

Report summarizing the findings and recommendations in the different areas addressed by the informal group on Hydrogen Fuel Cell Vehicles – Sub Group Environment (HFCV-SGE) in support of the harmonization process

The text reproduced below is an executive summary of the Technical Report, prepared by the informal working group on Hydrogen Fuel Cell Vehicles – Subgroup Environment (HFCV-SGE), summarizing the outcome of discussions and recommendations available in the different regions in support of the harmonization process. The Technical Report is available as document ECE/TRANS/WP.29/GRPE/2011/13, adopted at the sixty-second session of the Working Party on Pollution and Energy (GRPE) in June 2011. The Working Party on Noise (GRB) considered this report at its February 2011 session and noted no reservations were expressed on this document.

I. Introduction

The informal working group on Hydrogen Fuel Cell Vehicles (HFCV) has been operative for several years. In June 2005, the World Forum for Harmonization of Vehicle Regulations (WP.29) and the Executive Committee (AC.3) of the 1998 Agreement agreed on a proposal submitted by Germany, Japan and the United States of America (USA) on how to manage the development process of a global technical regulation (gtr) on hydrogen powered vehicles. However, because of different circumstances, it was not until April 2007 that the group received a clear mandate and a roadmap to achieve its goal of establishing a gtr for this class of vehicles (ECE/TRANS/WP.29/AC.3/17).

The final goals of SGE are to investigate the possibility of harmonizing environmentally related requirements and to propose actions in those cases where harmonization may not be possible.

The areas addressed within the field of competence of the SGE are aspects other than the ones addressed by SGS including energy and environmental considerations. The following Table summarizes the environmental and other energetic aspects that are pertinent to the vehicles with different propulsion systems that Regulations could address.

Areas that Regulations could address for vehicles with different propulsion systems

	<i>FC</i>	<i>Hybrid</i>		<i>ICE</i>
				<i>Mono-fuel (H₂)</i> <i>Bi-fuel</i> <i>Blends</i> <i>Dual fuel</i>
	<i>H₂</i>	<i>FC</i>	<i>ICE-H₂</i>	
	<i>Environmental & Energetic aspects</i>			
Fuel consumption	x	x	x	x
CO₂ emission				Bi-fuel, blends and dual fuel
External electrical consumption		x	x	
Pollutant emissions			x (NO _x)	x
H₂ and H₂O emissions	x	x	x	x
Engine power (measurement procedures)	x	x	x	x
Maximum speed (measurement procedures)	x	x	x	x
Fuel quality (reference)	x	x	x	x
Recycling	x	x	x	x
Disposal (hazardous materials)	x	x	x	x
Noise	x	x	x	x

APU (Auxiliary Power Units) are not covered, only FC and ICE engines running both with CGH₂ and LH₂ are addressed and it has not been included in AC3's action plan.

It is also apparent that electromagnetic compatibility is a more safety related subject discussed in the Working Party on Lighting and Light-Signalling (GRE) for conventional vehicles as well as for electro-hybrid, pure electric and FC vehicles.

H₂/FC vehicles are emitting hydrogen (exhaust, purge, leakage). Hydrogen is mainly a safety concern and covered by SGS. Therefore, hydrogen emissions are not included in the Technical Report.

Water emissions might be a safety problem in the future (water freezing in winter). It is mainly a safety concern and a minor environmental issue. Some scientists consider water emissions from vehicles as a contribution to climate change. The water emissions from H₂-ICE and FC vehicles are much higher than in the case of conventional vehicles. The foreseeable number of HFCV in the short term is low and, therefore, no Regulation is needed at this moment. Therefore, the technical report does not contain a chapter dedicated to water emissions.

The Technical Report (ECE/TRANS/WP.29/GRPE/2011/13) summarizes the SGE findings on the different areas addressed by the group and discusses whether it is adequate or not to support a harmonization process on the environmental and energetic aspects of HFCV.

II. Harmonization assessment in the area of environmental and energetic aspects

A. Fuel consumption

Regulations should be established consistently with common agreement on the issues involved. The basis for Regulations could be standards (national or regional) existing or under development. The related content should be, therefore, harmonized on an international basis.

B. Fuel quality

Once the technology to produce and assure the quality of hydrogen fuel containing minute amounts of impurities as specified in the fuel standards is established and such reference fuel is made available, it will be possible to evaluate the effect of impurities on individual vehicles and thus be helpful in the development of FC vehicles.

C. Pollutant emissions of hydrogen (H₂) fuelled vehicles

Worldwide harmonization is possible in case of HDV and 2-wheeled motorcycles, because gtrs for the measurement of pollutant emissions already exists. This is not the case for LDV, and the development of a worldwide harmonized test cycle and measurement procedure especial for LDV using H₂ in ICE is not efficient and feasible.

In the event that motorcycles or HDV with ICE using H₂ would be ready to be marketed, an amendment of gtr No. 2 (WMTC) or gtr No. 4 (WHDC) can easily be developed. Such amendments of the existing gtrs only needs the definition of the reference fuel, the calculation method for NO_x (H₂ fuel) and the definition of the H₂-bi-fuel approach. This can be considered as a midterm activity for both vehicle categories.

For LDV it should be considered to introduce a reference fuel (gas), a calculation method for the NO_x emissions and the definition of the H₂-bi-fuel approach with the WLTP gtr. In the meantime, the existing national legislation or UN Regulation No. 83 can be amended.

As a conclusion, it is not proposed to develop a dedicated gtr for the measurement and limitation of pollutant emissions of H₂ vehicles.

D. Carbon dioxide (CO₂) emissions of hydrogen (H₂) fuelled vehicles

Worldwide harmonization is possible in case 2-wheeled motorcycles, because gtrs for the measurement of CO₂ emissions already exist. This is not the case for LDV, and the development of a worldwide harmonized test cycle and measurement procedure especial for LDV using H₂ in ICE as H₂-bi-fuel is not efficient and feasible.

In the event that motorcycles with ICE using H₂ (H₂-bi-fuel) would be ready to be marketed, an amendment of gtr No. 2 (WMTC) can easily be developed. Such an amendment of the existing gtr only needs an extension of the scope to H₂-bi-fuel vehicles and the decision about the measurement of CO₂ in the petrol mode only. In this case there is no need to adapt the existing measurement and calculation methods. The amendment of gtr No. 2 can be considered as a midterm activity.

For LDV it should be considered to introduce this H₂-bi-fuel approach (see above) with the WLTP gtr. In the meantime, existing national legislation or UN Regulation No. 101 can be amended.

As a conclusion, it is not proposed to develop a dedicated gtr for the measurement of CO₂ emissions of H₂ vehicles.

E. Noise emissions

UN Regulation Nos. 41 (motorcycles) and 51 (passenger cars, trucks, buses) covers test procedures and performance requirements limiting the noise emissions of these vehicles. Rolling sound emissions of tyres are regulated by UN Regulation No. 117.

These existing Regulations are already applicable for H₂ powered vehicles.

Activities for the development of gtrs in the field of noise emissions are possible in future, but not mandated by AC.3 for the time being.

As a conclusion, it is not proposed to develop a special gtr for the measurement and limitation of noise emissions of H₂ vehicles.

F. Reusability, recyclability and recoverability

Regulations addressing the issue of reusability, recyclability and recoverability of hydrogen vehicle components (especially FC components) need to be considered. However, it is not proposed to develop a dedicated gtr addressing H₂ vehicle's reusability, recyclability and recoverability.

III. Summary and conclusions

There are three areas in the field of Regulations for HFCV where it makes sense to aim for international harmonization:

- (a) Test methods for the measurement of fuel consumption;
- (b) Test and calculation method for the measurement of pollutant and CO₂ emissions;
- (c) Definition of a reference fuel for test purposes.

In the first case — fuel consumption —, the recommendation is to use standards that exist or are underdevelopment and harmonize them on an international basis. The open question here is the development of a harmonized test cycle (currently underway at the UN). In the meantime, harmonization will be part of the method for measuring the fuel consumption, thereby allowing each region to apply its own test cycle until the world harmonized test cycle has been approved.

On the other hand it is perceived as helpful to define a reference fuel (fuel standard) as this will allow evaluating the effect of impurities on individual vehicles and supporting the development of HFCV.

It is, however, recommended to waive the development of a stand-alone gtr for environmental related provisions for HFCV. It is preferable to amend case by case existing UN Regulations or gtrs to accommodate this class of vehicles or to consider HFCV directly during the developing process of new Regulations.
