



L-B-Systemtechnik

---

# EC Workshop on H<sub>2</sub>/FC technologies - Regulations, Codes and Standards

## **EIHP2 – draft ECE regulations**

Reinhold Wurster [[wurster@lbst.de](mailto:wurster@lbst.de)]

Brussels - 25 February 2005



L-B- Systemtechnik GmbH  
D-85521 Ottobrunn, Germany  
<http://www.lbst.de>

# European Integrated Hydrogen Project - Phases 1 & 2

---

[<http://www.eihp.org>]



L-B-Systemtechnik

**Objectives:**            **Initiate and provide inputs for regulations on an EU and global level for the approval of hydrogen fuelled road vehicles, hydrogen refueling infrastructure and the relevant interfaces.**

## **Phase 1:    1998 – 2000**

- **Main focus on hydrogen fueled vehicles**
- **Vehicle - development of drafts for UNECE regulations**
- **Infrastructure - only very limited analysis**
- **Safety studies and limited computer simulations**

## **Phase 2:    2001 - 2004**

- **Enhanced focus on hydrogen vehicle refueling infrastructure**
- **Vehicle - efforts for licensing and approval of hydrogen vehicles on a global level (GTR)**
- **Infrastructure - refueling stations and fueling interface - EU and North America**
- **Safety studies, computer simulations and first limited safety tests**

**EIHP, a partnership between the European Hydrogen Industry and the European Commission, which provided inputs for regulatory activities on a European and global level to facilitate harmonised Procedures for the approval of hydrogen fuelled road vehicles and their refuelling infrastructure. The project has been finalised by January 2004.**

# Two Pathways to Present a Proposal for a Regulation



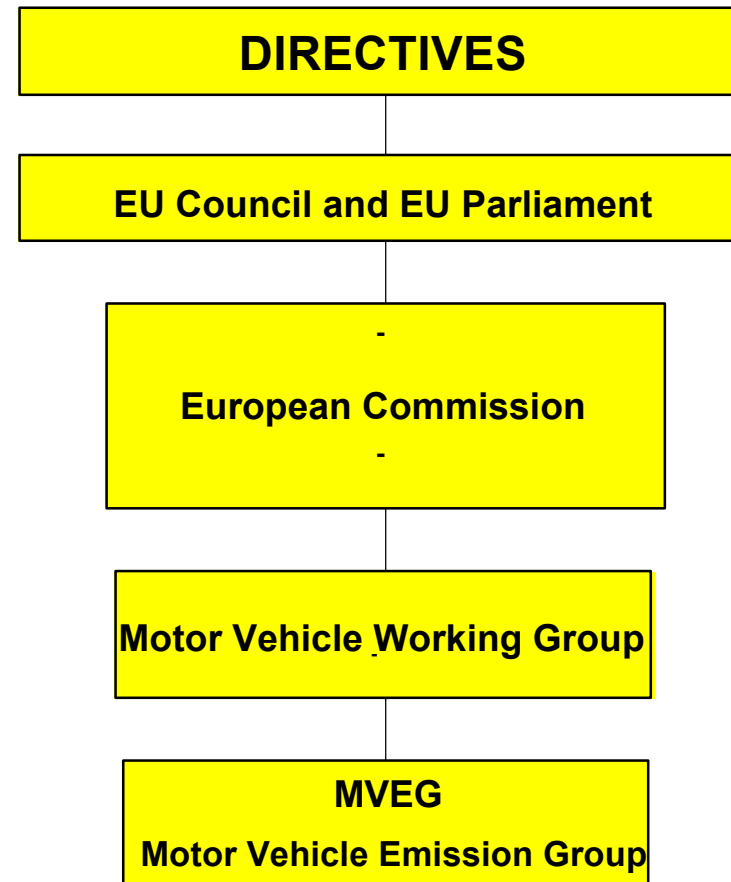
L-B-Systemtechnik

## UN-ECE



**Voluntary** (Valid for: EU, Jap., Aus.)

## EC



**Binding for WVTA** (Valid for: EU)

# EIHP1&2 - UNECE Draft Proposal Document for H<sub>2</sub> Road Vehicles



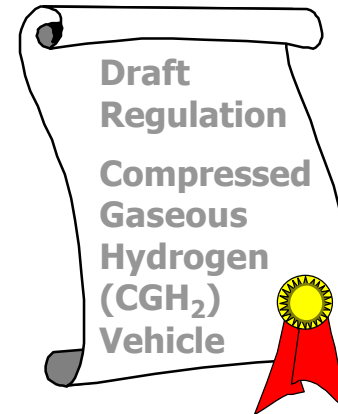
L-B-Systemtechnik



**PROPOSAL FOR A NEW DRAFT REGULATION**

**UNIFORM PROVISIONS CONCERNING THE APPROVAL OF:**

- I. SPECIFIC COMPONENTS OF MOTOR VEHICLES USING LIQUID HYDROGEN;**
- II. VEHICLES WITH REGARD TO THE INSTALLATION OF SPECIFIC COMPONENTS FOR THE USE OF LIQUID HYDROGEN**



**PROPOSAL FOR A NEW DRAFT REGULATION**

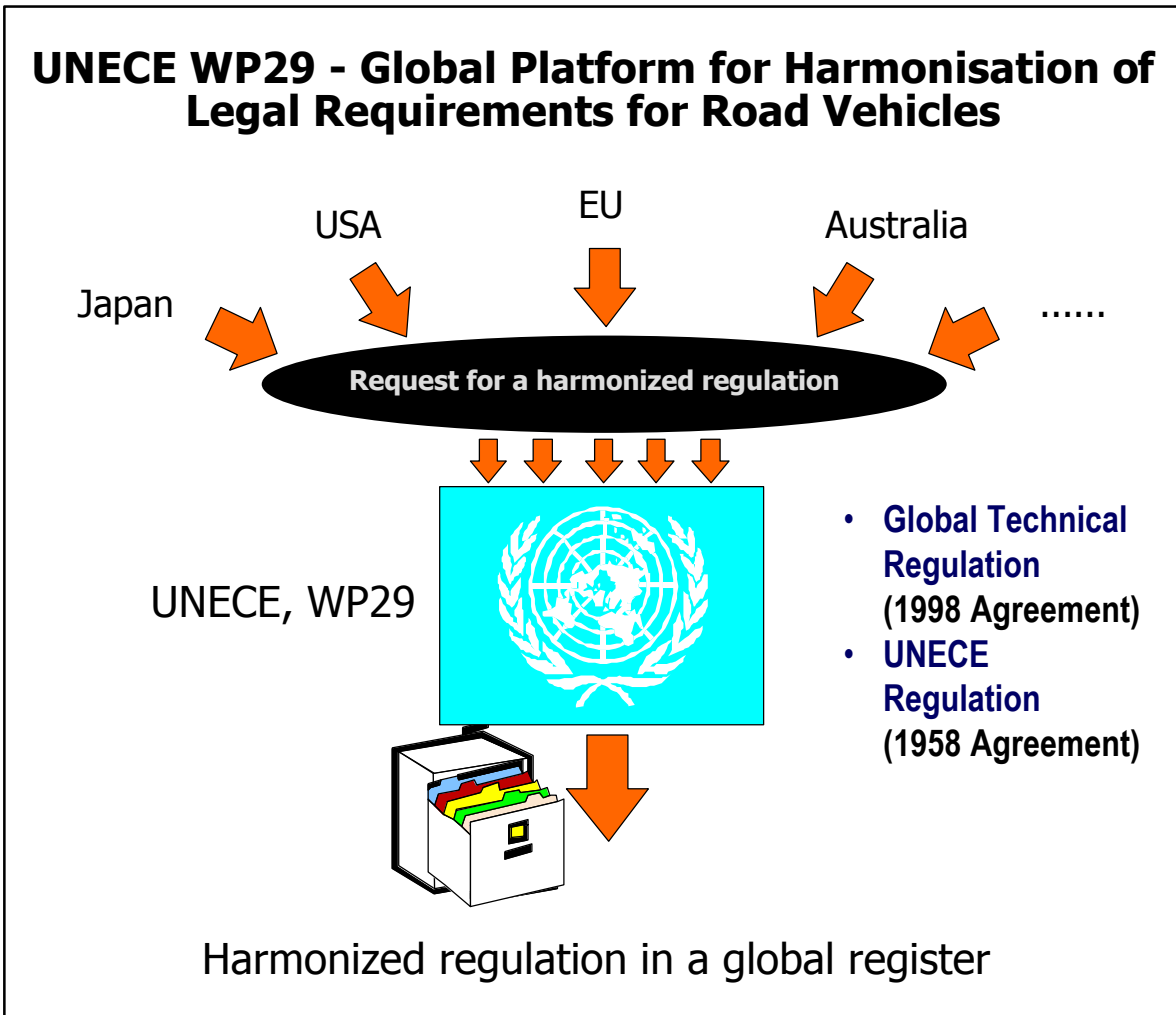
**UNIFORM PROVISIONS CONCERNING THE APPROVAL OF:**

- I. SPECIFIC COMPONENTS OF MOTOR VEHICLES USING COMPRESSED GASEOUS HYDROGEN;**
- II. VEHICLES WITH REGARD TO THE INSTALLATION OF SPECIFIC COMPONENTS FOR THE USE OF COMPRESSED GASEOUS HYDROGEN**

# UNECE Platform for Globally Harmonized Regulation for H<sub>2</sub> Vehicles



L-B-Systemtechnik



## MEMBERS OF THE 1958 AGREEMENT:

[(E/ECE/324-E/ECE/TRANS/505/Rev.2)]

GERMANY, FRANCE, ITALY, NETHERLANDS, SWEDEN, BELGIUM, HUNGARY, CZECH REPUBLIC, SPAIN, YUGOSLAVIA, UNITED KINGDOM, AUSTRIA, LUXEMBOURG, SWITZERLAND, NORWAY, FINLAND, DENMARK, ROMANIA, POLAND, PORTUGAL, RUSSIAN FEDERATION, GREECE, IRELAND, CROATIA, SLOVENIA, SLOVAKIA, BELARUS, ESTONIA, BOSNIA AND HERZEGOVINA, LATVIA, BULGARIA, TURKEY, THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA, EUROPEAN COMMUNITY, JAPAN, AUSTRALIA, UKRAINE, REPUBLIC OF SOUTH AFRICA

## MEMBERS OF THE 1998 AGREEMENT:

[(E/ECE/TRANS/132 AND Corr.1)]

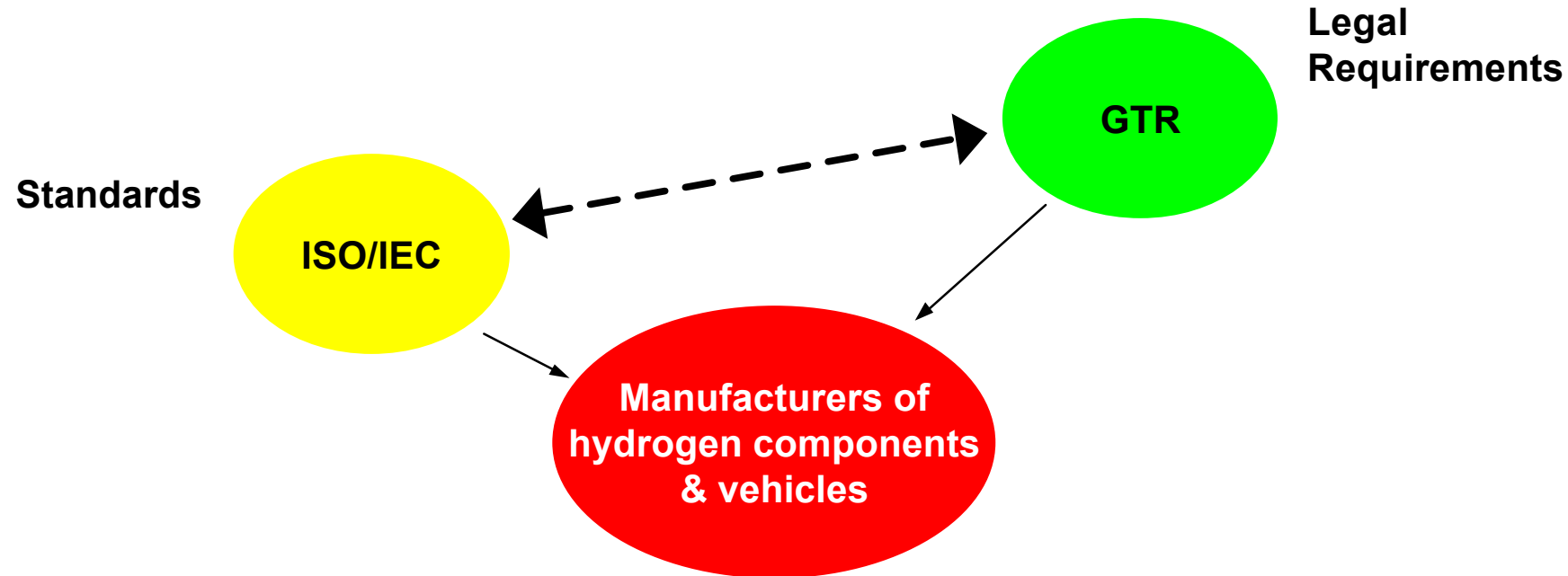
CANADA, **UNITED STATES OF AMERICA**, JAPAN, FRANCE, UNITED KINGDOM, EUROPEAN COMMUNITY, GERMANY, RUSSIAN FEDERATION, **PEOPLE'S REPUBLIC OF CHINA**, **REPUBLIC OF KOREA**, ITALY, REPUBLIC OF SOUTH AFRICA, SPAIN

# Desirable Future Scenario For Regulations & Standards

identified by EIHP2



L-B-Systemtechnik



- Legal requirements should be created only where necessary
- GTRs should refer to available ISO/IEC standards



## Action Items for EoI/ EIHP3 Proposal Drafting

2

- EoI on a **Handbook about typical approval processes for the installation of hydrogen refueling stations in Europe** based on experience available in Europe, US, Japan - virtual projects together with authorities in 2 or more member states

Acronym: HyAcceptance

Partners: AL, APCI, BP, Shell, Total, Linde, DNV, BV, Ineris, TÜV, **VDBT**, PR-specialist, NGOs (fire brigades, ...)

- EoI for automotive on GTR drafting activities

Partners: BMW, DC, Ford, Opel, PSA, Renault, Volvo, RAFS, CCS

- EoI on recommendations for an LH2 refueling station draft standard

Partners: **Linde**, AL, Messer, .....

- EoI on identification and testing of appropriate materials for hydrogen components

Partners: **NH**, ...

} No action taken !





### Action Items for EoI/ EIHP3 Proposal Drafting [2]

3

- EoI on safety of hydrogen handling in normal and emergency conditions [gaps analysis to HySafe]  
Partners: DNV, **EC-JRC**, FZK, NCSR, VDBT
- EoI on appropriate curricula for hydrogen down-to-earth specialist  
Acronmy: "HySchool"  
Partners: VDBT,
- EoI on Operation and Maintenance of stationary hydrogen installations  
Partners: **DNV**,
- EoI on hydrogen in marine applications  
Partners: **VDBT**, AL, Icelandic New Energy Ltd.
- EoI on verification of zoning distances for public hydrogen only and combined hydrogen/ hydrocarbon refueling stations  
Partners: **BP**, Linde, DNV, NCSR, EC-JRC, VDBT, *Shell, APCI, NH*

}  
Action taken ?

H2 to Sea





## Action Items for EoI/ EIHP3 Proposal Drafting [3]

4

- EoI on public hydrogen communication strategy  
Partners: BMW, EC-JRC, auto, fuel, approval, infrastructure, operators, ....

} No action taken !

**Deadline of first EoI draft: 20FEB2004**

### Expression of Interest, OJ Reference: OJ C283 of 26.11.2003

**EOI.FP6.SES-ML.2003** An opportunity for Europe's research community to help identify priorities for the mid-term revision of the Work Programme for the FP6 Thematic Priority 6.1.ii – sustainable energy systems, research activities having an impact in the medium and longer term

**Publication date:** 26 November 2003

**Closing date:** 19 March 2004, at 17.00 (Brussels local time)



## General Conclusions from EIHP2 and other RCS projects

---



L-B-Systemtechnik

- ⇒ do not re-invent the wheel
- ⇒ join forces internationally in the largest automotive markets (Europe, USA, Japan, China)
- ⇒ use existing regulatory and standardization bodies (UN, ISO, IEC) and participate more actively
- ⇒ try to avoid misunderstandings and misperceptions as early as possible
- ⇒ avoid duplications and contradictory/ inconsistent approaches
- ⇒ learn for local implementation also from similarities in requirements all over the world (e.g. fire authorities, work safety authorities, environmental authorities) by informal international exchange between local experts



L-B-Systemtechnik

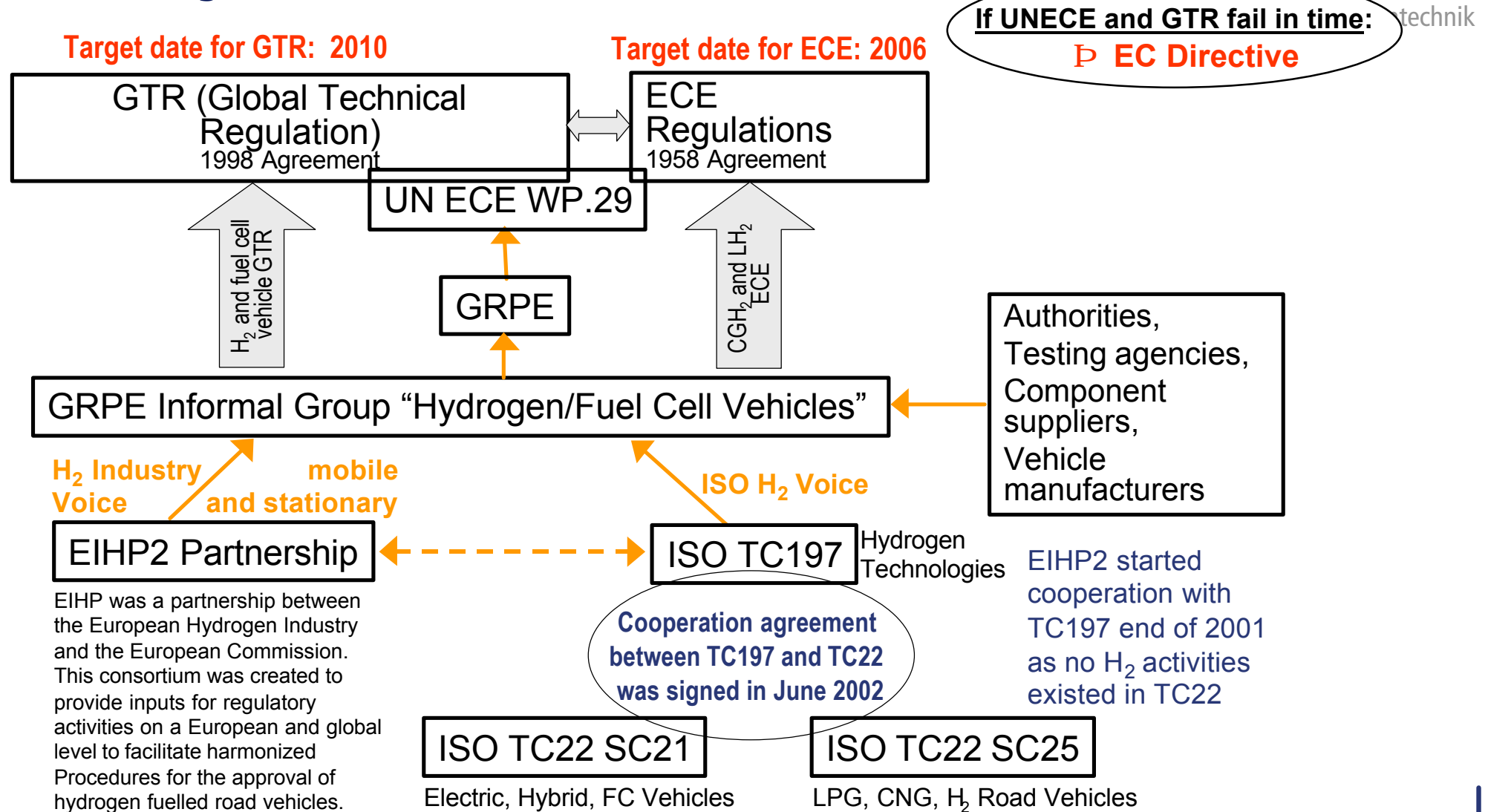
# Follow-on Activities:

## Conclusions from the UNECE GRPE Informal Group on HFCV

# Regulations, Codes and Standards for H<sub>2</sub> Road Vehicles - Present State



## Networking Activities



# Scope and Content of H<sub>2</sub>/FC GTR(s)



L-B-Systemtechnik

## 1.1 On-board storage system safety

Safety of Container and Components  
Lifecycles  
Re-qualification  
Performance  
Purging Limits  
Material Characteristics  
Flow Control  
Damage Tolerance  
Fire Protection  
Aging  
Material Characteristics  
Refuelling  
Mechanical Properties

Most items covered in UNECE regulation drafts

## 1.2 Whole vehicle safety

Crashworthiness  
Fire Safety  
Hydrogen System Integrity  
Pre-Crash  
Post-Crash  
Explosion Protection  
Road Hazards Exposure  
EMC (EMS)  
Spark / Grounding  
Electric Shock Protection  
Pre-Crash  
Post-Crash  
Emergency Medical Rescue  
Controls and Display

Most items not covered in UNECE regulation drafts

## 1.3 Other aspects including energy and environmental considerations

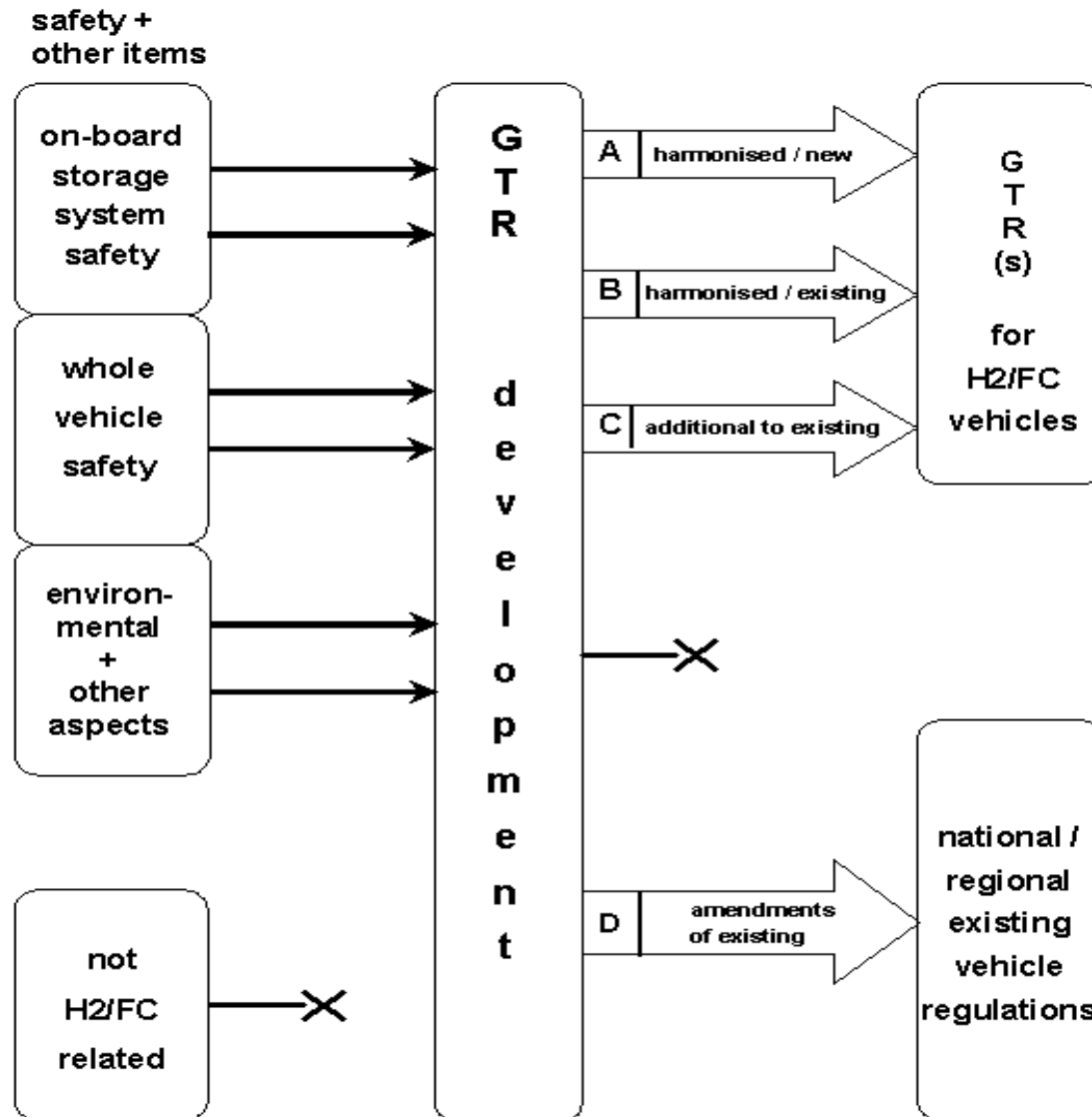
Pollutant Emissions  
Fuel Consumption  
Recycling  
Regeneration  
FC Disposal / Hazmat?  
Fuel Quality  
Engine Power  
EMC (EMI)  
Low Temperature

Items not at all covered in UNECE regulation drafts

# Concept to Develop the H<sub>2</sub>/FC GTR(s) by Informal Group on HFCV



L-B-Systemtechnik



- A: Harmonized GTR(s) for new items (e.g. safety of H<sub>2</sub> storage systems)
- B: Harmonization of existing regulations for H<sub>2</sub>/FC vehicles (e.g. electric safety)
- C: Harmonized requirements, additional applicable to existing national / regional regulations (e.g. additional crash requirements)
- D: No harmonization, but amendments of national / regional regulations (e.g. NOx limit value for internal combustion engines fuelled with H<sub>2</sub>)

# UN ECE and GTR soon or EC Directive in the meantime



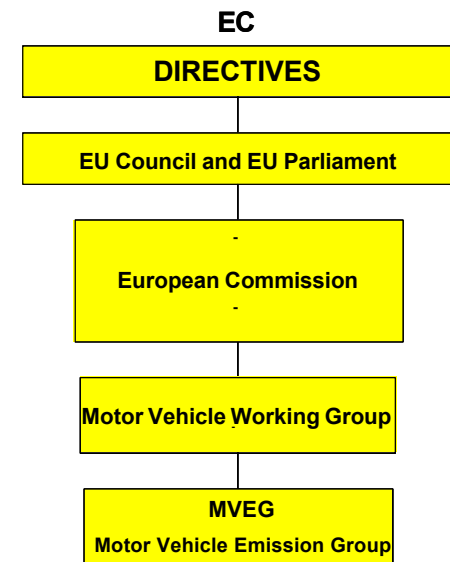
L-B-Systemtechnik

Onboard storage-related issues ⇒ Two ECE Regulations under the 1958 Agreement (with limited lifetime) (may be kept as referencing instrument to EEC directives) ⇒ **GTR** (to replace ECE Regs.)

↓  
↓  
↓

Rest of H2-Vehicle (FC, Safety in normal & crash conditions; Fuel Consumption; etc.)    ¶    ¶    ¶    ¶    **GTR** under the 1998 Agreement (referencing ISO, IEC)

or



\* *(still under discussion in the UNECE GRPE Informal Group on Hydrogen/Fuel Cell Vehicles)*



L-B-Systemtechnik

# Needs Identified by Industry Early with Respect to Political Support



## EIHP Messages to the HLG

Messages of the European Integrated Hydrogen Project to the European Commission's High Level Group on Hydrogen and Fuel Cells  
28 February 2003

- Maintain the EIHP expertise and install a *Working Committee* on the harmonisation of regulations, drafting codes and standards for hydrogen applications in the automotive sector and the associated refuelling infrastructure on a long term basis.
- Create and support a *Partnership* composed of companies + research institutes and universities + others
- Create an *EC program* for hydrogen and fuel cells *with a specially allocated budget* (as common practice in the USA and Japan, EU's major competitors). In addition it should be possible to link the program with other EC programs without bureaucratic hurdles. Invest more money on hydrogen !! [US: 300Mio\$/a, Japan 220Mio\$/a, EU 50(?) Mio€]

**IG-RCS**

(but no continuous public funding)

**Pending**

**Pending**



L-B-Systemtechnik

Thank you for your attention!

For upcoming information please visit

[www.EIHP.org](http://www.EIHP.org)

[www.hfpeurope.org](http://www.hfpeurope.org)

[www.hyapproval.org](http://www.hyapproval.org)

[www.HyWays.de](http://www.HyWays.de)