The German H2 RCS Roadmap 2025

RCS Regulations, Codes & Standards and Implementing Regulations in the Field of Hydrogen (H2)

Impressum

Commissioned by
NOW GmbH
Fasanenstraße 5
10623 Berlin
+49 (0)30-311 61 16-00
kontakt@now-gmbh.de

August 2020

Editor
Elena Hof
NOW GmbH
NIP Programme Manager

Design
kursiv Kommunikationsdesign
Peter Frey, Katrin Schek

Printing
Flyeralarm GmbH

PAGE CONTENT

List of abbreviations

ADR	Accord européen relative au transport international des marchandises Dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
AFID	Alternative Fuels Infrastructure Directive
ATEX	ATmosphères EXplosives (EXplosive ATmospheres)
BAuA	Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (Federal Institute for Occupational Safety and Health)
BMAS	Bundesministeriums für Arbeit und Soziales (Federal Ministry of Labour and Social Affairs)
BMBF	Bundesministeriums für Bildung und Forschung (Federal Ministry of Education and Research)
BMVI	Bundesministerium für Verkehr und digitale Infrastruktur (Federal Ministry of Transport and Digital Infrastructure)
BMU	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)
BMWi	Bundesministerium für Wirtschaft und Energie (Federal Ministry for Economic Affairs and Energy)
FC	Fuel Cell
CD	Committee Draft
CEN	Comité Européen de Normalisation (European Committee for Standardization)
DKE	Deutsche Kommission Elektrotechnik in DIN und VDE (German Commission for Electrical, Electronic & Information Technologies of DIN and VDE)
CENELEC	Comité Européen de Normalisation Électrotechnique (European Committee for Electrotechnical Standarization)
DIN	Deutsches Institut für Normung (German Institute for Standardization)
DVGW	Deutscher Verein des Gas- und Wasserfaches (German Association of Gas and Water)
EC	European Community
EN	Europäische Norm (European Standard)
FCH JU	Fuel Cell and Hydrogen Joint Undertaking
GB	Standards issued by the Standardization
Standards	Administration of China (SAC)
GSG	Government Support Group
GTR	Global Technical Regulation
H_2	Hydrogen
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
NLF	New Legislative Framework
NSF	National Strategic Framework
PED	Pressure Equipment Directive
RCS	Regulations, Codes and Standards
RL	Richtlinie (Directive)
SAE US	Society of Automotive Engineers
TC	Technical Committee
GHG	Greenhouse gases
TPED	Transportable Pressure Equipment Directive
TRBS	Technische Regel zur Betriebssicherheit (Technical rules for operational safety)
UNECE	United Nations Economic Commission for Europe
WG	Working Group

Impressum

Commissioned by
NOW GmbH
Fasanenstraße 5
10623 Berlin
+49 (0)30-311 61 16-00
kontakt@now-gmbh.de

August 2020

Editor
Elena Hof
NOW GmbH
NIP Programme Manager

Design
kursiv Kommunikationsdesign
Peter Frey, Katrin Schek

Printing
Flyeralarm GmbH

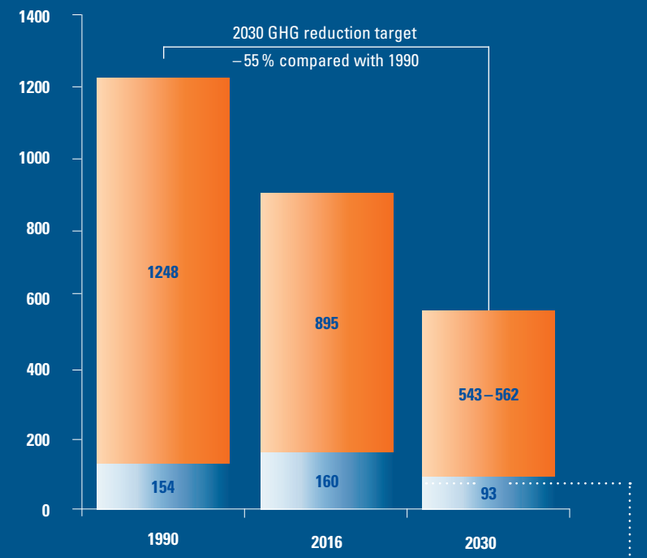
Motivation

Greenhouse gas emissions (GHG) in Germany in millions of tonnes CO_2 eq.

Data source:
BMWi 2018,
Energy data: complete edition,
Status January 2018

Sector source:
BMU 2016, Climate Action Plan 2050,
Status November 2016

BMU, National inventory report
for the German greenhouse
gas inventory 1990-2016
May 2018



Greenhouse gas emissions in Germany

Road transport share

Road transport:
CO_2 emissions: + 4,4 % (1990 – 2016)
GHG emissions: + 1,44 % (1990 – 2015)

Sectoral objective for transport 2030:
min. – 40 % compared to 1990

GHG emissions of commercial vehicles:
- Light commercial vehicles:
  + 114,66 % (1990 – 2015)
- Heavy duty vehicles:
  + 39,56 % (1990 – 2015)

Motivation

To achieve the 2050 national climate protection goal of a reduction in greenhouse gases (GHG) of up to 95% compared to 1990 levels, specific sectoral objectives were set out in the 2050 Climate Action Plan.

By 2030, greenhouse gas emissions are to be reduced by a minimum of 55% compared to 1990 levels.

A reduction of 27% was already achieved by 2016. The contribution of the different sectors however, varied greatly. In recent years the use of coal-based power in electricity provision led to an increase once again in GHG emissions, and GHG emissions in road transport even increased by 4% between 1990 and 2016. Thus, road transport represents one of the greatest challenges for climate protection, with heavy-duty road transport posing an even greater one. For climate protection to be successful, the energy demand in Germany must be further decreased and the use of renewable energies substantially intensified.

The switch to electric power generated from renewable energies will play a key role in this process.

In the road transport sector, this task can be achieved primarily through the intensive use of electric mobility including extensive use of fuel cell vehicles, while also securing the competitiveness of German industry.

As opposed to batteries, large quantities of energy can be stored over long periods with electricity-generated hydrogen, thereby adding an important stabilizing element to Germany's energy transition. With renewably-generated hydrogen, fuel cell vehicles can be operated with zero emissions from source to wheel over large distances and refuelled in just a few minutes.

Extract from the 2018 coalition agreement of the new federal government on the topic of climate protection:

"A simultaneous, parallel approach should be taken for the construction and transport sectors. This is how we build the foundations for the achievement of the 2030 sector objectives. On this basis we want to adopt a law which ensures compliance with the 2030 climate protection objectives. In 2019 we will pass a legally-binding implementation to this end."

Source: Coalition agreement, page 143 [6741 - 6745]

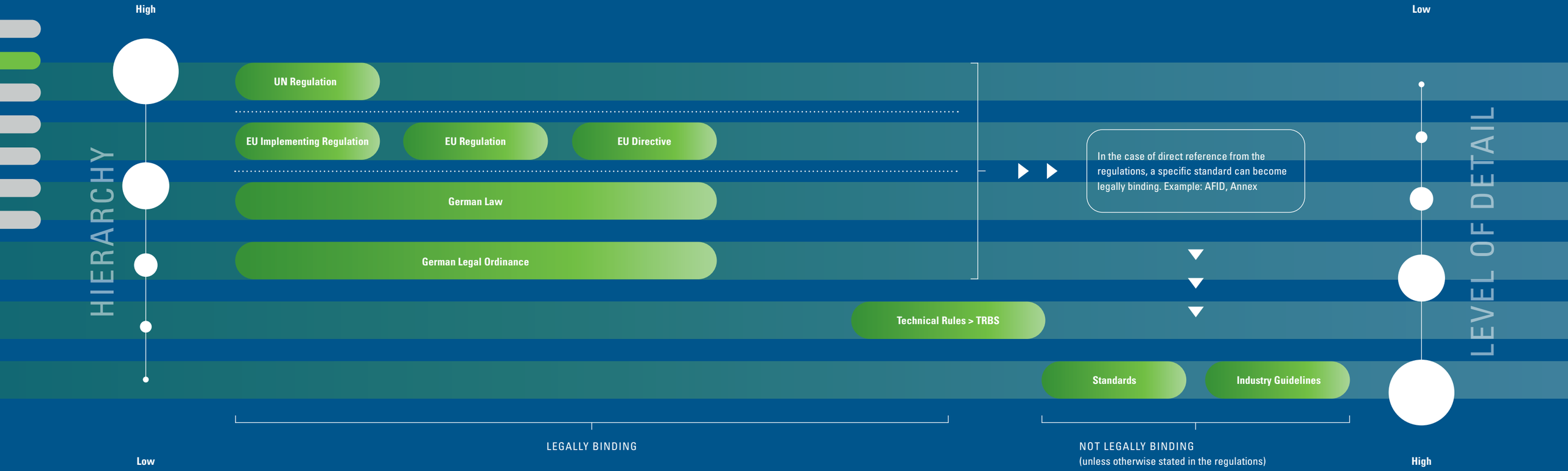
Sector goal for transport: - 40 to - 42 % reduction in GHG emissions by 2030 compared to 1990

The regulatory framework is changing:

- Efficient and cost-effective implementation of hydrogen and fuel cell technologies requires appropriate laws (regulations), standards and processes.
- Almost all relevant regulations applicable to hydrogen and fuel cells are currently based on European regulations (Directives or Regulations). These will and must be developed further and adapted.
- Likewise, a large proportion of standards applied today is based on international standards or is harmonised with them.
- Outside of Europe, primarily Japan, Korea, China and the USA have increasingly emerged as pioneers in the development and market introduction of hydrogen (H_2) and fuel cells (FC) in recent years.
- The further development of international regulations and standards will increasingly be influenced by technology and market developments outside Europe.
- Therefore, it is vital that German and European interests continue to be taken into account and RCS activities are closely tracked by German players in international panels.
- Currently German expert representation in the international H_2 RCS panels is decreasing as opposed to France, Japan and the US.
- This is all the more concerning because increased representation of German experts in all relevant European and international standardisation bodies is essential to address the requirements of the EU's New Legislative Framework (NLF) approach, so that suitable standards appropriate for Europe (ISO, IEC, CEN, CENELEC) can be referenced.
- This effort will be shouldered by industry in particular, although it already addresses regulatory work or support, which is not the primary task of private actors.
- Germany was able to implement licensing processes for new technologies in the past by analogy observation, which because of the NLF, is now becoming less and less possible.
- This is aggravated by the fact that China is developing many H_2- and FC-specific standards on a national basis, which in part, directly come into force (GB standards) and that China is intensifying its participation in international standardisation.
- Through participation in RCS panels, it is possible to a certain degree to co-design the configuration of future technology and its suitability for our own requirements. Non-participation is tantamount to abandoning this sphere of influence to other international competitors.

Introduction to RCS topic

RCS – Regulations, Codes & Standards
Regulations, Implementing Regulations & Standards



The topic of RCS is complex, internationally oriented and is subject to continual further development. For example, the manufacture and use of H₂/FC products are increasingly subject to internationally applicable regulations (e.g. UN, EC) and standards (e.g. ISO, IEC).

The following table gives an overview of important international and national organisations that develop laws and standards as well as industry guidelines. Aside from UN regulations, EU regulations or directives constitute applicable law or are transposed into national laws.

Laws	Description	Legislative allocation of competence
Regulation	Binding legal act that must be implemented by all countries.	Exclusive competence: UN or EU
Directive	Legal act in which an objective to be achieved by all EU countries is determined. However, it is up to the individual country to adopt its own legislation to realise this objective.	Shared competence: EU and individual member states – directives correspond to German framework legislation, which regulates only the main principles (detailed regulation is undertaken by member states).
German law	A legally-binding legal norm determined by parliament.	
German legal ordinance	A legal provision developed by the administration which has been empowered to do so by the parliament. Hierarchically-speaking, legal ordinances are subordinate to laws.	
Technical rules of the Federal Institute for Occupational Safety and Health (BAuA)	The technical rules reflect the status of technology. They are determined in committees and published by the Federal Ministry of Labour and Social Affairs (BMAS) in the Federal Labour Gazette. The technical rules flesh out the legal ordinances with regard to identification and assessment of hazards as well as the derivation of suitable measures. In applying the measures mentioned, the assumption of compliance to the provisions of the industrial health and safety ordinance (BetrSichV) or the ordinance on hazardous substances can be claimed. Should the employer choose another solution, he/she must show evidence in writing of the equivalent fulfilment of the ordinance.	

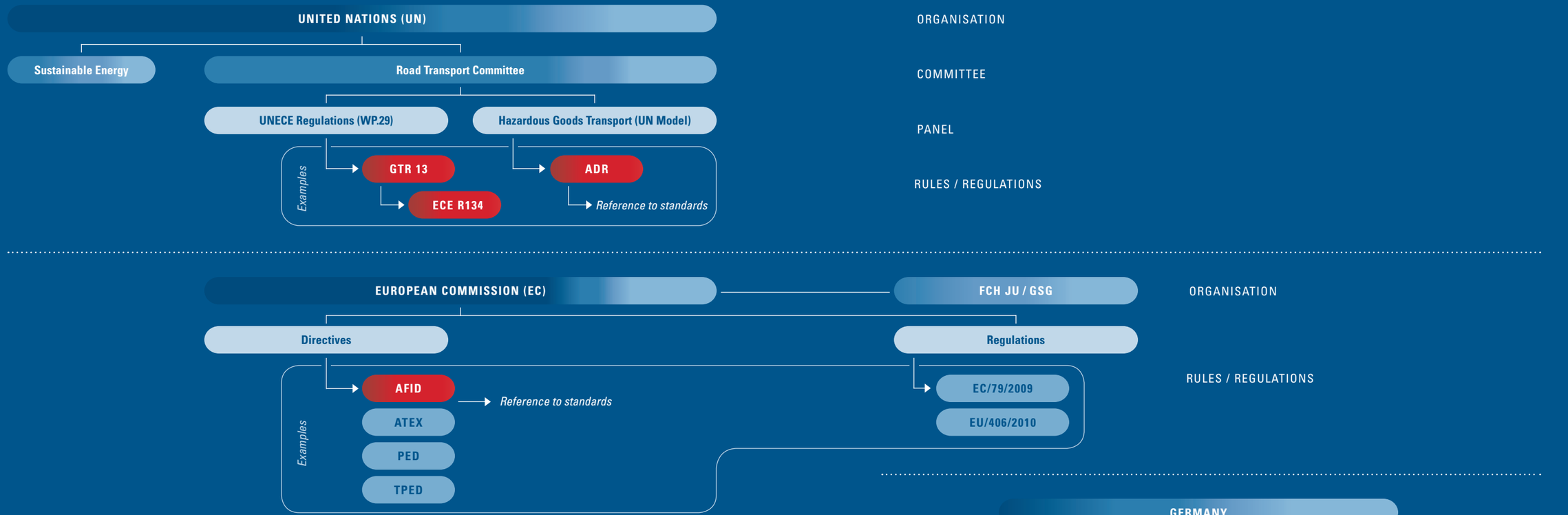
Important standards organisations/ panels. Examples:

International	EU	Germany
ISO, IEC	CEN, CENELEC	DIN, Mirror panel ISO/TC 105; ISO TC 97

Important standards organisations/ panels. Examples:

International	EU	Germany
IICAO, OICA	ACEA, EIGA	DGUV, DKE, DVGW, IGV, VCI, VDA, VdTÜV

Rules and regulations



UNECE: United Nations Economic Commission for Europe
WP.29: World Forum for Harmonization of Vehicle Regulations

- Regulations are legally binding and must be complied with or implemented in the national states. Nevertheless, European and international regulations and directives for hydrogen (H_2) and fuel cells (FC) are increasingly being adopted and supersede previous national laws.

- Among the key regulations in the area of H_2 and FC which will be further developed over the coming years are “UN GTR13”, “UN ADR” and “AFID”.

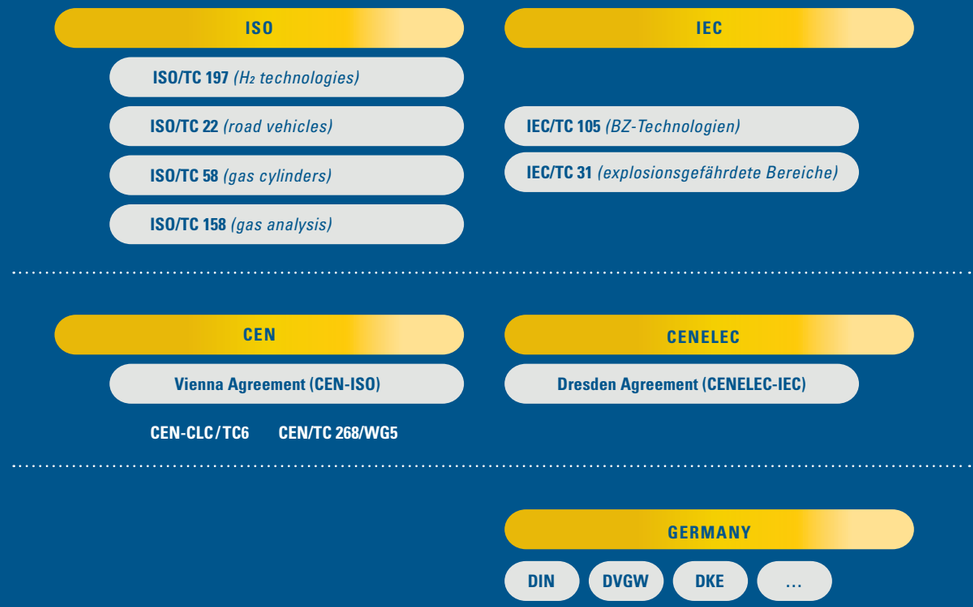
- Notably the reference to (non-German/ EU) standards is gaining in importance for H_2/FC actors, as these are in part, directly referred to in regulations.

- The illustration gives and overview of the most important international, European and national RCS organisations and committees in the H_2/FC area.

- Important regulations in the H_2/FC area:
  - UN: GTR 13/ ECE R134 – Licensing of hydrogen-operated cars
  - UN:ADR: Dangerous goods transport of hydrogen
  - EU: AFID Alternative fuels infrastructure directive (European directive on the building of infrastructure for alternative fuels, including hydrogen)
  - Germany: Technical rules (Technische Regeln zur Betriebssicherheit (TRBS))

- Other relevant European regulations:
  - ATEX (explosion protection)
  - ED (pressure equipment directive)
  - TPED (Directive on transportable pressure equipment)
  - European regulation EC/79/2009 and EU/406/2010 (type-approval of H_2 vehicles)

Standards



ISO – International Organization for Standardization
IEC – International Electrotechnical Commission
TC –Technical Committee
CEN – Comité Européen de Normalisation (European Committee for Standardization)
CENELEC – Comité Européen de Normalisation Électrotechnique (European Committee for Electrotechnical Standardization)
DIN – Deutsches Institut für Normung (German Institute for Standardization)
DVGW – Deutscher Verein des Gas- und Wasserfaches (German Technical and Scientific Association for Gas and Water)
DKE – Deutsche Kommission Elektrotechnik in DIN und VDE (German Commission for Electrical, Electronic, and Information Technologies of DIN and VDE)

- In principle, published international or European standards are legally non-binding unless explicitly referenced from EU legal documents such as regulations or directives, like for example, AFID and ADR.

- Standards fundamentally cover the minimum safety requirements based on the latest status of technology at time of publishing.

- Important national standards are currently being developed on the H_2 issue, e.g. in North America (e.g. SAE) and China (e.g. GB). These are also cross-referenced from ISO and IEC standards and thus are also obligatory for Europe/Germany.

  Example: SAE J2601 in ISO 19880-1
  The problem: In Europe, creating EN standards must be critically checked by CEN/CENELEC, which are based on ISO/IEC standards, to ensure that in compliance with EU regulation EU/1025/2012, they in turn only cross-reference ISO/IEC standards, i.e. no national normative references to e.g. SAE, GB.

- International standardisation takes place in the standardisation organisations ISO and IEC:

- ISO is an independent, non-governmental international organization with a membership of 161 national standardisation panels.

  Example:ISO/TC 197 – Standardisation in the systems and equipment area for the production, storage, transport, measurement and use of hydrogen, consisting of numerous working groups.

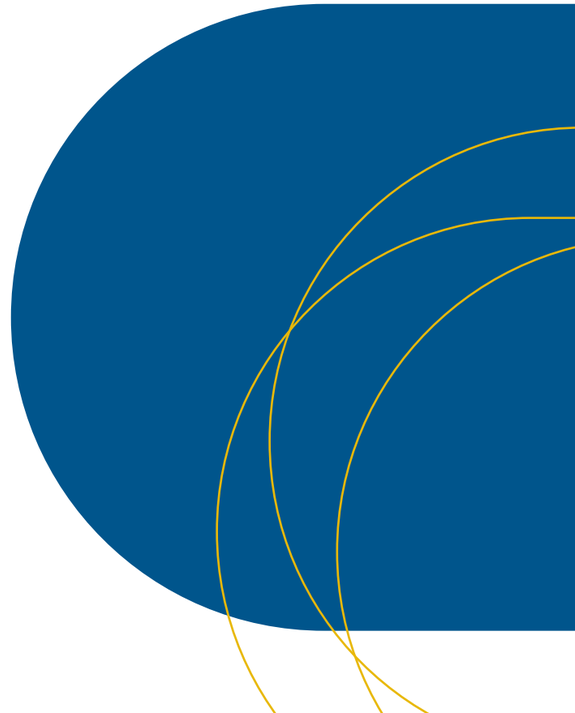
- IEC organisation for the creation and publishing of international standards for all electrical, electronic and applied technologies.

- Example: IEC/TC 105 – The priority is to prepare international standards relating to fuel cell (FC) technology for all FC applications.

- Euro-regional standardisation is equivalent to international standardisation in terms of structure and connected to the latter through the Vienna and Dresden Agreements:
  - CEN (Vienna Agreement with ISO)
  - CENELEC (Dresden Agreement with IEC)

- The relevant national standardisation in Germany for H_2 and FC is divided into private sector standards, found in DIN, and standards in the public interest developed by BAuA.
  - Headquartered in Berlin, The German Institute for Standardisation (DIN) is the only body responsible for national standardisation because of a contract with the federal government. Along with the standardisation contract, it assumes responsibility for the technical formulation of these requirements on behalf of Germany.
  - The BAuA is a departmental research institute under the authority of the Federal Ministry of Labour and Social Affairs and carries out research and development in the area of occupational health and safety. The technical rules developed reflect the status of technology.

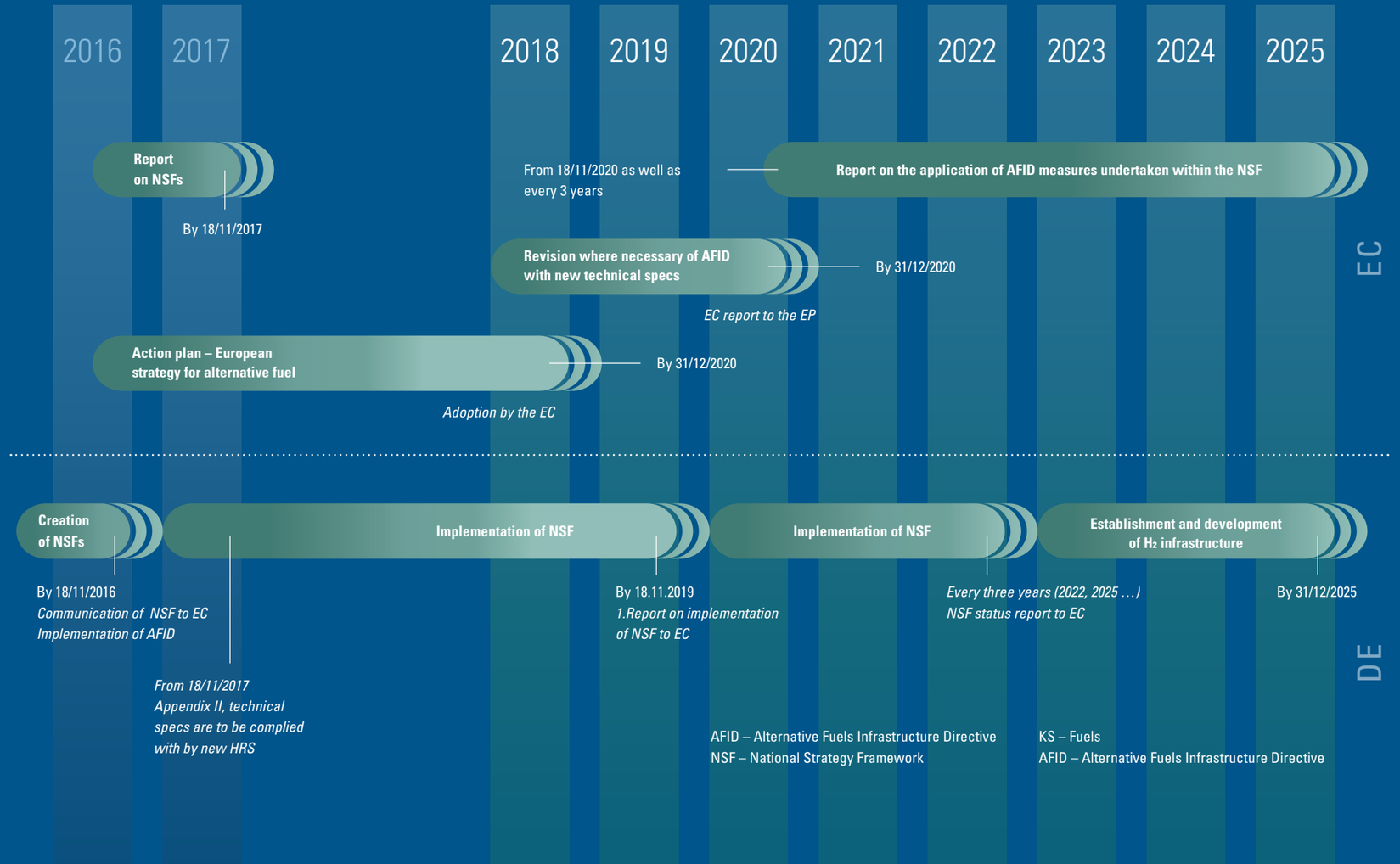
- Additional International and European institutions for standardisation, examples:
  - Int.: SAE, ITU, ICAO, IACS
  - Europa: ETSI, EUROCAE (EIGA provides inputs to international standards development)



Identified action required for Germany

- Among the most significant RCS challenges that have been identified are the revision and updating of AFID, GTR 13, ADR as well as international H_2/FC standards.
- Regarding the development of hydrogen and fuel cell standards, the international panels ISO/TC (197, 158, 58, 22), IEC/TC (105, 31) and the CEN/CENELEC technical committees are particularly important.
- Overall Germany and Europe need to urgently exert greater influence and participation.
  For instance, every application for the adoption or improvement of a standard is to be communicated to the secretariat of the technical committee.
- The most critical areas of action are summarised below.

AFID



Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure (AFID)

- AFID signals the creation of the framework for the establishment of an infrastructure for alternative fuels, including H_2, in Europe.

- Furthermore, it will ensure pan-European 'interoperability', i.e. that a type-tested hydrogen road vehicle can drive across all member states of the European Union with a hydrogen infrastructure without any refuelling problems (e.g. no access restrictions to hydrogen refuelling stations, guaranteed H_2 quality, standardised H_2 refuelling protocols and connectors).

- The nation states also have each developed their own National Strategy Framework (NSF). This describes the deployment of alternative fuels infrastructure (number of refuelling stations, technical minimum requirements, consumer information) up to 2025 in the respective state.

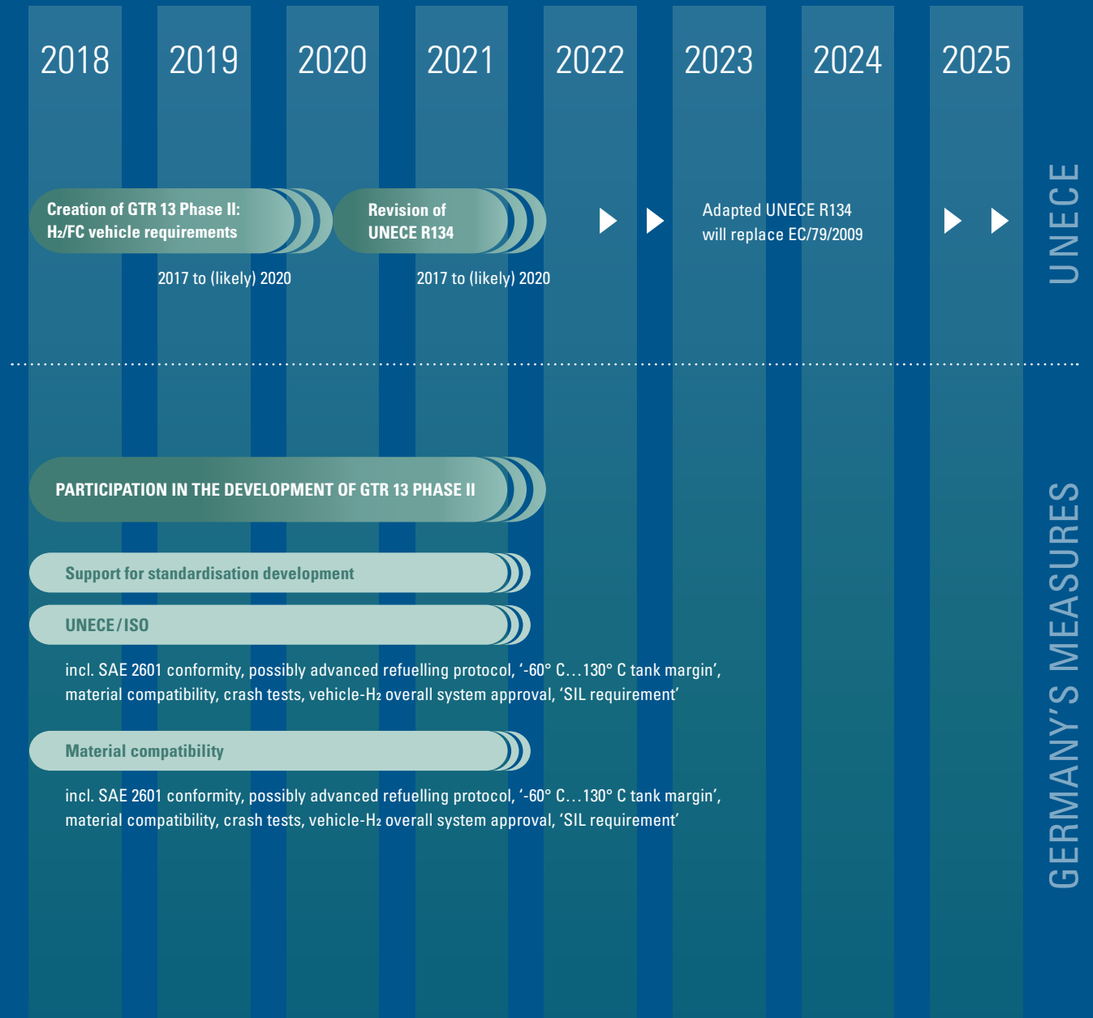
- The European Commission tracks and reports on progress in Europe

- Timetable
  - National AFID implementation by 2019
  - Implementation of NSFs by 2025
  - National report generation 2019, 2022, 2025
  - From 2020 the EC reports on European implementation
  - The first revision of AFID by the EC possible until 12/2020

- Recommended measures for Germany until 2025:
  - Coordination of European strategy (including with SFEM Hydrogen Energy Working Group, FCH JU RCS SCG and EU member states via the GSG)
  - Increased monitoring of ongoing and new European / international activities
  - Support for standardisation development, particularly exchange with ISO/TC 197 WG 18 – 28, WG24 on H_2 refuelling stations (ISO 19880-1) as well as H_2 refuelling protocols
  - As required: request to update the annex according to Article 5, Paragraph 3 (references to standards)

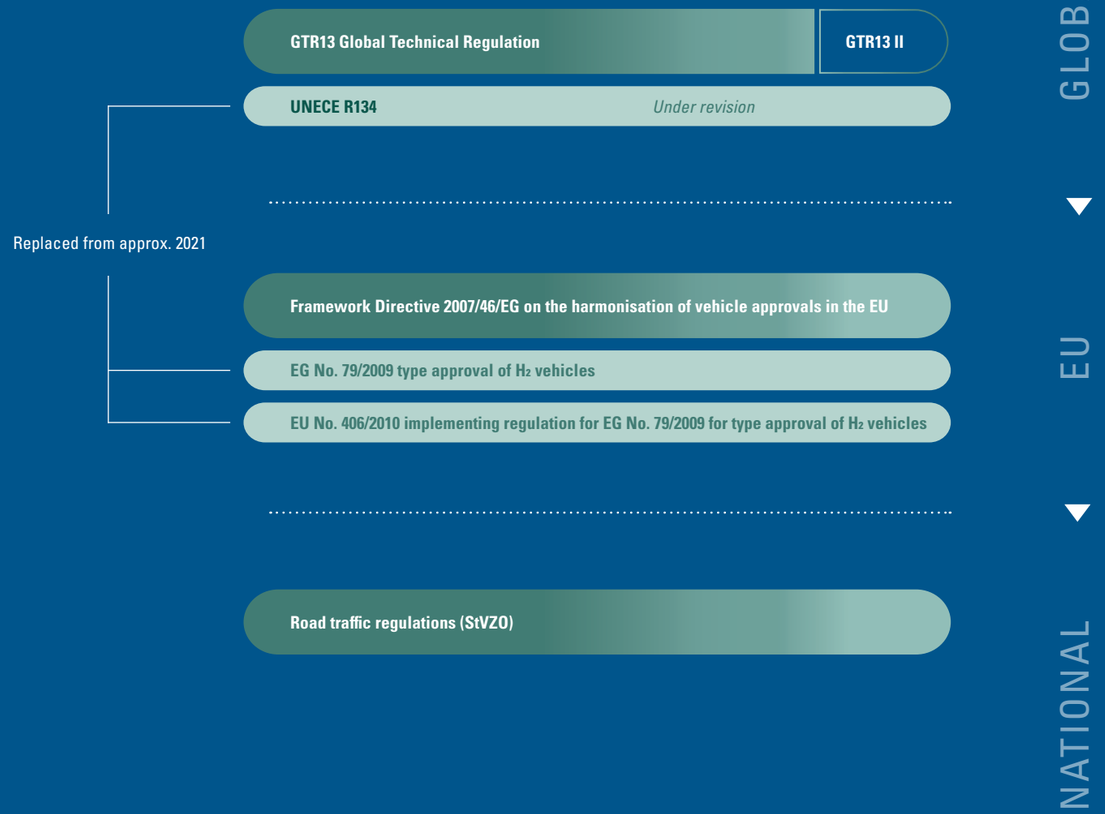
GSG – Government Support Group
SCG – Strategy Coordination Group

UN GTR13

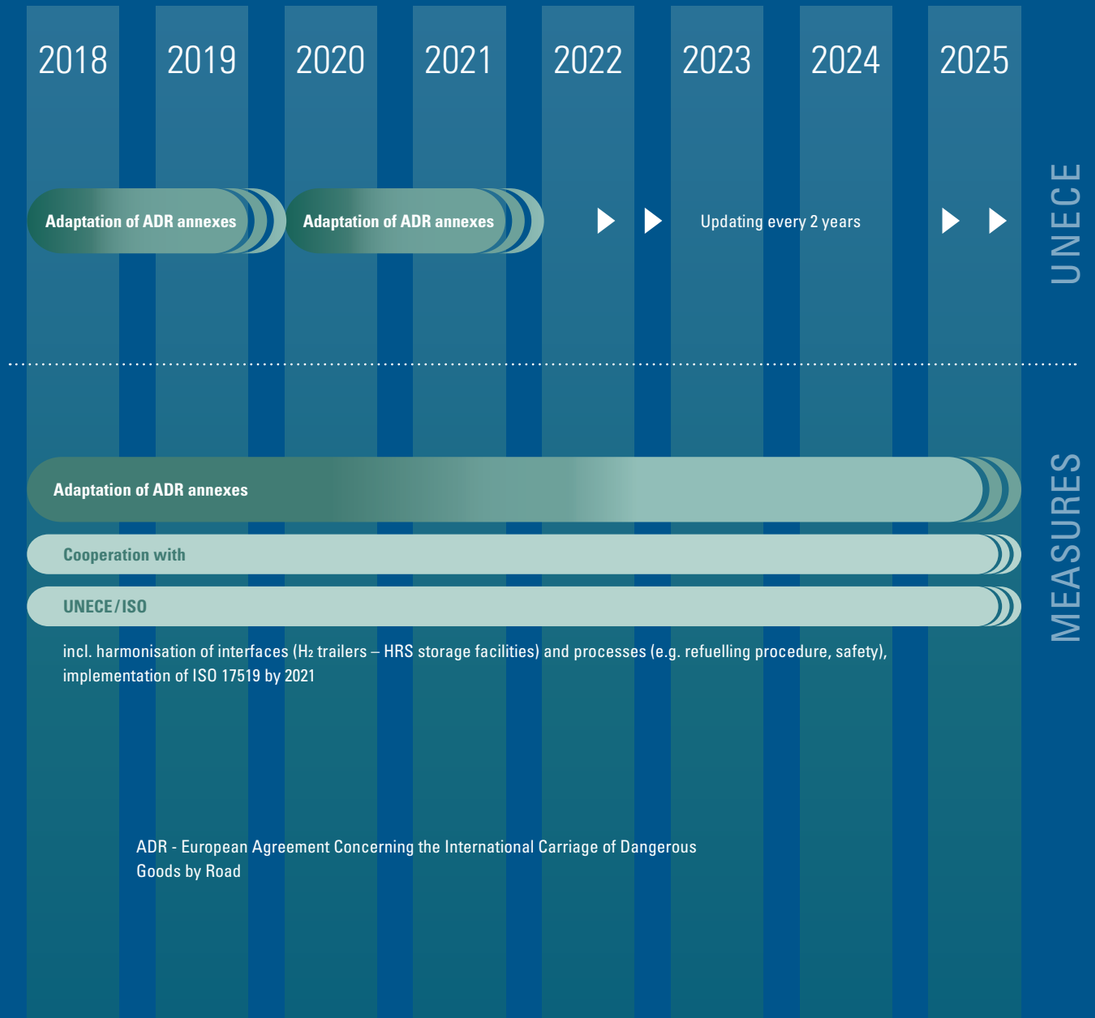


GTR13 Phase II, UNECE R134, 79/2009 EC, EU/406/2010, UNECE R100

- One of the most important ongoing activities in the area of road transport is the further development of GTR – Global Technical Regulation No. 13.
- Since 2017 the requirements for the licensing of H_2 /FC vehicles are being newly regulated through the so-called ‘GTR 13 Phase II’. The finalisation and entry into force of this regulation will occur at the end of 2020 at the earliest.
- On the basis of GTR 13 Phase II, an adaptation of the internationally valid UNECE R134 for the pan-European type approval of H_2 vehicles will take place. This will likely replace the regulations EC/79/2009 and EU/406/2010, hitherto valid throughout Europe.
- Action required: Collaboration in GTR 13 Phase II, including tackling the disparities between Europe and others (e.g. Japan) in terms of demonstrating material compatibility, refuelling protocol, overall system approval, etc.



ADR

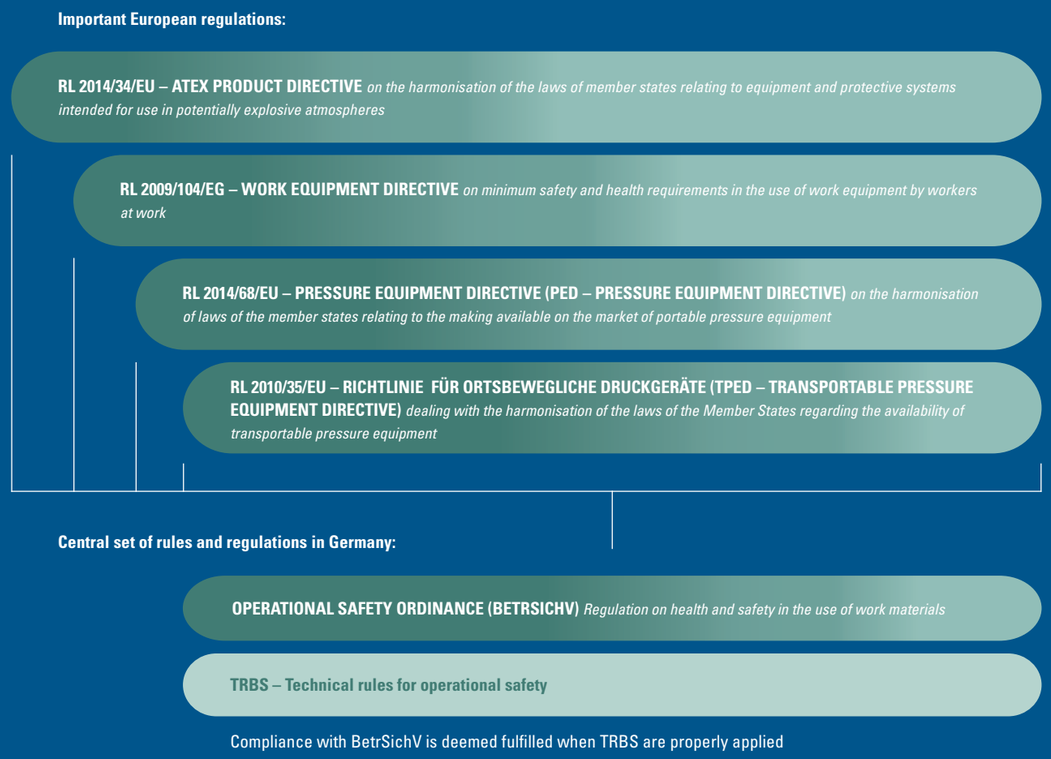


ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road on 17 April 2015

- This agreement contains special provisions for road traffic with regard to packing, securing cargo, and labelling of dangerous goods, in so far as the transport in the territory is conducted by at least two signatory countries.
- In the case of hydrogen transport, the regular adaptation of the ADR annexes is vitally important.
- The next rotational revisions of the ADR annexes occur by 2019 and 2021, respectively.
- The ISO must contribute to this with a revision or preparation of suitably referenced standards.
- For example, it was recognised that the new development of high pressure composite tanks (10,000l) for hydrogen transport are insufficiently addressed in the ADR. Presently the standards ISO 11119-1 to ISO 11119-3 (all up to 450l) as well as ISO 11515 for tubes (up to 3,000l) are used for the certification of cylinders from composite material. For pipe transport with up to 3,000l there is also an initiative for an EN standard.
- Where appropriate, ISO 17519 could offer potential solutions here. The current ISO/FDIS 17519 deals with the construction, manufacture, initial testing and testing of permanently mounted tubes from composite materials (i.e. refillable permanently mounted composite pipes for transport) with volumes up to 10,000l and a pressure of up to 100 MPa, which are permanently mounted in a transport frame for global deployment.

Revision of Technical Rules

Example: Health and safety requirements for employees in the use of work equipment as well as the protection of other people (third parties) in hazardous areas of facilities that require monitoring.



TRBS - Technical rules for operational safety

- The operational safety ordinance (BetrSichV) regulates the safety and health protection requirements of employees in the use of work equipment as well as the protection of other people ('third parties') in the hazardous area of facilities that require monitoring.
- The technical rules for operational safety (TRBS) flesh out the operational safety ordinance with regard to determining and evaluating hazards as well as deriving suitable measures.
- In taking the aforementioned measures in the TRBS, the employer can in this respect, assert compliance with the regulations of the BetrSichV. Should the employer choose another solution, he must prove, in writing, the equivalent fulfilment of the regulation.
- Action needed: Participation in the regular review of the TRBS every five years in the committees.
- The following TRBS are of particular relevance to hydrogen:

  - TRBS 1111 Risk assessment and safety evaluation
  - TRBS 1112 Maintenance
  - TRBS 1122 Modifications and significant changes to facilities as per § 1 article. 2 sentence 1 No. 4 BetrSichV – Determining obligation to be inspected and to obtain a permit
  - TRBS 1123 Modifications and significant changes to facilities according to § 1 article. 2 sentence 1 No. 3 BetrSichV - Determining the necessity for inspection pursuant to § 14 article. 1 and 2 BetrSichV
  - TRBS 1201 Inspections of work equipment and of facilities requiring monitoring
  - TRBS 1203 Qualified persons
  - TRBS 2141 Hazards of steam and pressure
  - TRBS 2152 Dangerous explosive atmospheres
  - TRBS 2153 Avoidance of ignition hazards due to electrostatic charges
  - TRBS 3145 Portable compressed gas containers – filling, making available, in-house transportation, emptying
  - TRBS 3146 Fixed pressure equipment for gases
  - TRBS 3151 Avoidance of fire, explosion and pressure hazards at refuelling stations and gas filling systems for the filling of land vehicles

Additional action required in international standardisation

Panel	Secretariat	Specialist topic	Action required/activities
CEN/TC 268/WG 5	AFNOR, France	Specific H_2 application technologies	Preparation of AFID annex 2, cross-referenced standards on HRS, H_2 connectors
CEN-CENELEC/TC 6	NEN, Netherlands	Hydrogen in energy systems	Standardisation in the area of systems, equipment and connectors for the production, storage, transport and distribution, measurement and use of hydrogen from renewable energy sources and other sources in the context of the European strategy for the development and acceptance of the hydrogen market
ISO/TC 197	BNQ, Canada	Hydrogen technology	WG24 – ISO/CD 19880-1 (HRS) WG27 – ISO/CD 19880-1 (H_2 quality)* WG28 –H_2 quality control* WG15 – ISO/CD 19884 compressed gaseous hydrogen storage container WG18 – ISO/CD 19882 fuel tanks for hydrogen land vehicle
ISO/TC 158	NEN, Netherlands	Gas analysis	Inexpensive H_2 gas analytics

Panel	Secretariat	Specialist topic	Action required/activities
ISO/TC 58	BSI, UK	Gas cylinders	ISO/DIS 17519 re. – 10,000l high pressure composite material tanks
ISO/TC 22	AFNOR, France	Road vehicles	ISO/TC22/SC41/WG7 [road vehicles – compressed gaseous hydrogen (CGH_2) and hydrogen / natural gas blends fuel systems]
IEC/TC105	DKE, Germany	Fuel cell technologies incl. range extenders	Not all working groups on the international level have a German mirror panel, APU standardisation is vacant, range extenders have only now been included in the scope, and testing standardisation for bipolar plates does not exist, but is being worked on in China at the moment
IEC/TC 31	BSI, UK	Explosive atmospheres	Technical Committee 31 Explosive Atmospheres Report from TC 31 to ISO/TC 197
OIML/TC8/SC7	Agentschap Telecom, Netherlands	Measuring systems	OIML R 139-1 compressed gas measuring systems for vehicles, part 1: metrological and technical requirements

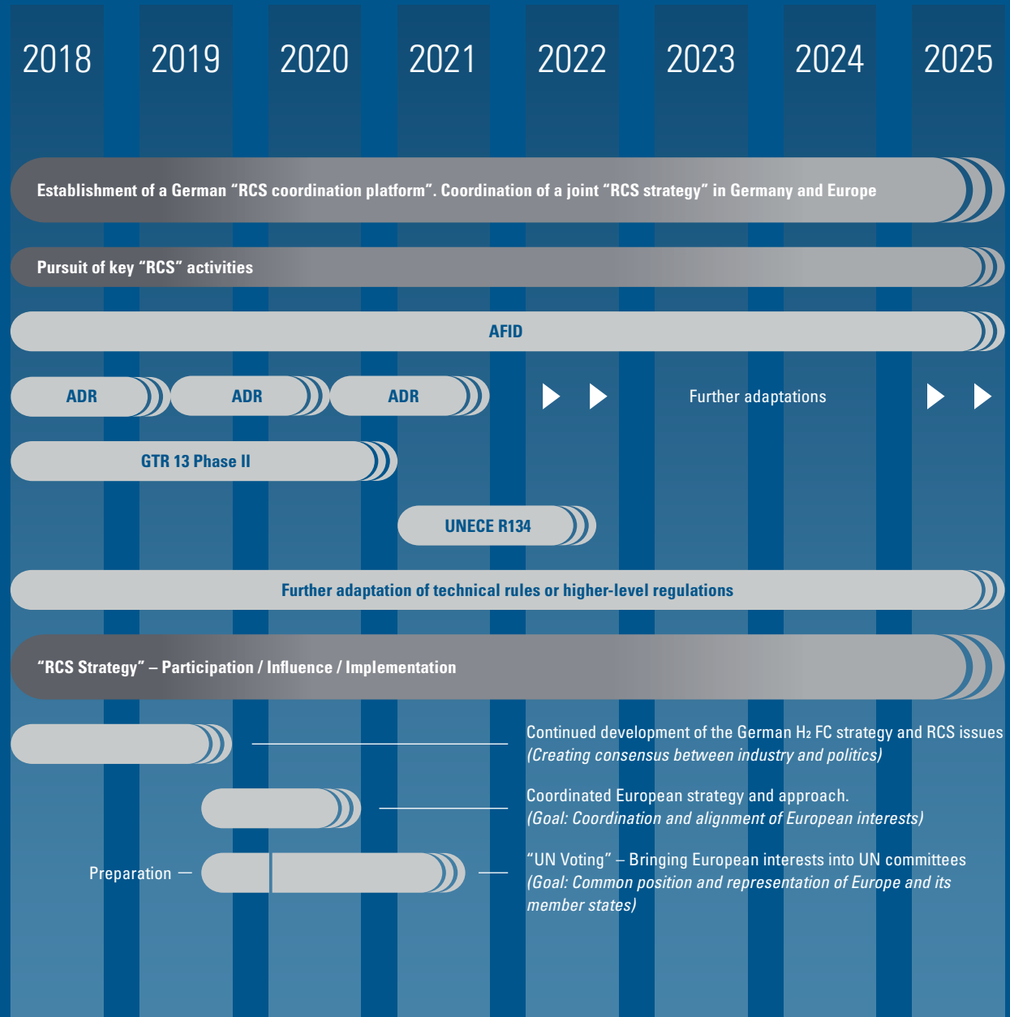
* WG27/28 work on uniform global requirements for H_2 fuel specification and management

- With respect to the development of H_2 and FC standards, international committees ISO/TC (197, 158, 58, 22), IEC/TC (105, 31) and CEN/CENELEC expert committees are particularly important. Germany and Europe need urgently to exert stronger influence and participation. Every application for the adoption or improvement of a standard is to be communicated to the secretariat of the technical committee.
- The table shows the expert committees in which relevant H_2/FC standards are being developed and that require a stronger German participation/influence.
- National standardisation organisations from Europe have many secretariat positions in these panels/expert committees.

Furthermore, it is recommended with regard to first responders, to implement the following requirements:

- The use of emergency shutdowns (ESD) in stationary applications
- Thermal pressure relieving facilities (TPRD – thermal pressure relief devices) for hydrogen vehicles
- Harmonisation of labels and symbols for H_2/FC applications

The German H_2 Roadmap 2025



Establishment of a H_2 RCS coordination platform

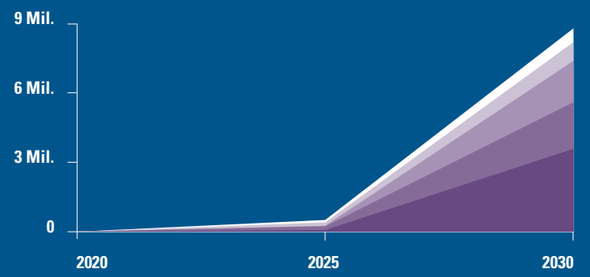
Important tasks include

- Monitoring of priority developments and trends
- Development of a homogenous position/voice in RCS matters within Germany
- Regular collaboration/consultation with the actors in Germany (industry representatives, relevant networks as well as other experts)
- Development of a joint position/voice within Europe
- Coordination of RCS activities with the FCH JU in Europe
- Collaboration with the European Government Support Group (GSG) and the EU member states governmentally-represented within it
- Exerting influence within/participation in European (CEN/CENELEC) and international (ISO/IEC) standard developments

Outlook

Possible market introduction – transport example

Number of fuel cell vehicles in key markets



Take-up 2030:

Europe: Germany (1,8 M; [H2M 2014])
UK (1,6 M)
Others in Europe (0,2 M; [HIT 2016])

China: [Wang 2017], [Liu 2016]

USA: [H2USA 2017]

Japan: [JHyM 2018]

Korea: [Woo 2016]

FCEVs	Market preparation until 2020	Market preliminary phase until 2025	Mass market until 2030
Europe	3.000	20.000	3.600.000
China	3.000	50.000	1 – 2.000.000
USA	20.000	90.000	1.800.000
Japan	40.000	200.000	800.000
Korea	10.000	100.00	630.000

- Asian companies have already been offering commercial FC systems in cars and for domestic energy supply for a few years. The broad market introduction is being planned and prepared by Japanese, Korean and Chinese manufacturers. For instance, from 2020, at least 30,000 FC cars will be manufactured in Japan. China will follow with large numbers for buses and trucks, and later also for cars after 2020.

- In the area of commercial vehicles, manufacturers like for example, Toyota, Hyundai, Weichai, Nikola and other manufacturers are already developing trucks and buses with FC drives. European manufacturers are following this development.

- In Germany the launch of the first FC trains is being prepared.

- Hydrogen infrastructure in Europe should be built by 2025 in the framework of AFID

- The broad breakthrough and mass market for fuel cells in the transport sector is expected by 2030.

- Europe also offers an attractive market for these systems. With renewable energy, GHG emissions as well as pollutants can be successfully reduced.

- Increasingly standards are internationally dominated. For example, in 2017 approx. 75% of new standards were international and only 20% European. (Source: IEC/DKE).

- As a departmental research institute of the BMAS, the BAuA initiates technical rules which reflect the status of the technology. The TRBS are the rules which implement the requirements of the BetrSichV.

- Because of the requirements of the EU's New Legislative Framework approach, increased representation of German experts in all relevant and international standardisation committees is needed.

- Because this is in fact, in terms of content, regulatory work/ support, comprehensive financial support of RCS development by the ministries must be provided.

- As already explained, H_2 and FC technologies are being developed globally, particularly in Asia and North America. This influence is also reflected in important regulations and standards for hydrogen (H_2 RCS).

- In order to ensure representation of Germany's interests in the future, active participation and collaboration is required within the panel work, especially with regard to the EU, UNECE, ISO, IEC, CEN, and CENELEC.

- An important goal here is the broad inclusion of actors in Germany, i.e. trade, industry and association representatives, but also federal states, regions and municipalities.

- In particular there is urgent action required in the key areas of road transport including refuelling infrastructure and stationary applications in the coordination and further development of the AFID (deployment of alternative fuels infrastructure, H_2 here), the GTR 13/ UNECE R134 (type approval of H_2 road vehicles) and the ADR (transport of hazardous goods by road).

- Because of the path taken by the EC of regulation development through the New Legislative Framework, relevant actors need to anticipate, synchronise and harmonise the development of standards and regulations.

- Because of this, the governments of the EU member states must also increasingly coordinate with one another on for example, what is happening in the Government Support Group.

Compiled and coordinated by:

ludwig bölkow
systemtechnik

Content-related collaboration: