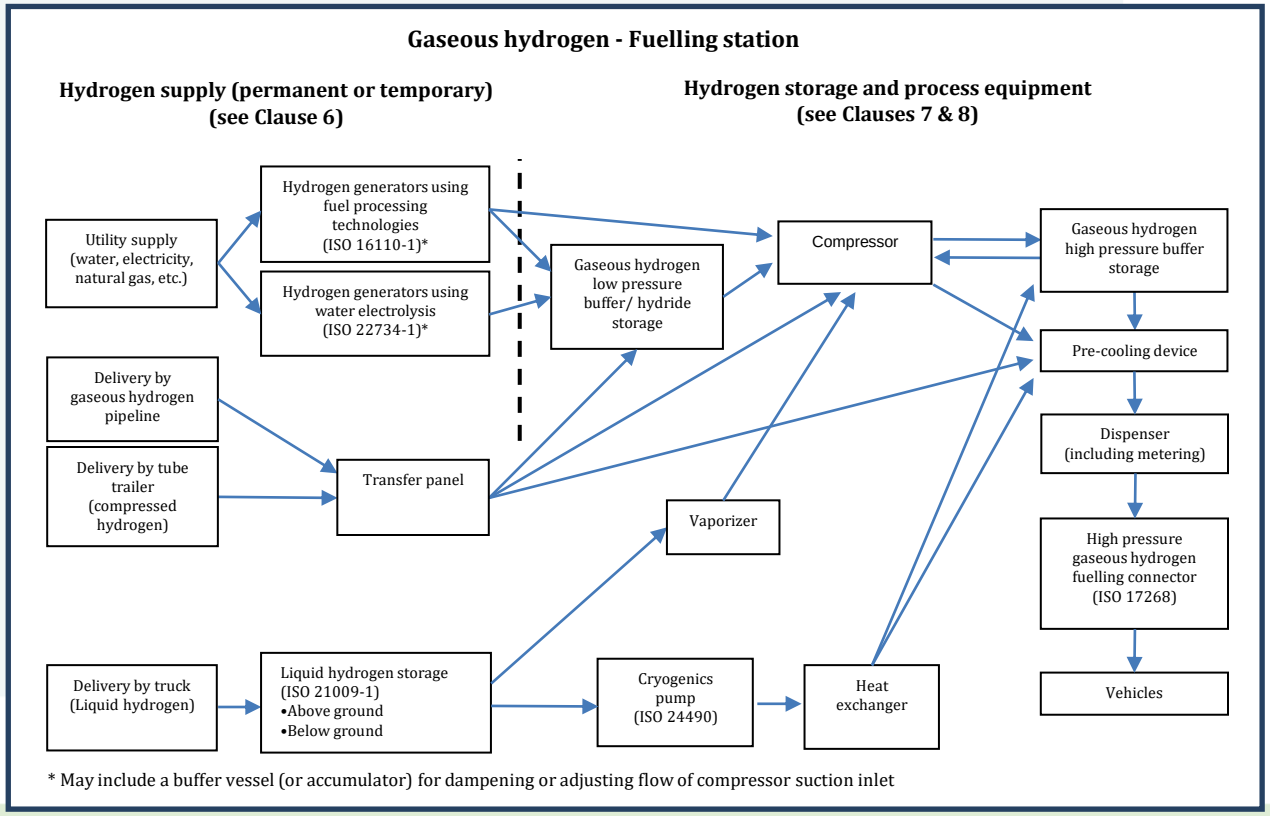
ISO 19880-1: Gaseous hydrogen – Fuelling stations – General requirements

Content:

1-4	Scope, References, Terms & Definitions, Abbreviations
5	Risk management
6	Hydrogen supply safety and operation
7	Equipment and Components
8	Dispensers
9	Hydrogen quality
10	Electrical
11	Instrumentation and control system
12	Station Inspection and Tests
13	Operation
14	Technical documentation
15	Inspection and maintenance

Annexes, including further guidance



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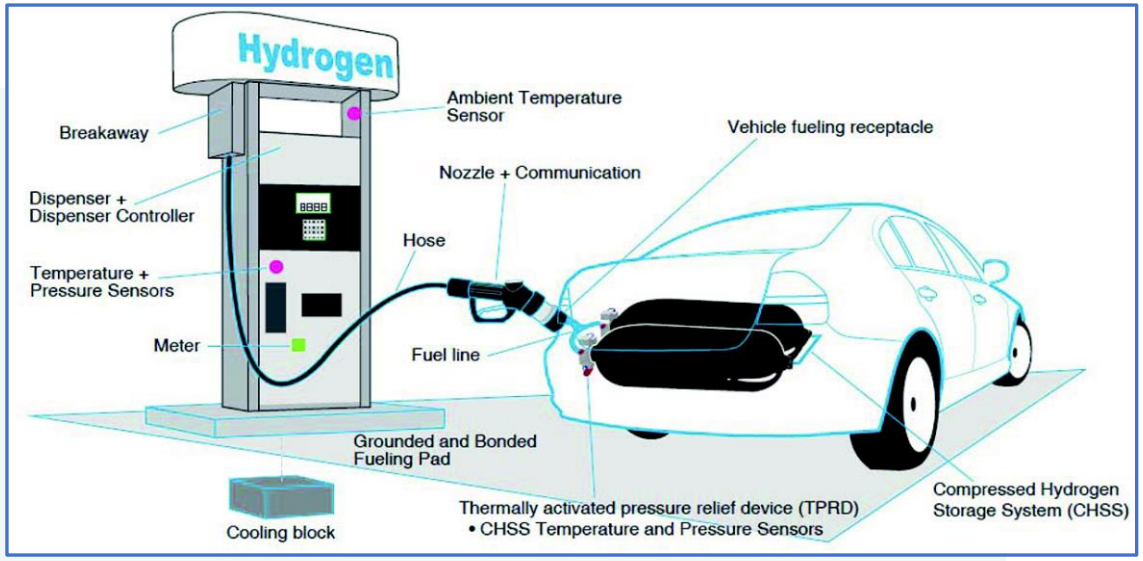
ISO 19880-1: Links to documents with further detail

Cross-reference to related ISO standards in ISO 19880 family and others, for example:

- ISO 19880-3: Valves
- ISO 19880-5: Dispenser hoses and hose assemblies
- ISO 19880-8: Fuel quality control
- ISO 17268: Gaseous hydrogen land vehicle refuelling connection devices

Cross-reference to related non ISO standards, for example:

- OIML R139-1: Compressed gaseous fuel measuring systems for vehicles. Part 1: Metrological and technical requirements
- SAE J2601: Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles



Important that vehicle and dispenser requirements are harmonized for interoperability:

- ISO 19881: Gaseous hydrogen — Land vehicle fuel containers
- (in support of Global Technical Regulation, GTR #13 concerning hydrogen and fuel cell vehicles)
- ISO 17268: Gaseous hydrogen land vehicle refuelling connection devices

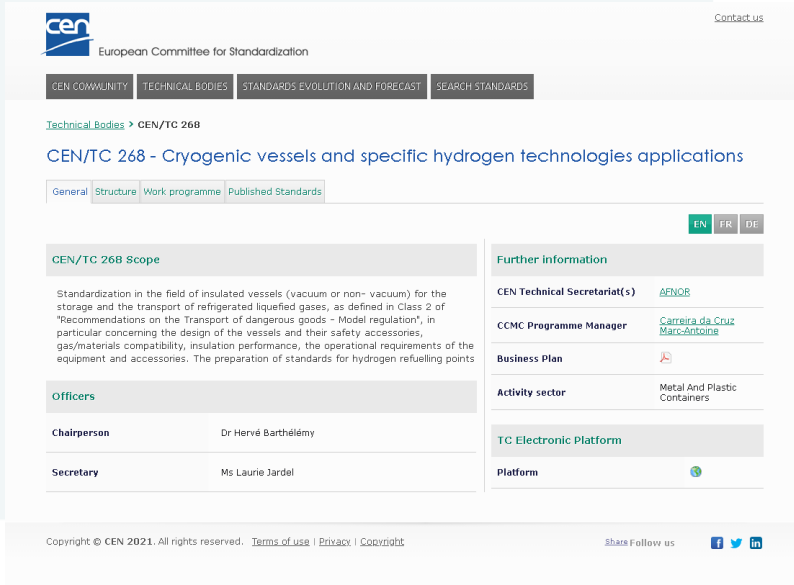
CEN/TC 268: Cryogenic vessels and specific hydrogen technologies applications

SCOPE

Standardization in the field of insulated vessels (vacuum or non- vacuum) for the storage and the transport of refrigerated liquefied gases… The preparation of standards for hydrogen refuelling points.

Secretariat: Afnor (France)
Current Chair: Dr Hervé Barthélémy (France)

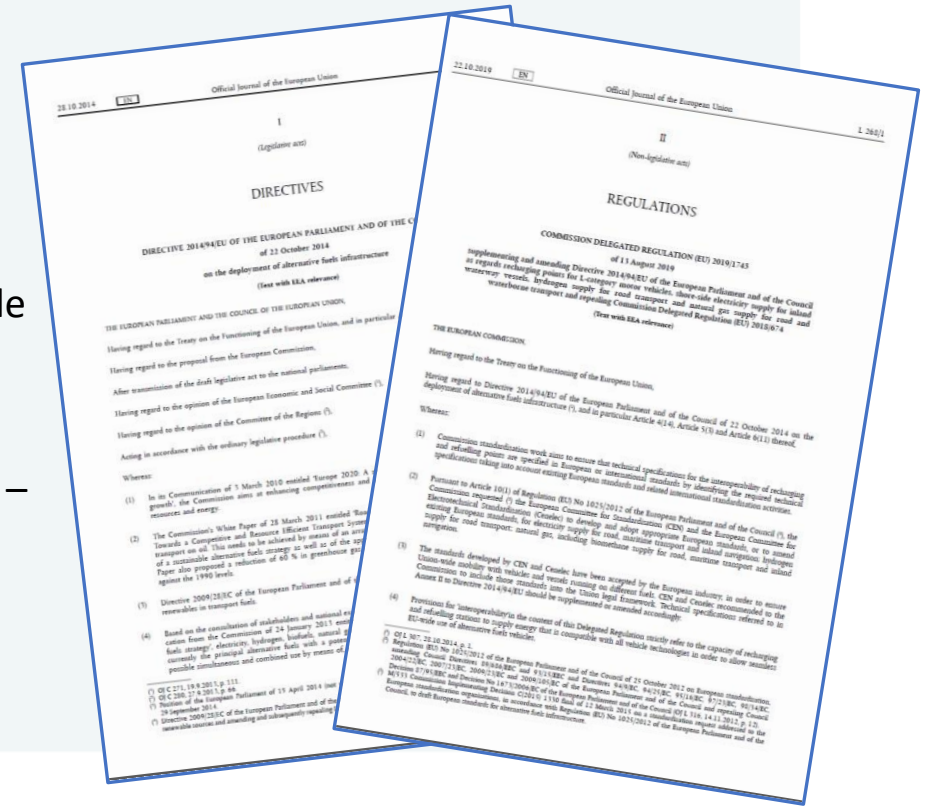
- 3 existing working groups – WG 5: “Specific hydrogen technologies applications”
- 3 published standards – Written to support the Directive 2014/94/EU
- One prepared by Vienna Agreement (taking ISO document and publishing as EN ISO)
- Two written in CEN/TC 268/WG 5, based on content of ISO/TC 197 standards
- EN ISO 17268, EN 17124, EN 17127



SPECIFIC LEGISLATION RELEVANT TO HRS

EUROPEAN LEGISLATION:

- Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure;
- Requirements for public electric vehicle charging, hydrogen, CNG and LNG vehicle fuelling;
- Both safety (interoperability) and availability;
- For hydrogen, initial Directive included reference to ISO standards (see Annex II) – changing to EN standards by Delegated Regulation 2018/674 and subsequently Delegated Regulation 2019/1745.
- (EN standards developed by CEN TC 268)



SPECIFIC LEGISLATION RELEVANT TO HRS

UK LEGISLATION:

- S.I. 2017 No. 897: The Alternative Fuels Infrastructure Regulations 2017

  (Transposes Directive 2014/94/EU into UK law)
- Enforced by OPSS (Office of Product Safety and Standards)

  (Guidance available here)
- Automated and Electric Vehicles Act 2018
- Primary legislation, to enable new regulations that could require introduction of hydrogen refuelling points (and electric charging points), technical and other, e.g. availability related, requirements

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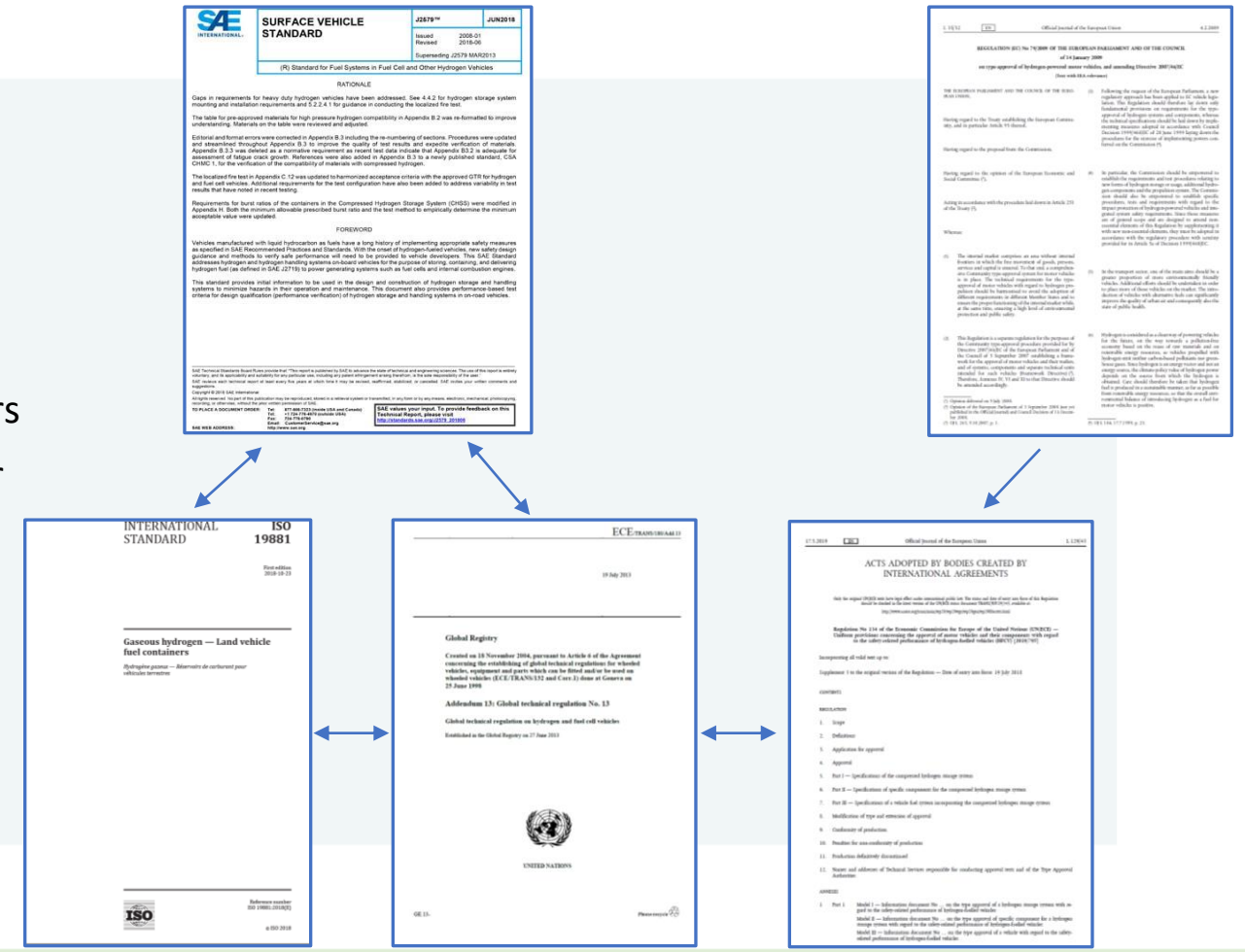
SPECIFIC LEGISLATION RELEVANT TO VEHICLES

- Global Technical Regulation, GTR #13 concerning hydrogen and fuel cell vehicles
- ISO 19881: Gaseous hydrogen — Land vehicle fuel containers
- SAE J2579: Standard For Fuel Systems In Fuel Cell And Other Hydrogen Vehicles
- UN ECE Regulation 134 - Uniform provisions concerning the approval of motor vehicles and their components with regard to the safety-related performance of hydrogen-fuelled vehicles (HFCV)
- Regulation 79-2009 EC on type-approval of hydrogen-powered motor vehicles



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CEN/TC 234: Gas Infrastructure

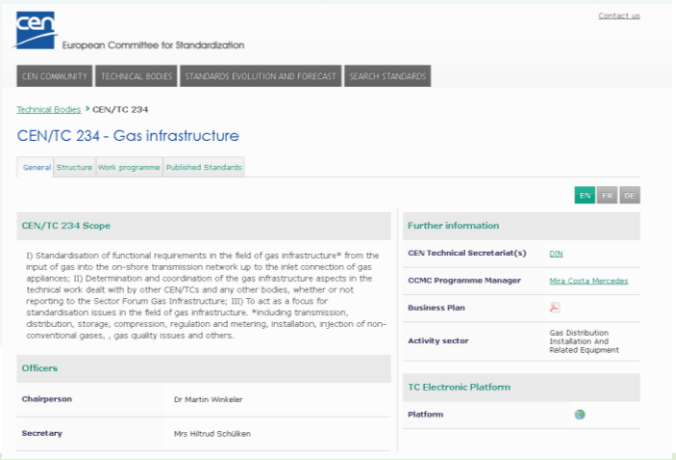
SCOPE

I) Standardisation of functional requirements in the field of gas infrastructure* from the input of gas into the on-shore transmission network up to the inlet connection of gas appliances; II) Determination and coordination of the gas infrastructure aspects in the technical work dealt with by other CEN/TCs and any other bodies, whether or not reporting to the Sector Forum Gas Infrastructure; III) To act as a focus for standardisation issues in the field of gas infrastructure.

*including transmission, distribution, storage, compression, regulation and metering, installation, injection of non-conventional gases, gas quality issues and others.

Secretariat: DIN (Germany)
Current Chair: Dr Martin Winkeler (Germany)

- 14 current working groups – including WG 13: “PNR H2NG/H2 in NG systems”
- Examining existing standards to develop where necessary for H2/NG and “100%” H2
- Additional standards (e.g. hydrogen injection equipment, hydrogen quality)
- In conjunction pre-normative research on hydrogen in natural gas and natural gas infrastructure conducted by The European Gas Research Group, GERG, and others



Identifying areas for potential future standards development

Co-ordination activities - examples:

- ISO committees, e.g. ISO TC 197 Strategic Planning Meetings (yearly)
- Others: IAHySafe, Hydrogen Council, etc.
- CEN/CENELEC Sector Fora (e.g. SFEM WG H2, SFG-I, SFG-U)
- PNR funding and RCS activity through Hydrogen Europe & FCH JU / CHE e.g. RCS Strategy Coordination Group

Taking output from pre-normative research (PNR) projects such as:

- PRHYDE – Protocol for Heavy-Duty Hydrogen Refuelling → development of ISO 19885 (part 3)
- MultHyFuel – Safety and permitting requirements for hydrogen refuelling in multi-fuel environment → development of CEN/CLC Guide 37
- MetroHyVe and MetroHyVe 2 – Metrology for hydrogen vehicles → development of ISO 19880-9

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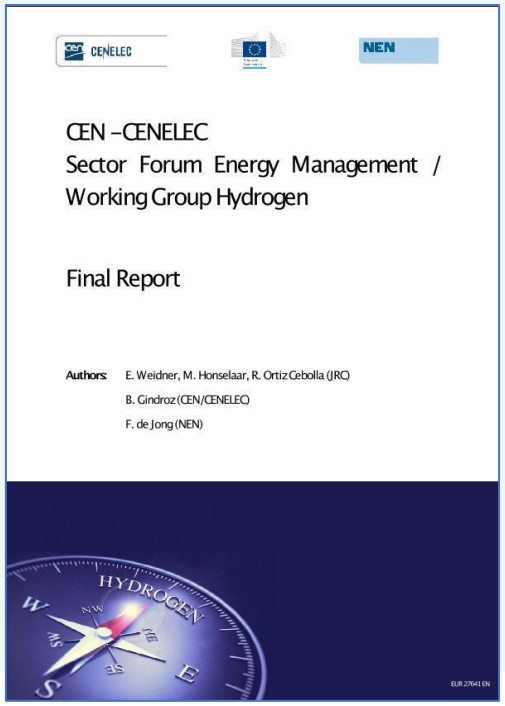
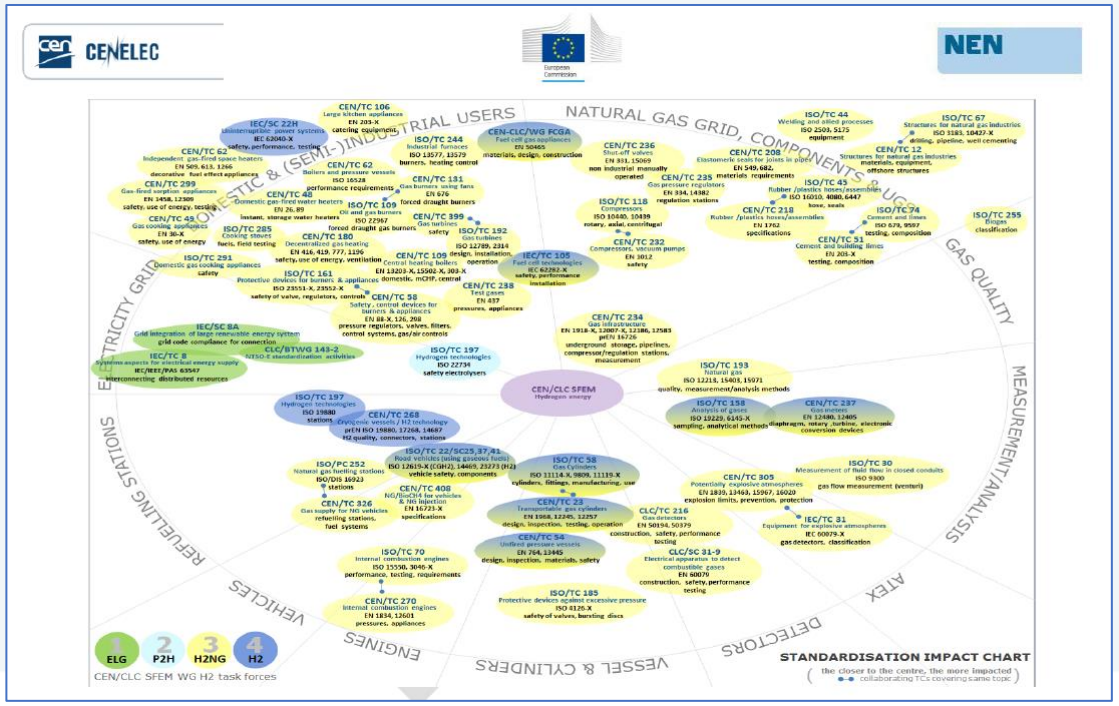
Status standards in 2016: CEN-CENELEC SFEM WG H2 report





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See : https://ec.europa.eu/jrc/en/publication/cen-cenelec-sector-forum-energy-managementworking-group-hydrogen-final-report

FUTURE STANDARD DEVELOPMENT

HYDROGEN ENERGY SYSTEMS

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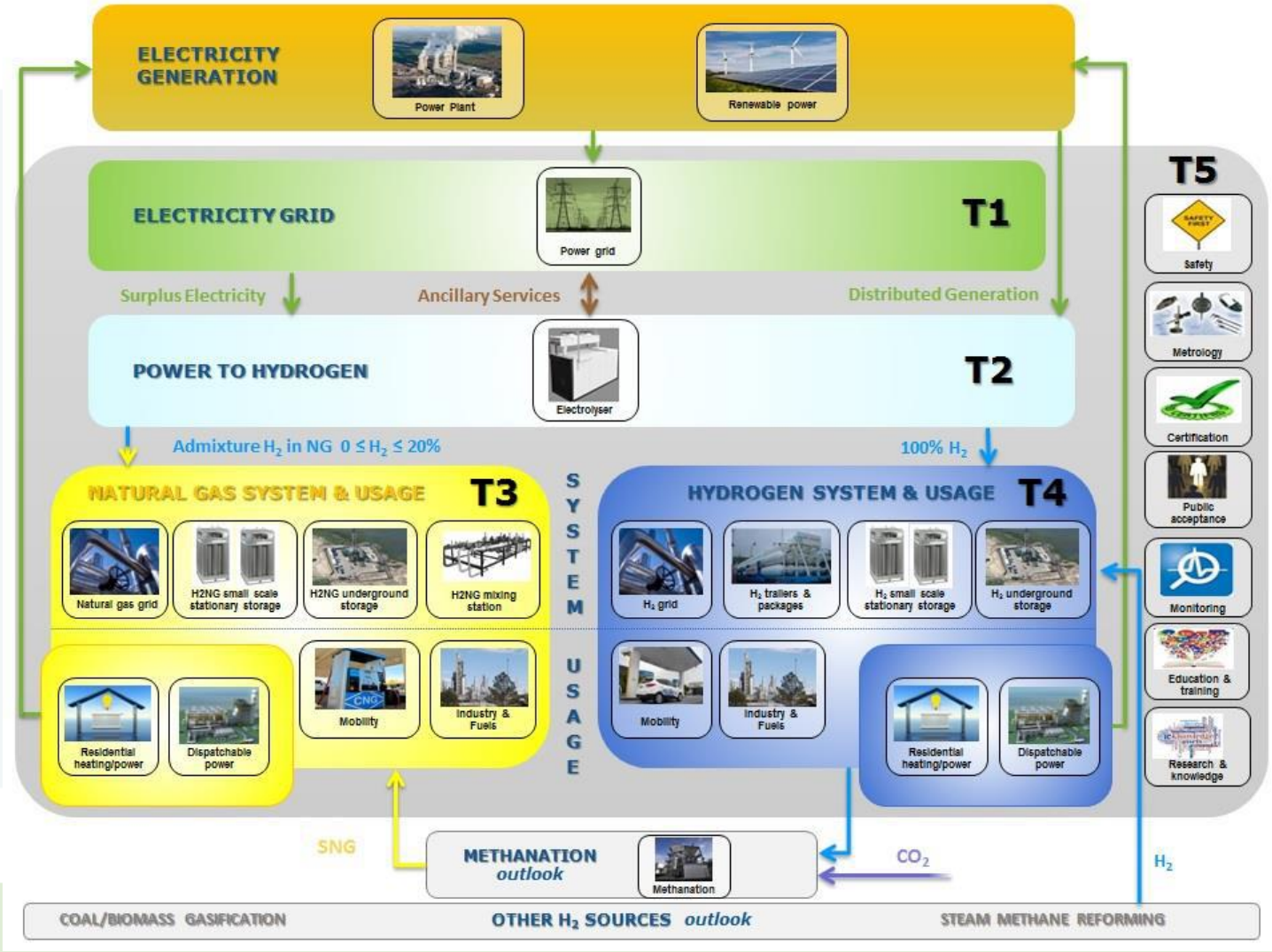
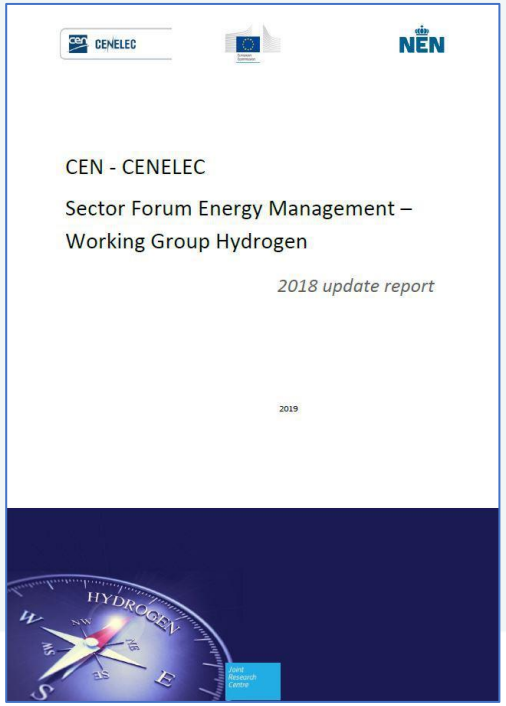


See : https://ec.europa.eu/jrc/en/publication/cen-cenelec-sector-forum-energy-managementworking-group-hydrogen-final-report

Status standards in 2018: Updated CEN-CENELEC SFEM WG H2 report

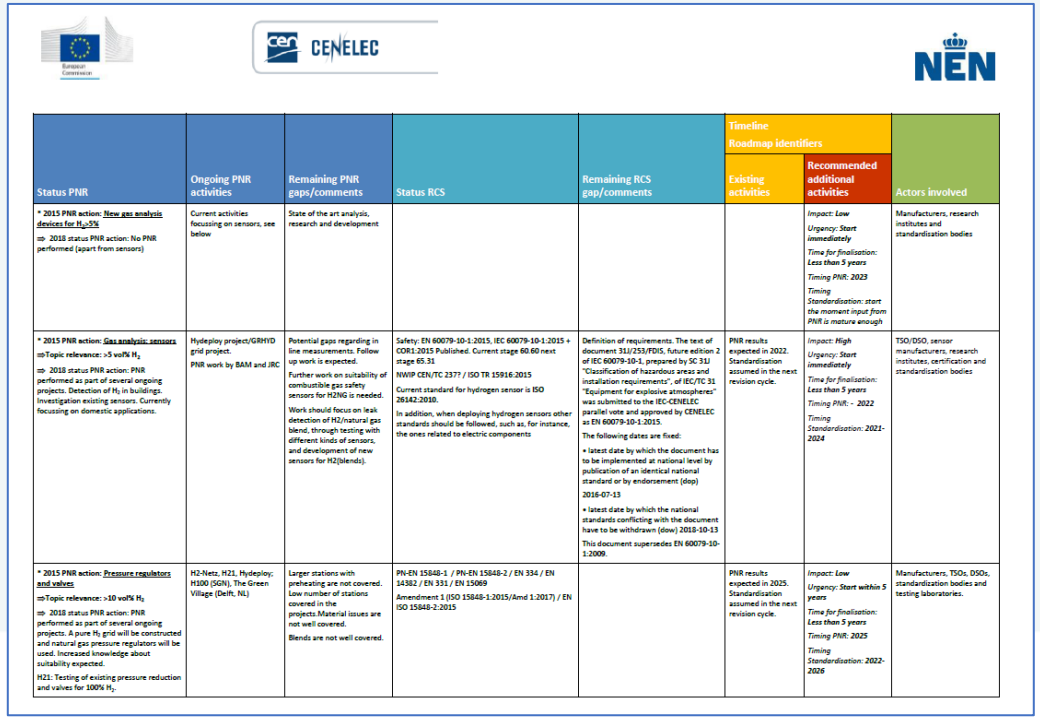


CEN - CENELEC

Sector Forum Energy Management – Working Group Hydrogen

2018 update report

2019



Status PNR	Ongoing PNR activities	Remaining PNR gaps/comments	Status RCS	Remaining RCS gap/comments	Timeline Roadmap identifiers: Existing activities	Timeline Roadmap identifiers: Recommended additional activities	Actors involved
* 2015 PNR action: New gas analysis devices for H_2>5% ⇒ 2018 status PNR action: No PNR performed (apart from sensors)	Current activities focussing on sensors, see below	State of the art analysis, research and development				*Impact: Low* *Urgency: Start immediately* *Time for finalisation: Less than 5 years* *Timing PNR: 2023* *Timing Standardisation: start the moment input from PNR is mature enough*	Manufacturers, research institutes and standardisation bodies
* 2015 PNR action: Gas analysis: sensors ⇒Topic relevance: >5 vol% H_2 ⇒ 2018 status PNR action: PNR performed as part of several ongoing projects. Detection of H_2 in buildings. Investigation existing sensors. Currently focussing on domestic applications.	Hydeploy project/GRHYD grid project. PNR work by BAM and JRC	Potential gaps regarding in line measurements. Follow up work is expected. Further work on suitability of combustible gas safety sensors for H2NG is needed. Work should focus on leak detection of H2/natural gas blend, through testing with different kinds of sensors, and development of new sensors for H2(blends).	Safety: EN 60079-10-1:2015, IEC 60079-10-1:2015 + COR1:2015 Published. Current stage 60.60 next stage 65.31 NWIP CEN/TC 237? / ISO TR 15916:2015 Current standard for hydrogen sensor is ISO 26142:2010. In addition, when deploying hydrogen sensors other standards should be followed, such as, for instance, the ones related to electric components	Definition of requirements. The text of document 31J/253/FDIS, future edition 2 of IEC 60079-10-1, prepared by SC 31J "Classification of hazardous areas and installation requirements", of IEC/TC 31 "Equipment for explosive atmospheres" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60079-10-1:2015. The following dates are fixed: • latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-07-13 • latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-10-13 This document supersedes EN 60079-10-1:2009.	PNR results expected in 2022. Standardisation assumed in the next revision cycle.	*Impact: High* *Urgency: Start immediately* *Time for finalisation: Less than 5 years* *Timing PNR: - 2022* *Timing Standardisation: 2021-2024*	TSO/DSO, sensor manufacturers, research institutes, certification and standardisation bodies
* 2015 PNR action: Pressure regulators and valves ⇒Topic relevance: >10 vol% H_2 ⇒ 2018 status PNR action: PNR performed as part of several ongoing projects. A pure H_2 grid will be constructed and natural gas pressure regulators will be used. Increased knowledge about suitability expected. H21: Testing of existing pressure reduction and valves for 100% H_2.	H2-Netz, H21, Hydeploy; H100 (SGN), The Green Village (Delft, NL)	Larger stations with preheating are not covered. Low number of stations covered in the projects.Material issues are not well covered. Blends are not well covered.	PN-EN 15848-1 / PN-EN 15848-2 / EN 334 / EN 14382 / EN 331 / EN 15069 Amendment 1 (ISO 15848-1:2015/Amd 1:2017) / EN ISO 15848-2:2015		PNR results expected in 2025. Standardisation assumed in the next revision cycle.	*Impact: Low* *Urgency: Start within 5 years* *Time for finalisation: Less than 5 years* *Timing PNR: 2025* *Timing Standardisation: 2022-2026*	Manufacturers, TSOs, DSOs, standardisation bodies and testing laboratories.

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See : https://ec.europa.eu/jrc/en/publication/cen-cenelec-sector-forum-energy-management-working-group-hydrogen-2018-update-report

How to get involved?

- Majority of International standards development work is possible through National Standards Organisation (NSO), for example, Afnor, ANSI, BSI, DIN, JISC, KATS, SA, SAC, SCC, etc….
  - Through membership of trade association or equivalent
  - As independent expert

→ process that leads to ISO and CEN (and IEC & CENELEC) standards being published through NSO (typically as national document, e.g. BS ISO or BS EN or even BS EN ISO standard)

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