EIHP2
Work Package 6 – International Links
Final Report

This report has been written by Dr Stephen Cook (BP) and provides a summary, by sub-task, of the work performed and results obtained within EIHP2 Work package 6. It has been compiled, in the main, using information supplied by BP and Shell.

Disclaimer and Confidentiality

Scope of Work

Since the cooperation and participation of the vehicle manufacturers was not forthcoming during the project, the scope of WP6 is confined largely to infrastructure issues

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Objectives

1. Maintain relations to California Fuel Cell Partnership, to NHA's international hydrogen infratstructure steering committee, to DoE's Blueprint for Hydrogen Fuel Infrastructure Development etc.

2. Several comparable activities already have started in the EU and further activities are likely to start in the area of regulations, infrastructure and demonstration of hydrogen fuel cell vehicles, as well as in general safety aspects of vehicles and infrastructure. This package will try to establish and maintain links between the EIHP2 and other cluster activities in order to ensure the flow of information between the different groups, to avoid double work, to identify common goals and to develop increased strengths for these initiatives.

3. Identification of comparable initiatives in Japan

4. Dissemination of results achieved to interested experts

Description of Work

Sub-task 6.1
Exchange information with California Fuel Cell Partnership, with NHA, SAE and DoE in USA as appropriate. Attend meetings of Hydrogen Associations world-wide as appropriate. Attend plenary meetings and working groups 5&6 meetings of ISO TC 197 hydrogen technologies.

Sub-task 6.2
Establish contact with EU cluster activities in related fields with relevance to the envisaged EIHP2 activities and exchange information as appropriate

Sub-task 6.3
Establish first contact with comparable initiatives in Japan in related fields

Sub-task 6.4
Collection and systemizing editing of available information from selected sources. Distribution of the results among the partners

Sub-task 6.5
Information of target groups (also from US and Japan) through workshops and project related internet site.

Sub-task 6.6
Initiation of a hydrogen infrastructure implementation network for the EU together with the European Commission. **NOTE**: this is a task of the project 'HyWays' and is therefore not covered here

Executive Summary

The intention of WP6 was to create and maintain international linkages both within the EU and externally, particularly within the US.

Through the activities of the partners in WP6 these aims have been achieved:

- Various US bodies including DoE and IHIG are now fully aware of the role and purpose of EIHP. This has been enabled by the unique ability of global companies to span regional divides

- Initial meetings with delegations from the Japanese Electric Vehicle Association and the Japanese Hydrogen Forum have provided a useful first view of the RC&S landscape in Japan

- Summaries of RC&S activities in Europe and the US have been produced and a preliminary high-level gap analysis of European C&S for hydrogen infrastructure has been carried out and shared with key stakeholder in the US

Details of the above initiatives can be found in the summaries of sub-task activities within this document.

Some high level conclusions are stated here:

- The leadership of the DoE in the US has provided a much-needed framework for C&S activities in the US which is enabling a focused approach

- Japan is viewed as the most advanced and coordinated with respect to RC&S activities, driven by their desire to commercialise hydrogen vehicles in 2005

- EIHP2 is viewed as a significant strength within Europe by the US but the view still persists that its main function is to create competitive advantage

- Comparison of US and EU gap analyses for infrastructure C&S activities reveals a great deal of similarity in key areas requiring progress. This is a good basis for future international collaboration

Sub-task 6.1 – Links with US bodies

US engagement

The following bodies have been regularly engaged by EIHP2 members during the life of the project, both through attending meetings, participation on steering committees and presentations:

- US Department of Energy (DoE)
- International Hydrogen Infrastructure Group (IHIG)
- US National Hydrogen Association (NHA)
- Internatinal Organisation for Standardisation (ISO) Technical Committee 197 (TC197)
- California Fuel Cell Partnership (CaFCP)
- US Freedom Car Codes and Standards Technical Team
- International Codes Council (ICC)
- US state legislature (e.g. Michigan Department of Environmental Quality)
- Society of Automotive Engineers (SAE)
- American Petroleum Institute (API)

3 reports compiled by Jim McGetrick (BP) detailing summaries of these activities are attached as **appendices 1-3** of this report.

EU and ISO activities briefing

Jim McGetrick (BP) compiled a report issued November 2002 which detailed the activities within EIHP and how they relate to the work being carried out within ISO. The full document is attached as **appendix 4** of this report, an executive summary is given here (this report is considered to form **deliverable 3** for WP6).

At the June 14, and 15, 2002 **International Standards Organization TC 197** meeting in Montreal, Canada , two new work item proposals (NWIP) were unanimously approved. The first new work item proposal is for an International Standard for "Hydrogen generators using fuel processing technologies " (ISO/TC 197 N238, 2002-07-31) and the second work item is the "Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride" (ISO/TC 197 N239, 2002-07-31). ISO will circulate the two NWIPs to the member countries of ISO TC 197 for a three month vote (7-31 to 11-13). If the NWIPs are approved the new work items will be assigned to an existing working group, or a new working group may be formed.

ISO TC 197 has formally asked the SAE for approval to adopt the SAE J2600 connector standard as the working draft for the Working Group (WG). A copyrighted version of the SAE standard has been circulated to the WG members. Comments from the WG will be reviewed at the WG meeting September 19/20, 2002 in Las Vegas. Assuming all comments are resolved

at the Las Vegas meeting, the draft will be circulated as a Draft International Standard (DIS)

The **European Integrated Hydrogen Project** (EIHP) was conceived in the late 1990's to fulfill the need for harmonized legal requirements within Europe to assist the development and introduction of hydrogen powered vehicles

Two proposals were developed in EIHP1,"Draft Regulation Document for Compressed Onboard Storage System for Liquid Hydrogen" (on 8th revision, 9th revision to be issued shortly) and "Draft Regulation for Liquid Hydrogen " (11th revision complete, 12th revision to be issued shortly). The draft regulation for compressed hydrogen consists of:

- Specific Components of Motor Vehicles Using Compressed Gaseous Hydrogen
- Vehicles with regard to the Installation of Specific Components for the Use of Compressed Gaseous Hydrogen

The draft regulation for liquid hydrogen consists of:

- Specific Components of Motor Vehicles Using Liquid Hydrogen
- Vehicles with Regard to the Installation of Specific Components for the Use of Liquid Hydrogen

EIHP2 has also developed a "Draft on Gaseous Hydrogen Installations and Vehicle Refuelling Stations". This draft has useful summaries on offsets and design issues.

Finally, US DOE will provide a link to EIHP to the US DOE comprehensive **Codes & Standards Matrix**. The matrix is being refined, i.e., significant input from API, and will be sorted by the different applications. This new layout will improve the understanding of what Codes & Standards are necessary to build a hydrogen service station.

Codes and Standards activities in the USA

Jan Maarten Teuben (Shell) produced a report issued October 2002 for EIHP2 WP6 which summarized C&S activities in the USA. This report is contained in this document as **appendix 5** (this report is considered to be **deliverable 1** for WP6). An executive summary is given here.

An overview of the most important activities in C&S development in the USA in 2002 is covered. It is based on information and drafts received from the ICC through the IHIG network, through contacts with the American Petroleum Institute (API) and on information obtained from the Society of Automotive Engineers (SAE).

The International Code Council has accepted proposals to include hydrogen in the International Fire Code (IFC) and International Mechanical Code (IMC)

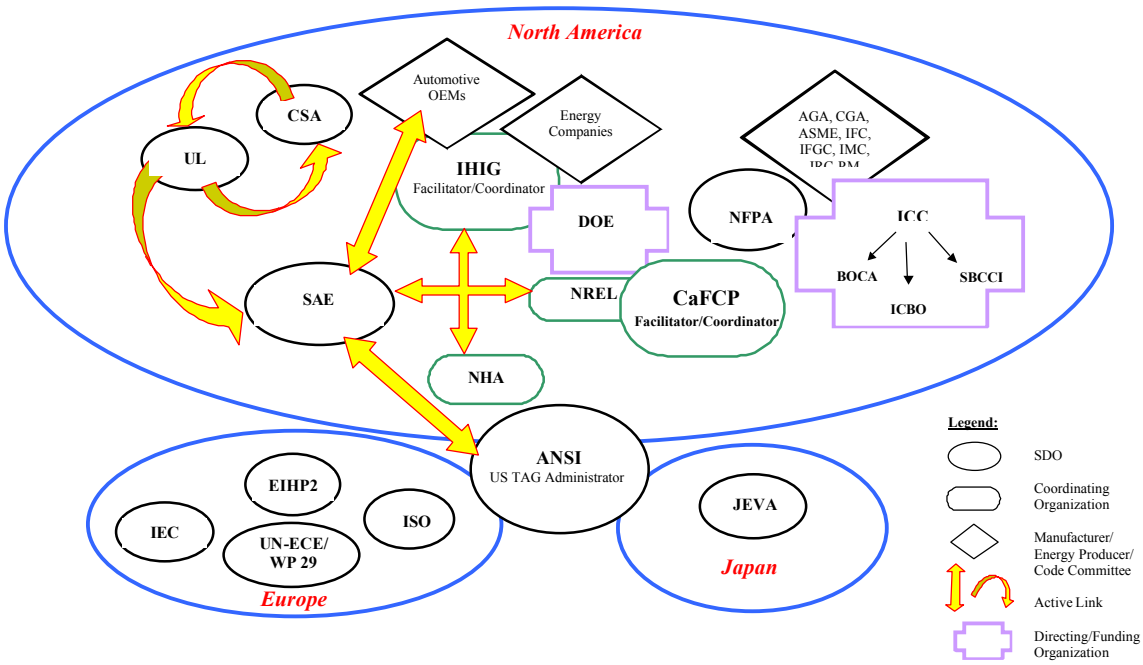
in its annual meeting on October 4 2002. It has also accepted inclusion of hydrogen in the International Fuel Gas Code (IFGC). Inclusion in the IFGC was not approved in an earlier stage of the approval process, as it was strongly opposed by the American Gas Association (AGA). It is thought that the AGA opposes the inclusion of hydrogen for political reasons, as AGA members are mostly natural gas suppliers. Shell with BP contributed to the ICC code changes by commenting on early drafts. As a result of this active approach the accepted code changes are more in line with the interests of energy companies. These changes will appear in the 2003 IFC.

The SAE is progressing quickly in its efforts to develop standards. The SAE standard J2600 'Connectors for Gaseous Hydrogen' has been balloted and accepted in September 2002 and it will be published shortly. It specifies the WEH geometry for the connector. The EIHP has decided to recognize this standard as a base for its activities and has contributed actively to its development by commenting on draft versions.

The report also contains a list of C&S organizations and contact information.

US perspective

For interest, shown below is a US – centric view of US C&S activities and how they inter-relate. This is courtesy of Mike Steel (GM) and is his personal view.



Sub-task 6.2 contact with EU cluster activities

EIHP2 partners are active in the two main cluster activities which are relevant: HyNet and HyWays. Both of thee projects seek to create a European Roadmap for hydrogen.

Through this participation it has been possible to disseminate and share knowledge from EIHP2 and ensure no repetition of work.

- HyNet is the European H2 network formed under Framework 5 with wide participation by key industrial stakeholders (Vehicle OEMs, utilities, OilCos, IGCs)

- HyNet has been requested by EC to deliver a H2 roadmap by mid-Jan 04 as a follow up to the HLG vision. EU is lagging behind US, Japan and Canada and feels the competitive pressure and need to respond.

- EIHP members of HyNet are participating in this roadmap process. BP has helped to define this process and the first consultative workshop took place in July 03. A draft roadmap was produced in December and distributed for comment, ahead of EU meeting week of 19th January.

- HyWays is a European Framework 6 project (2004-2006) to produce a harmonized H2 roadmap for all EU & future EU countries. The aim is to develop a standardized database & tool set to enable each member state to determine its optimum pathway based on its own socio-economic imperatives and natural resources, while attempting to minimise emissions.

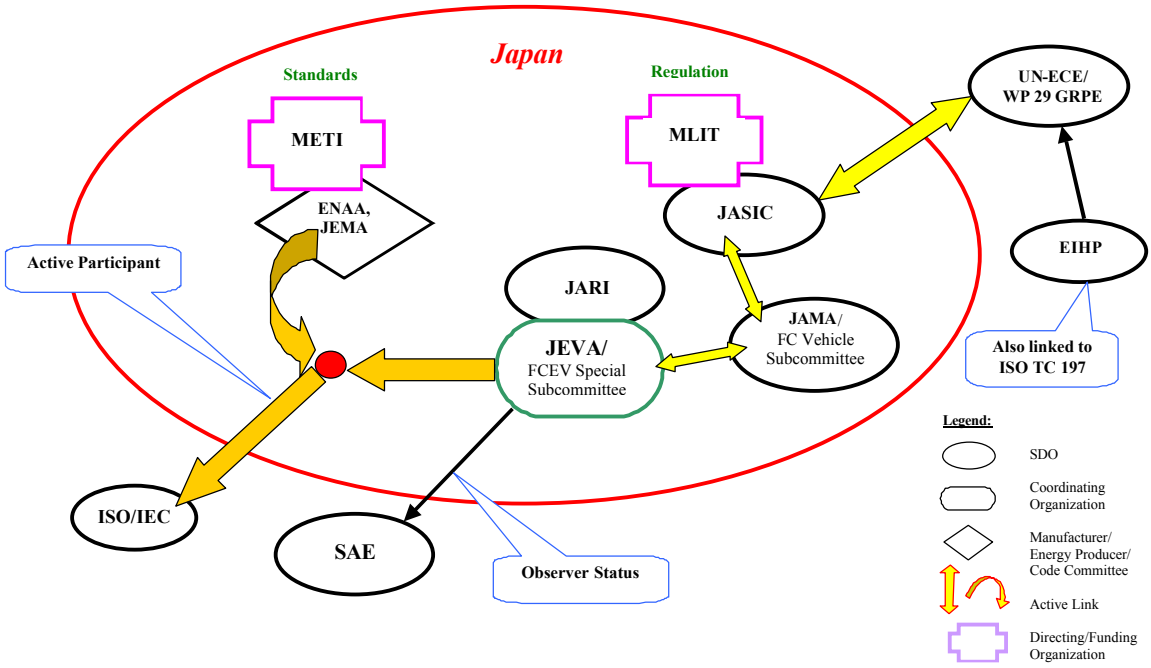
Sub-task 6.3 First contacts with Japan

EIHP partners have hosted visits from Japanese delegations:

- Japanese Electric Vehicle Association (JEVA) – Oct 2001
- Japanese Hydrogen Forum - Nov 2003

Through these engagements it has been possible to obtain a high level view of the Japanese approach to C&S activities.

A summary (courtesy of Mike Steele, GM) is provided below:



This summary diagram is considered to form **deliverable 4** for WP6

In summary:

- Japan is aggressively pursuing the goal of 2005 vehicle introduction
- There is heavy involvement / support from government which is seen as a key factor driving success

Sub-task 6.4 Collection and editing of available information

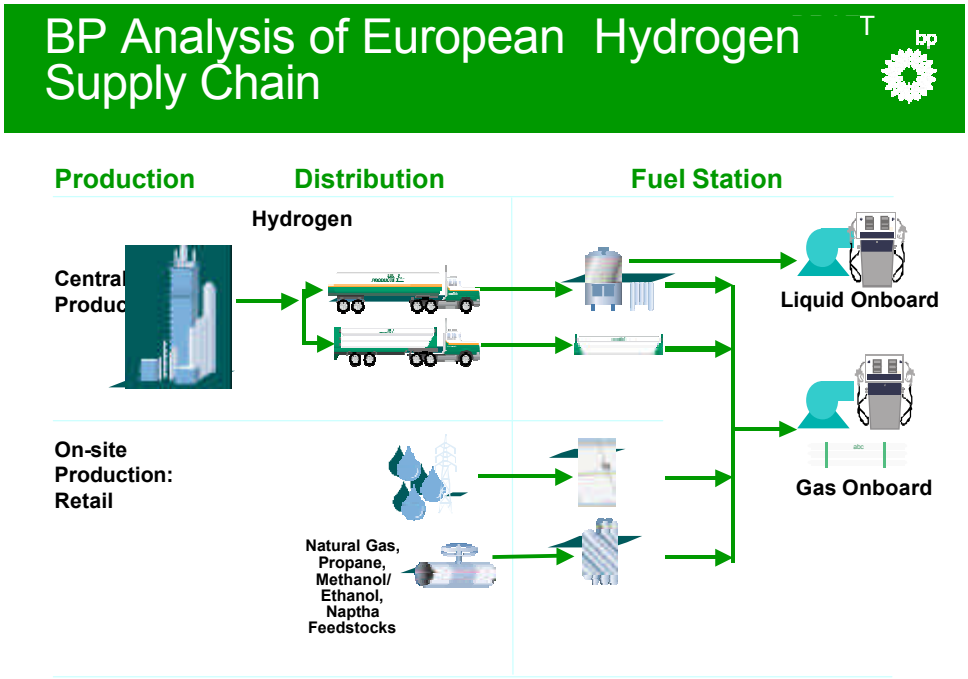
The work undertaken for this sub-task consisted of creating a preliminary gap analysis of the status of European Codes and Standards relating to the infrastructure and supply chain for hydrogen.

This document has been created by BP and the methodology is described in detail in the **BP partner report**. The full output as it stands is presented as an appendix to the BP partner report and is considered to be **deliverable 2** for WP6.

The framework used to create the gap analysis was a matrix approach developed by Jim Ohi (NREL) and Karen Campbell (Air Products) through their participation in IHIG. A gap analysis had been outlined for the US and so there was an ideal opportunity to use the same framework with the permission of the IHIG chairman. This enabled:

- Information to be shared with the US using a common framework and understanding
- Better links to be created with IHIG

The basis of the approach was to look at key elements of the supply chain (shown below)



The key areas considered were:

- Production
- Delivery
- On-site bulk storage
- Fuel dispensing
- Fuel Island

Within each of these major categories, a series of sub-headings were defined.

For each sub-heading the current status, current activity and future outlook were ranked according to the following colour-coded system:

Current Status

🟢	Standard in place, and adequate for projected needs
🟡	Standard in place, not adequate for projected needs
🔴	No applicable standard in place

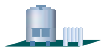
Current Activity

🟢	Significant activity
🟡	Some level of activity
🔴	No activity

Future Outlook

🟢	Direction appears adequate for business needs
🟡	Direction may fall short of business needs
🔴	Direction appears to be inadequate for business needs

An example of the output for Europe for On-site bulk storage is given below

		Current Status	Current Activity	Future Outlook	Comments
HP Composite		🔴	🔴	🔴	Standards will be started
HP Conventional		🟢			Well-established technology
Set-back		🟡	🟡	🔴	European codes looking at verification
Location above grade		🟡	🟡	🔴	
Underground		🔴	🟡	🔴	No standard
Cryogenic		🟢	🟡		New cryo for Below ground
Set-back		🟡	🟡	🔴	
Location		🟡	🟡	🔴	Tests underway, ICC, NFPA codes
Underground		🔴	🟡	🟢	New cryo for Below ground

The preliminary matrix was presented by BP at an IHIG meeting 30/10/03. The presentation was well received and there is an open invitation to return with an update.

Sub-task 6.5 Information of target groups

- A number of EIHP documents are publicly available on the project internet site at www.eihp.org

- The documents available include a summary of the project aims and work-packages, output from the major work-packages and presentations made at external events

- Presentations and information about EIHP have been shared at meetings with the following organizations:

    - US Department of Energy (DoE)
    - International Hydrogen Infrastructure Group (IHIG)
    - US National Hydrogen Association (NHA)
    - California Fuel Cell Partnership (CaFCP)
    - US Freedom Car Codes and Standards Technical Team
    - International Codes Council (ICC)

- EIHP2 partners have made a point of presenting EIHP aims and objectives at conferences and platform events whenever possible.