Hydrogen-fuelled Vehicles

*Transmitted by the expert from Germany*

1) The EUROPEAN INTEGRATED HYDROGEN PROJECT

**Background:**

A significant reduction or even elimination of local greenhouse gas (GHG) emissions from vehicles can be achieved by the use of hydrogen as a vehicle fuel, particularly when it is produced from renewable energy sources. Vehicles using hydrogen as a fuel either in a fuel cell or in a hydrogen optimised internal combustion engine provide a solution for the reduction of local and global pollutants. The results of the project “Transport Energy Strategy” (also referred to by its German initials VES) are indicating that hydrogen is the most promising fuel in the long term.

**Current situation:**

Several hydrogen vehicles are already on the road. They are licensed as single vehicles in different countries.

**Current situation regarding the legal requirements for hydrogen vehicles in Europe:**

In total 47 EC directives are applicable for vehicles. The directives for emissions, fuel consumption and engine power cannot be fulfilled by hydrogen vehicles because of the absence of a standardised reference fuel or the absence of a procedure for testing the engine power. Requirements regarding the safety of the hydrogen on board storage system however are missing. Therefore each country is applying their national requirements regarding the safety of the hydrogen onboard storage system. These national requirements are differing significantly.

2) The EUROPEAN INTEGRATED HYDROGEN PROJECT


**Project Summary:**

In order to enhance the safety of hydrogen vehicles and to facilitate the approval of hydrogen vehicles, the European Integrated Hydrogen Project was established. The project was starting in 1998 and was co-sponsored by the former GD XII Science, Research and Development under Contract N° JOE3-CT97-0088.
The objectives of the project were as follows:
- To create a Pan European database of existing regulations and codes of practice
- To contact other pertinent authorities outside Europe
- To identify weak spots in today’s technology
- To define the areas requiring regulation
- To create a basis for an ECE regulation for hydrogen vehicles
The project partners are portrayed in the annex.

Results:

The EIHP partners finally developed 2 drafts for new ECE regulations, one for the onboard storage system for liquid hydrogen and one for the onboard storage system for gaseous hydrogen. The elaboration of the drafts was in close co-operation with some Technical Services. Some approval authorities where informed about the results accordingly. The drafts are available in the Internet under http://www.eihp.org/.

EIHP 1 - Partners

Air Liquide S.A., Sassenage, France
Bayerische Motoren Werke AG, BMW, Munich, Germany
EC-Joint Research Centre, Ispra, Italy
Hamburgische Elektrizitäts-Werke AG, HEW, Hamburg, Germany
Hydrogen Systems N.V., Turnhout, Belgium
Instituto Nacional de Técnica Aerospacial, INTA, Madrid, Spain
Ludwig-Boelkow-Systemtechnik GmbH, LBST, Ottobrunn, Germany
Messer Griesheim GmbH, Krefeld, Germany
Renault – Direction de la Recherche, Guyancourt cedex, France
AB Volvo, Göteborg, Sweden
3) The EUROPEAN INTEGRATED HYDROGEN PROJECT
   Phase 2 (start 2001)

Project Summary:

Draft regulations for the approval of hydrogen fuelled road vehicles have been
developed during the last two years and are presently in the submission process to the
relevant European regulatory bodies. These draft regulations shall be developed to
such a level that they can be harmonised on a global level, initially between the EU and
North America. By applying these draft regulations to the design and approval of fuel
cell vehicles with direct onboard hydrogen storage they will be validated by taking into
account not only hydrogen related vehicle components and systems but also safety
requirements, refuelling procedures and periodic inspections.

For the relevant hydrogen refuelling infrastructure components and systems, for which
existing standards, codes of practice and regulations are only partly identified, the
applicable national standards and regulations will be identified and necessary
requirements for new draft standards and possibly draft regulations for approval will be
developed. These activities among others will also comprise refuelling procedures,
safety aspects, periodic inspections and the layout of refuelling stations. The interface
between the refuelling station and the vehicle (receptacle and nozzle) will be an
important issue. The eligibility for EU-wide harmonisation will be checked. It will also be
investigated to what extent certain elements of the refuelling systems are suitable for
harmonisation on a global regulatory scale, e.g. components.

Comparative risk and safety analyses with respect to the release of hydrogen in
confined and semi-confined environments, such as tunnels, garages, refuelling stations,
and inner city streets will be undertaken. These shall provide data in sufficient depth in
order to enable the partnership to define the required inputs for hydrogen related
standards and regulations.

Results:

- Development of a worldwide harmonised regulation for hydrogen fuelled road
  vehicles.
- Development of procedures for periodic vehicle inspections (roadworthiness).
- As far as possible development of a worldwide standard or regulation and of periodic
  inspection procedures for the relevant refuelling infrastructure, subsystems or
  components.

These draft regulations and standards will enable both the vehicle and infrastructure
industries to save enormous resources in bringing hydrogen fuelled fuel cell vehicles
onto the road. Many countries will for the first time have the legal basis to approve the
operation of hydrogen fuelled vehicles on public roads and refilling at public refuelling
stations. In addition, the access of European vehicle and infrastructure component
manufacturers to the EU market as well as the North American market will be facilitated
in the medium and long term.


EIHP 2 - Partners

L-B-Systemtechnik GmbH, Ottobrunn, Germany
Adam Opel AG, Ruesselsheim, Germany
Air Liquide S.A., Sassenage, France
Air Products, Walton-on-Thames, United Kingdom
Bayerische Motoren Werke AG, Munich, Germany
BP Amoco, Sunbury-on-Thames, United Kingdom
Commissariat a l'Energie Atomique, Bruyeres le Chatel, France
DaimlerChrysler AG, Stuttgart, Germany
National Centre for Scientific Research Demokritos, Aghia Parakevi-Attikis, Greece
Det Norske Veritas, Department for Strategic Research, Hoevik, Norway
EC-Joint Research Centre, Ispra, Italy
Ford Werke-Aktiengesellschaft, Koeln, Germany
Forschungszentrum Karlsruhe GmbH, Karlsruhe, Germany
Hydrogen Systems N.V., Turnhout, Belgium
Instituto Nacional de Técnica Aerospacial, INTA, Madrid, Spain
Messer Griesheim GmbH, Krefeld, Germany
Norsk Hydro SA, Oslo, Norway
Shell Research Ltd., Chester, United Kingdom
AB Volvo Technological Development, Göteborg, Sweden
Raufoss ASA, Raufoss, Norway