HarmonHy (SES6 – 513542)

Harmonization of Standards and Regulations for a Sustainable Hydrogen and Fuel Cell Technology

a "Specific Support Action" under the 6th Framework Programme of the European Commission

- Findings and Recommendations -

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Agenda

1. Introduction
2. Objectives of the WP
3. Major findings
4. Recommendations to the HFP/IP

1. Introduction
General Objective

- The general objective of the HarmonHy project was to:
  - identify what has to be done in order to close existing gaps that are present in the existing framework of non-harmonized items
  - help the setting up of a consistent EU strategy to establish priorities on actions to be undertaken in the field of RCS related to fuel cell and hydrogen applications,

1. Introduction

Participants

Industry, Public bodies, Universities, Associations, Consultants

VUB	Vrije Universiteit Brussel
BMW	Bayerische Motoren Werke Aktiengesellschaft
CRF	Centro Ricerche Fiat
ENEA	Ente per le Nuove Tecnologie, l'Energia e l'Ambiente
ENGVA	European Natural Gas Vehicles Association
JRC-NL	Joint Research Centre of the EC NL
LBST	Ludwig-Bölkow-Systemtechnik GmbH
HYDRO	Norsk Hydro
HYGS	Hydrogenics Europe
AVERE	European Association for Battery, Hybrid and Fuel Cell Electric Vehicles
VOLVO	Volvo Technology Corporation
CCS	The CCS Global Group

2. Objectives of the WP

The Harmony project was structured in five work packages (WP).

- WP1 aimed at identifying and mapping the state-of-the-art of ongoing activities in hydrogen and fuel cell specific RCS in international organizations, namely the UNECE, ISO and IEC.
- WP2 aimed to review the availability of pre-normative data able to support the development of RCS. The tasks included:
  - mapping existing R&D projects in the field of fuel cell and hydrogen for transport and stationary applications
  - identifying gaps, lacks or limited comparability of data, in supporting the development of common data collection methodology,
  - defining specific international collaborations for pre-normative research activities.

2. Objectives of the WP

- WP3 consisted of identifying the organizations that should establish liaisons with a view of facilitating the harmonisation of RCS.

- WP4 consisted of the analysis of industrial and societal needs, identifying gaps and conflicts and making propositions to solve fragmentation.

- WP5 consisted of preparing an action plan for further work on harmonisation of RCS on an international basis at UNECE, ISO and IEC.

3. Findings

State-of-the-art of RCS

- The WP1 analysis has shown that the hydrogen and fuel cell standardization landscape is in a state of rapid development and transition.
- WP4 has recognized that, in order to achieve global harmonization, most of the standardization work has to be performed at recognized international SDO level (ISO, IEC).
  - The WP4 gap analysis has shown that some RCS activities are not yet covered by ISO/TC 197 in the case of hydrogen technologies and IEC/TC 105 in the case of fuel cell technologies
  - These gaps would need to be addressed.

3. Findings

State-of-the-art of RCS

Among the identified gaps between needs from industry and RCS

INDUSTRIAL NEED	*GAP*
Terminology	SAE J2574 is accepted at world wide level for fuel cell vehicular applications
	Hard to agree on terminology of different subsystems in a powertrain
H_2 sensors and detection	Documents by ISO TC197 are far to be published
Materials compatibility	RCS documents refer mainly to a maximum operating pressure around 25 MPa
	No documents concerning compatibility with materials different than metals (for example plastics)
	No indications of material behaviour with hydrogen under dynamic loads (thermal and mechanical) as coming out from vehicular applications

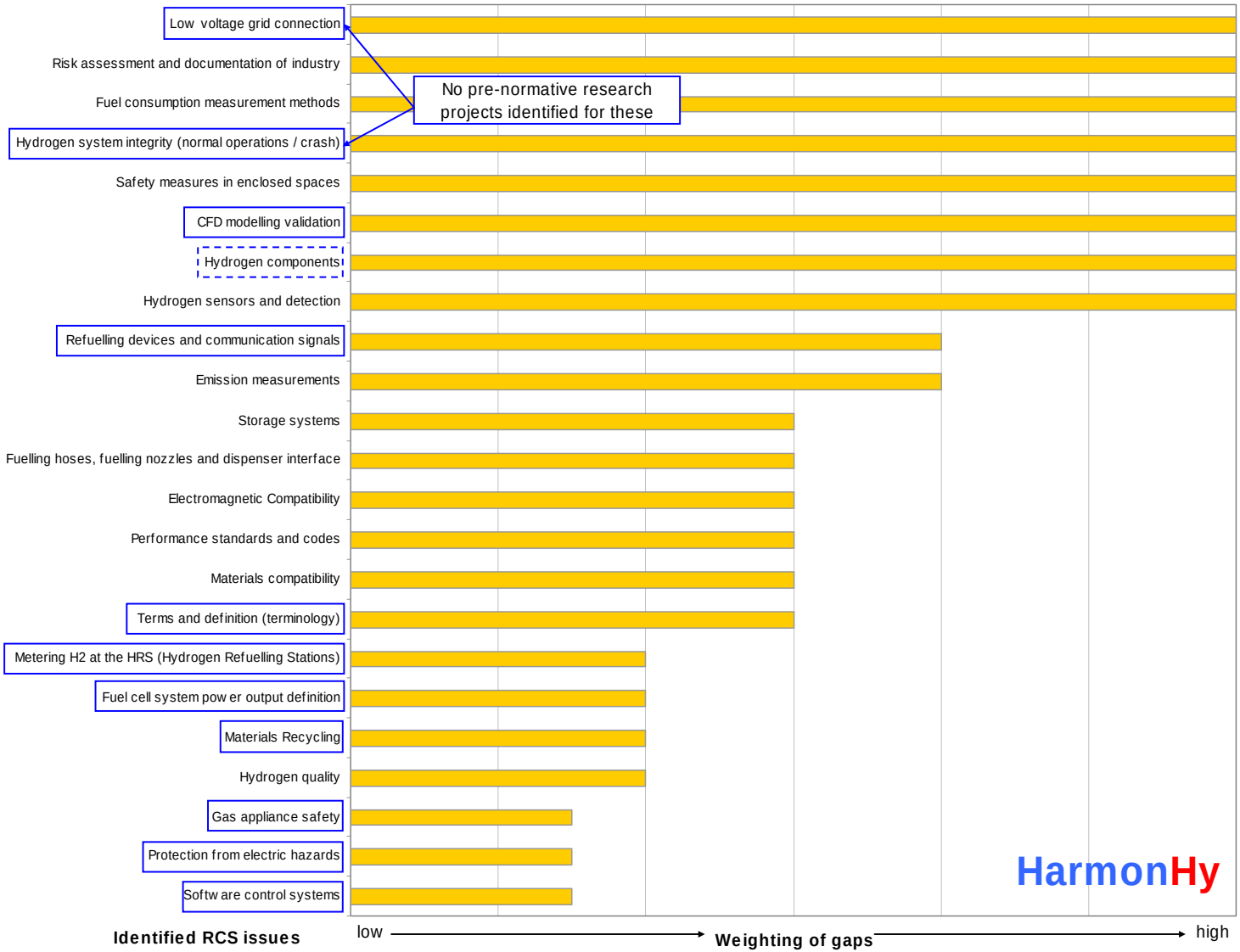
3. Findings

State-of-the-art of RCS

INDUSTRIAL NEED	*GAP*
FCS Performances	Lack of documents defining standard tests for fuel cell system performance evaluation
EMC	Lack of metrics (especially in susceptivity tests) when fuel cell systems are involved
H_2 consumption measurement	ISO documents take into consideration only fuel cell vehicles with compressed hydrogen
Fuelling interface	ISO 17268 does not take into consideration 70 MPa operating pressure
	No information on operational aspects of refuelling
Storage systems	No mention of 70 MPa tanks
Low voltage grid connection	Directive does not exist

3. Findings

State-of-the-art of RCS



3. Findings

State-of-the-art of RCS

- At the international level, WP4 has highlighted that the technical committees of ISO and IEC have already started to share efforts to overcome conflicts within RCS
- Unfortunately, the WP3 and WP4 analysis has depicted that the situation is quite different on a national level.
  - For each identified industrial need, different RCS documents are already published or under development
  - For example, the US RCS National Bodies (SAE for vehicles, ASME, CGA, CSA America, NFPA for other purposes) are duplicating some of the work carried out at ISO and IEC
  - This will lead to different and potentially conflicting standards on the same topic.

3. Findings

State-of-the-art of RCS

- WP1 has identified that further collaborative structures will need to be defined to avoid discrepancy between standards and regulations
- The “New Approach” philosophy of the European Commission towards regulation constitutes a worthy example that should be encouraged:
  - Any Directive or Regulation should be limited to “essential requirements”, but should not state technical details or specifications
  - The technical details of products that fulfil the essential requirements should be given in “harmonised standards”

3. Findings

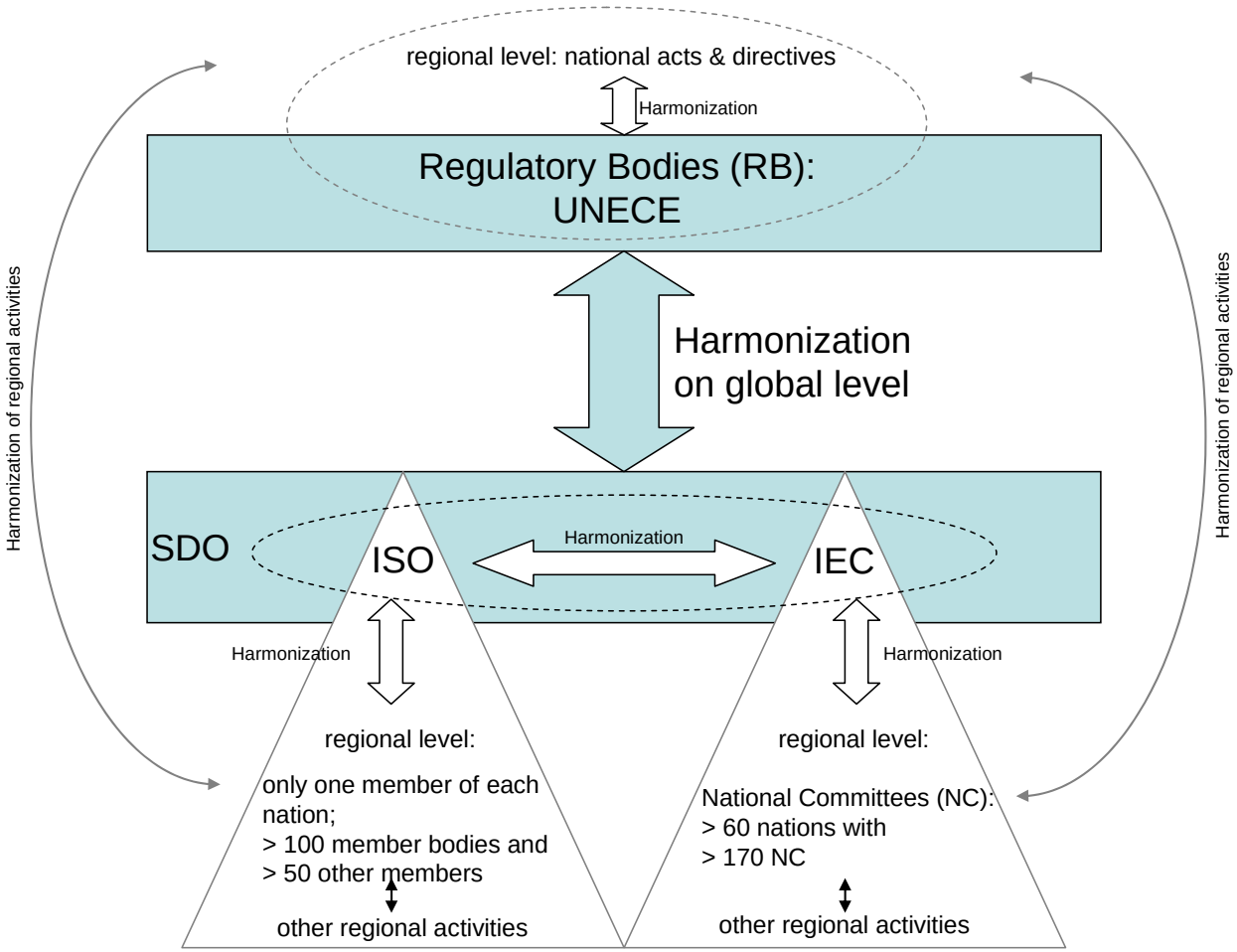
Collaborative structures proposed for RCS

It is recommended that a liaison committee be created to interface with the Regulatory Bodies and Standards Development Organisations, the European Commission (EC), as well as with other bodies that are funding research in Europe, ensuring that the research is used for the benefit of standardisation by linking:

- R&D and standardisation for “CNR”: co-normative research (CNR) interacts directly with ongoing and/or planned standardisation activities.
- R&D and standardisation for “PNR”: pre-normative research relates to projects likely to generate new actions for standardisation.

3. Findings

Harmonization work within SDOs, regulatory bodies, ISO & IEC as well as between SDOs and UN ECE



3. Findings

State-of-the-art of RCS

- In the case of road vehicles, it has been recognised that major vehicle manufacturers prefer a regulation with globally harmonised technical requirements, in order to be able to sell an identical vehicle all over the world.
- WP4 has highlighted differences between the Japanese and European approach in terms of vehicle regulations
  - The two-step approach towards GTR (with an intermediate EU Directive or EC regulation) may generate fragmentation at Regulatory level
  - Efforts should be made to ensure that the Japanese and the European regulations are replaced by a GTR as soon as it becomes available.

3. Findings

State-of-the-art of RCS

- The situation for road vehicles stands in contrast with the situation for stationary applications, where no international regulating body responsible for harmonizing regulations exists.
- In this case, the risk of proliferation of diverging national requirements is greatly increased. It is therefore more important that the “New Approach” philosophy of the EU be applied to all new regulations covering stationary applications.

3. Findings

Identified PNR research topics for hydrogen technologies and recommendation for further steps

Category	Recommendations	
	Pre-normative Research	**Description**
Fuel specification	*Standardized test for fuel quality and composition measurements and specifications*	Fuel specification is fundamental in the use of FCs. There is a need for integration of efforts to agree upon international rules for measuring fuel composition and accepting defined specifications. EU needs to increase the effort to complement and integrate projects underway in USA and Japan
Materials compatibility	*Test protocols*	Basic definition of ways to characterize materials
Safety	*Safety/ CFD/ Handbook heat and mass transfer correlations*	Joint efforts to reach global consensus using demo results
Materials compatibility for pipelines	*Comparison and verification of protocols and materials*	Common selection of materials must be done by using long-term endurance tests on a variety of materials
Testing procedures per storage systems	*Test protocols for different storage systems*	There is the need to verify and develop specific test protocols for various storage systems
Refuelling stations	*Common approval procedures*	
Parking areas	*Safety studies*	Analysis of leakage and accidents
Tunnels	*Safety studies*	Analysis of leakage and accidents
User interface	*Studies for new/ innovative HRS layout and related safety studies*	Inherently safe HRS layout and user-friendly human/ machine interface

3. Findings

Identified PNR research topics for fuel cell technologies and recommendation for further steps

Category	Recommendations	
	Pre-normative Research	**Description**
FC MEA	*Identify relationships between physical and performance properties of MEAs*	FC MEA and related materials must be analysed according to common, comparable procedures.
FC stacks	*Test protocols*	Basic definition of ways to characterize materials
Environment tests	*Definition of common environmental conditions*	Joint efforts to reach demonstration results
Testing protocols	*Harmonized procedures*	Testing protocols and procedures for transportation and stationary applications must be verified and standardised.

3. Findings

State-of-the-art of pre-normative research (PNR)

- The WP2 analysis has identified a significant difference in the strategic approach on PNR activities between Japan and USA and Europe.
  - In Japan and in the USA, dedicated subprograms are directly funded , often not requiring cost sharing by private enterprises since they are regarded as pre-commercial and of strategic importance.
  - In 2005, the specific public budget for RCS sub-programs/ projects was:
    - about 27 M€ in Japan
    - about 5 M€ in the USA
    - about 3 M€ (average in FP6) for the EU [only specific projects/ not including JRC direct actions]
- The WP2 analysis has depicted that some PNR activities are carried out on the same topic in Japan, USA and EU, although leading to potential duplication of effort, it might be worthwhile to allow for an appropriate comparison of results.

3. Findings

Interaction with outside bodies

- The WP3 analysis has shown that the establishment of further co-operations and liaisons between regulatory bodies (RB) and technical committees of SDO are needed in order to facilitate the harmonization of RCS.
- There should be a stronger inter-relationship between European research programmes and standardisation, and that this should be a two-way process.
  - Technical Committees could make more use of technical research.
  - Research consortia could be more strategic about exploiting their knowledge through standardisation.

3. Findings

Analysis of industrial and societal needs

- The analysis of the industrial and societal needs has highlighted the need to:
  - provide education and training to personnel operating hydrogen equipment
  - increase awareness to improve consumer confidence in hydrogen
  - continue improvement of technical knowledge on specific hydrogen and fuel cell issues
- The WP.4 analysis showed that there was a need to better coordinate the EC RCS activities through a **RCS Platform**