SIXTH FRAMEWORK PROGRAMME
NETWORK OF EXCELLENCE

Safety of Hydrogen as an Energy Carrier

Contract No SES6-CT-2004-502630

WP16 Contribution to standards and legal requirements
Deliverable 18

Lead participant:	INERIS - BAM
Partners	AL, BAM, BMW, BRE, CEA, HSL, JRC, NH, Risoe, Volvo, UNIPI, UU
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1. Progress Report

1.1 WORKPACKAGE OBJECTIVES AND STARTING POINT

Initial Objectives

1. Ensure by active participation to standardisation groups that consensual knowledge on hydrogen safety is adequately taken into account in the process of building new standards and regulations related to hydrogen technologies,
2. Make, whenever required proposal to standardisation organisations for new work on hydrogen safety related standardisation to be launched,
3. Provide hydrogen safety expertise to authorities.

Revised objectives (after kick off meeting):

• Follow of current standardisation and regulatory hydrogen safety activities: within WP16 persons are to be nominated to follow relevant standardisation and regulation working group progress,
• Based on progress (draft under votes) WP16 members should meet to discuss safety aspects of drafts when critical safety issues arise,
• If consensus or proposal emerged from WP16 meetings, this point of view should be communicated to the different shadow committees and directly on behalf of HySafe in the dedicated working group by the nominated HySafe representative,
• In case WP16 come to the conclusion that knowledge is not sufficient to provide a reasonable input to standardisation and regulation working groups, proposal for new jointly performed work will be forwarded to the network management.

This WP focussed on the revised objectives. These revised objectives will be pursued over the period to come. Objectives 2 and 3 have not been dealt with and will not be addressed for the year to come.

1.2 ACHIEVEMENTS

So far, WP16 partners hold their kick off meeting at INERIS on the 4th of May 2004. This meeting aimed at reviewing the WP objectives and at agreeing on the way forward. Newly agreed objectives are recalled above. Besides reviewing current participation of partners to regulation and standards working groups, WP16 decided to propose a survey to investigate the current interest of partners so as to focus our work.

A questionnaire has been released to identify priorities based on a set of criteria:
• technology maturity,
• potential market size,
• potential market location (is it a priority if not in Europe or is it an opportunity for EU companies?),
• likely date of first commercialisation,
• existing standards or regulations,
• hazard potential or risk,
• and finally, interface to the public.

These questionnaire went through different types of technologies:

• Hydrogen production
• Hydrogen distribution,
• Hydrogen storage,
• Transportation applications (vehicle and fuelling stations),
• Stationary applications,
• and finally portable applications.

Results were biased by the relative small number or responders (BMW, JRC, INERIS, UNIPI, AL, BAM and Volvo). Results showed a tendency to emphasise on mobile application (fuelling stations and storage). Besides, the hydrogen transport topic has also been identified as a priority.
It is however clear that work of ISO TC 197 ("hydrogen technologies"), IEC TC 105 ("fuel cells) as well as UN GRPE WP29 will be followed by this group. Participants have not been appointed yet to specific working groups. At present, BAM, NH, AL, INERIS and CEA are participating to ISO TC 197 activities. AL, BAM, INERIS and CEA are also participating in IEC TC 105. Finally BMW and Volvo are participating in UN GRPE WP29.

Contacts have been established with ISO TC197 and IEC TC105 secretariat in order to gain recognition of HySafe activity and eventually to allow us to circulate drafts. IEC never replied. ISO answered negatively to this offer for the reason that HySafe is not any legal entity. To overcome this difficulty and to facilitate draft circulation when necessary, we intend to identify and list:

- Presidents of European shadow committees,
- Secretary of the different ISO and IEC working groups.

WP16 also had a meeting at BMW in December 2004 to discuss WP16 objectives. BMW wanted to emphasise the need to address regulatory issues.

Contribution to the HFCTP informal group on RC&S has also been proposed. INERIS hosted the IGRC&S meeting on the 21st of January. For that occasion, a survey of the current organisation contributing to regulation codes and standards has been proposed. This review highlighted the need in Europe:

- to have European working groups where draft standards could be developed,
- to support European projects dedicated to this kind of outputs (EIHP, HyApproval).

This review and conclusions have also been presented in Brussels at the "RC&S workshop" organised by the commission on the 25th of February.

WP16 reported regularly on its activity during co-ordination committees. WP 16 representative mainly:

- gave an overview to the co-ordination committees of standardisation work under progress,
- and also proposed a feasibility study for a European based standard on "Basic Hydrogen Safety".

This latest point revealed that CEN standardisation group will never be created because a similar work topic is already dealt with at international level. This matter of fact hindered European capacity to get organised and to propose European draft standards.

However, in order to progress quality and homogeneity of safety approach in Europe, it would be relevant that the commission assesses European project proposal on safety criteria also. US DOE edited a specific guidance for project submitter indicating that a safety plan should be submitted along with the project. Quality of this safety plan is assessed by a panel of DOE experts. Among different criteria, funding is tight to their conclusion. Contacts have been established with DOE. Similar project assessment procedure will be proposed to the commission.

Then, prior to the voting deadline, the standard content of ISO/CD 16110-1 " *H_2 generators using fuel processing technologies Part 1: Safety*" have been forwarded to the WP16 participants. None of them showed interest to call or a meeting to discuss its content.

Morover, Volvo proposed, based on ISO/DIS 15869-5 "*Gaseous H2 and H2 blends - Land vehicle fuel tanks - Part 5: Particular requirements for fully wrapped composite tanks with a non-metallic liner*" to further study permeation rates proposed in this standard. This input to standard will be investigated in the course of the InsHyDe proposed internal project.

More recently, INERIS updated its work progress document about ISO TC197 and IECTC105. This document has been forwarded to WP16 partners.

It highlited that 3 crucial topics concerning safety are under vote, that is to say :

Document	Title	Closing date for voting
ISO/TC 197 N 310	NWIP « Hydrogen detectors	18/08/2005
105/91/CDV (IEC TC105)	Fuel cell technologies - Part 3-1: Stationary fuel cell power plants - Safety	Circulation : 20 May 2005 Closing date : 21 October 2005
105/88/CDV (IEC TC105)	Fuel cell technologies - Part 5: Portable fuel cell appliances - Safety and performance requirements	Circulation : 25 February 2005 Closing date : 29 July 2005

1.3 DEVIATIONS

1. HySafe representatives in the different standardisation and regulation working groups have not been identified yet,

2. List of standardisation and regulation working groups with related HySafe participation not available on the HySafe Website yet,

3. No standard an regulation discussed yet and no input to standard and regulation proposed,

4. Activity report not delivered yet.

1.4 REMEDIES ACTIONS

1. New WP objectives for the next JPA has been proposed A meting will follow (Warsaw University 15/06/2005). This meeting will address nomination of HySafe representatives in the different working groups,

2. A document will be sent to the webmaster to put this information in a dedicated page of the website,

3. This activity will start following this meeting to come,

4. D27 will be delivered in April once points 1 and 2 will be cleared off.

2. Example of contributiond during the reported period

2.1 AGREEMENT ON WP16 INITIAL OBJECTIVES : QUESTIONNAIRE SENT TO PARTNERS

« INERIS has been proposed to lead WP16 entitled “Contribution to Standards and Legal Requirements”. AL, BAM, BMW, BRE, CEA, HSL, JRC, NH, Risoe and Volvo proposed their contribution to this group.

Now comes the time to make up our mind on the activity we would like to share during the first 18 months of the NoE knowing that, on average, 1 MM has been allocated to all of you (INERIS and BAM have twice this amount).

As a reminder, the description of work indicates : “*End-users and hydrogen technologies developers would like to have a better view on current and future legal and standardisation requirements that might affect their plans. Indeed, one can easily see how difficult it would be to work on a technical project for which the legal and* ***standardisation frameworks are not clear****, or even more seriously where there are conflicting requirements in different markets. Such a situation would act as a barrier to the development and introduction of hydrogen technologies”*

Objective: “*HySafe will work to* ***ease introduction of hydrogen technologies in the general market by providing the safety expertise*** *required to progress the development of appropriate standards and regulations. Attention will be given to avoid pushing forward premature standards or regulations that hinder the development of innovative hydrogen technologies.”*

Above objective induces **three actions** :

1. Ensure by active participation to standardisation groups that consensual knowledge on hydrogen safety is adequately taken into account in the process of building new standards related to hydrogen technologies,
2. Make, whenever required, proposal to standardisation for new work on hydrogen safety related standardisation to be launched,
3. And finally provide safety expertise to authorities.

Three subtasks have been identified :

- the two first one concern our participation to standardisation groups,
- and the last one, concerns support to public authorities.
-

Regarding the above description, we have to get a presentation ready for the kick off meeting. At least, this presentation shall cover (see mail from Thomas JORDAN):

- specific objectives of the WP,
- approach and methodologies chosen,
- resources allocated
- assignment of responsibilities
- deliverables,
- and finally interactions with other WPs.

I need your input in order to write this presentation. Thus, here are few questions I would need you to answer or comment :

Questions	Comment from INERIS / **Write your own comment instead**
1. Basically, WP16 objectives are to spread safety excellence in standardisation groups and also to spread this excellence to public authorities for regulatory or decision making purposes to ease introduction of hydrogen technologies. **Do you agree with this overall objective ?**	
2. Which relevant standardisation group do you believe WP16 should take part to ? **Delete elements or complete the list** : • UN ECE WP.29 GRPE • ISO TC 197 “Hydrogen technologies”, • IEC TC 105 “Fuel Cells”, • ISO TC 58 & CEN TC 23 “Pressure vessels”, • ISO TC 22 “Road vehicles” • ISO TC 92 “Fire safety” • CEN TC 197 “Road tankers”, • ISO TC 21 “Equipment for fire protection and fire fighting”, • CEN TC 305 “Potentially explosive atmospheres – explosion prevention and protection”, • CENELEC working group on FC gas heating appliances.	
3. **Is your organisation taking part to standardisation groups** ? Which group(s) is it ?	As far as INERIS is concerned we take part to the French mirror committee of ISO TC197, IEC TC105 and CEN TC 305
4. How do you think we should organise ourselves for “WP16” to participate to standardisation groups ? **What specific input can we bring ?**	I would suggest to organise meetings (at least twice a year and more during the first year) to : - discuss the content of standardisation drafts and make “safety” proposals to be expressed in mirror committees each of us participate in, - identify standardisation issues where existing scientific knowledge / practical experience is not sufficient for appropriate standardisation and propose work to be done in the joint programme of activity (eg : what is the maximum acceptable leaking rate for a land vehicle ?,…) - identify areas where hydrogen technologies safety would benefit from new standardisation work and make proposal, The idea being to find consensus within HYSAFE so as all of us can speak

	the same voice at the committees we take part to.
5. What about **creating a list of existing standards on hydrogen ?** Do you know if this list exist already ? (NHA)	
6. Approach and methodology to chose ?	I can not think of any particular methodology except making sure that we cover all current work on standardisation (at least one representative of Hysafe in each group). Maybe, each of us can be appointed with the responsibility of following one group in particular and to communicate / keep up to date other members of WP16,… .
7. Resources allocated: who from your organisation will participate to the meetings and the work we will be doing ? Could you please complete or delete people from the attached list.	
8. What could be our activity on regulatory aspects ?	Regarding regulatory aspects, I believe that the starting point would be to list existing national expectations on key subjects and underline differences and similarities. An EoI entitled Hyapproval suggests to make this comparison in European countries for a "virtual refuelling stations" . What about collaborating to this work if it gets through ? What about doing the same thing on an easy subject such as comparing expectations on industrial hydrogen storage for instance ? Or a more difficult task would be to work on stationary power stations. If we spot great differences, calculations and / or experiments could be planned in the joint program of activity to asses the proposed safety distances for instance.
9. Can you think of any other "short term" action in the field of regulatory aspects ?	
10. Commission is keen on standardisation,… . Therefore, I believe that the commission expects a lot from us. Can you think of any other important action we should work on during the first 11 months ?	
11. Can you think of any "long term" actions in the field of regulatory aspects ?	Work could be done on mapping regulation priorities (RISOE). We could also work on editing guidance
12. As far as deliverables are concerned I am thinking about handing out an activity report. At least, this report shall indicate : - Our opinion on standards we worked on regarding safety aspects - Critical elements that shall be covered in the future by standardisation, - Scientific / experience lack in answering critical questions (inputs to JPA), - Information about comparison of national regulations.	

ANY COMMENT ON DELIVERABLES ?	
13. The commission (and the governing board) will evaluate our performance regarding technical subjects as well as “integration”. Therefore, we should propose performance indicators and targets on these two subjects. Can you propose some more performance indicators ?	As far as performance is concerned, performance indicators could be : - number of standardisation committees WP16 representative take part to versus total number of identified relevant committees, - number of inputs to draft standards documents, - number of EC countries chosen to make comparison on a given subject, And regarding “integration”, I could only suggest : - WP16 meetings attendance,
14. The kick off meeting will not give us much time to discuss about WP16 activity. Therefore, we must, as from now, set a date for the first meeting to take place. I would suggest : - 22nd of April - 23rd of April - 4th of May - or 5th of May.	

That is all for today, I am looking forward to hearing from you.

Please do not hesitate to contact me on 0033 344 556 339 to discuss the matter above. »

2.2. WORK STATUS OF ISO TC197 AND IEC TC 105

WP16 provided the consortium with two work status of ISO TC197 and IEC TC105 work progress. You will find below the latest one.

ISO TC 197 Update – 25/05/2005

1. SCOPE

Standardization in the field of systems and devices for the production, storage, transport, measurement and use of hydrogen.

2. ISO PUBLISHED STANDARDS / TECHNICAL REPORTS

Reference	Title
ISO 13984 : 1999	Liquid Hydrogen - Land vehicle fuelling system interface
ISO 14687 : 1999 & ISO 14687 : 1999/Cor 1 : 2001	Hydrogen fuel - Product specification
ISO/PAS 15594 : 2004	Airport H2 fuelling facility
ISO/TR 15916 : 2004	Basic considerations for the safety of hydrogen systems

3. DOCUMENT FOR VOTING

Document	Title	Closing date for voting
ISO/TC 197 N 310	NWIP « Hydrogen detectors	18/08/2005

4. DRAFT STANDARDS

WG	Document	Standard Title	Status
1	ISO/DIS 13985.3	Liquid Hydrogen – Land vehicle fuel tanks	Enquiry stage FDIS : January 2005 (approved 81%) IS : June 2005
5	ISO/DIS 17268	Gaseous H2 - Land vehicle filling connectors	Enquiry stage DIS approved (07-2004)
6	ISO/DIS 15869-1	Gaseous H2 and hydrogen blends - Land vehicule fuel tanks - Part 1: General requirements	Enquiry stage DIS disapprouved (06-2004)
6	ISO/DIS 15869-2	Gaseous H2 and H2 blends - Land vehicule fuel tanks - Part 2: Particular requirements for metal tanks	Enquiry stage DIS approved (06-2004) FDIS : October 2004 IS : ,January 2005
6	ISO/DIS 15869-3	Gaseous H2 and H2 blends - Land vehicule fuel tanks - Part 3: Particular requirements for hoop wrapped composite tanks with a metal liner	Enquiry stage DIS approved (06-2004) FDIS : October 2004 IS : ,January 2005
6	ISO/DIS 15869-4	Gaseous H2 and H2 blends - Land vehicule fuel tanks - Part 4: Particular requirements for fully wrapped composite tanks with a metal liner	Enquiry stage DIS approved (06-2004) FDIS : October 2004 IS : ,January 2005
6	ISO/DIS 15869-5	Gaseous H2 and H2 blends - Land vehicule fuel tanks - Part 5: Particular requirements for fully wrapped composite tanks with a non-metallic liner	Enquiry stage DIS disapprouved

8	ISO/CD 22734-1	H2 generators using water electrolysis process. Part 1: Industrial and commercial applications	Comments/voting summary circulated DIS : 2004-10 (under review, DIS vote to come soon) FDIS : 2005-10 IS :2006-0
8	ISO/CD 22734-2	H2 generators using water electrolysis process. Part 2: Residential applications	Committee draft registered CD : 2005-06 DIS : 2005-12 FDIS : 2006-12 IS :2007-06
9	ISO/CD 16110-1	H2 generators using fuel processing technologies. Part 1 : Safety	Comments/voting summary circulated CD : 2004-04 (DIS vote to come soon) DIS : 2004-12 FDIS : 2005-09 IS : 2005-12
9	ISO/CD 16110-2	H2 generators using fuel processing technologies. Part 2 : Procedures to determine efficiency	CD study / ballot initiated CD : 2005-06 DIS : 2005-12 FDIS : 2006-12 IS :2007-06
10	ISO/CD 16111	Transportable gas storage devices -- H2 absorbed in reversible metal hydride	CD study / ballot initiated CD : 2004-10 (vote on CD closed in Februar 2005)

			DIS : 2005-04 FDIS : 2006-04 IS : 2006-10
11	ISO/AWI TS 20012	Gaseous H2 - Service Station	New project registered DTS : 2006-10
12	ISO 14687 : 1999/AWI Amdt	Hydrogen fuel - Product specification	New project registered CD : 2004-11 DIS : 2005-05 FDIS : 2006-05 IS : 2006-11

CD : Committee Draft
DIS : Draft of International Standard
FDIS : Final Draft of International Standard
PAS : Publicly Available Specification
TR : Technical Report
TS : Technical Specification

5. STANDARDS PROJECTS CANCELLED

Document	Standard Title
ISO/W1/15866	Gaseous H_2 blends and H_2 fuel - Service stations
ISO/DIS 13985-2	Liquid H_2 - Land vehicle fuel tanks - Part 2: Installation and maintenance
ISO/WD 13986	Multimodal transportation of liquid H2

6. MEMBERSHIP

– 18 Participating countries

Argentina (IRAM), Austria (ON), Belgium (IBN), Denmark (DS), Egypt (EOS), France (AFNOR), Germany (DIN), Italy (UNI), Japan (JISC), Korea, Republic of (KATS), Netherlands (NEN), Norway (SN), Russian Federation (GOST R), Spain (AENOR), Sweden (SIS), Switzerland (SNV), USA (ANSI)

– 12 Observing coountries

Australia (SA), China (SAC), Czech Republic (CNI), Hungary (MSZT), India (BIS), Jamaica (JBS), Libyan Arab Jamahiriya (LNCSM), Serbia and Montenegro (ISSM), Thailand (TISI), Turkey (TSE), Ukraine (DSSU), United Kingdom (BSI)

IEC TC 105 : Fuel Cell Technologies Update – 25/05/2005

7. SCOPE

To prepare international standards regarding fuel cell (FC) technologies for all FC applications such as stationary FC power plants, FC for transportation such as FC propulsion systems and auxiliary power units and portable FC power generation systems.

8. IEC PUBLISHED STANDARD

IEC 62282-2 (2005-03) English and French
Fuel cell technologies - Part 1: Terminology

IEC 62282-2 (2004-07) English and French
Fuel cell technologies – Part 2 : Fuel cell modules

9. DOCUMENT FOR VOTING

Document	Title	Closing date for voting
105/91/CDV	Fuel cell technologies - Part 3-1: Stationary fuel cell power plants - Safety	Circulation : 20 May 2005 Closing date : 21 October 2005
105/88/CDV	Fuel cell technologies - Part 5: Portable fuel cell appliances - Safety and performance requirements	Circulation : 25 February 2005 Closing date : 29 July 2005

10. DRAFT STANDARDS

WG	Standard	Standard Title	Status	Status

				Document
3	**IEC 62282-3-1**	Fuel cell technologies - Part 3-1: Stationary fuel cell power plants - Safety	CDV (under vote)	105/91/CDV
4	**IEC 62282-3-2**	Fuel cell technologies - Part 3-2 : Stationary fuel cell power plants - Test methods for the performance	RDIS - FDIS: September 2004	105/58/CDV
5	**IEC 62282-3-3**	Fuel cell technologies - Part 3-3: Stationary fuel cell power plants - Installation	ANW - CD : Autun 2005	105/24/NP
6	**IEC 62282-4**	Fuel cell technologies - Part 4: Fuel cell system for propulsion and auxiliary power units (APU)	PWI	105/23/NP
7	**IEC 62282-5**	Fuel cell technologies - Part 5: Portable fuel cell appliances - Safety and performance requirements	CDV (under vote)	105/88/CDV
8	**IEC 62282-6-1**	Fuel cell technologies - Part 6-1: Micro Fuel Cell Power Systems - Safety	ANW	105/61/NP
9	**IEC 62282-6-2**	Fuel cell technologies - Part 6-2: Micro fuel cell power systems - Performance	ANW 2005	105/70/RVN
10	**IEC 62282-6-3**	Fuel cell technologies - Part 6-3: Micro fuel cell power systems - Interchangeability	ANW	105/72/NP

PNW *Proposed New Work*
RDIS *Text for FDIS received and registered*
FDIS *Final Draft International Standard*
CD *Committee Draft*
ANW *Approved New Work*
PWI *Potential New Work Item*
RVC *Results of Voting on Committee Draft for Voting*
RVN *Results of Voting on New Work Item Proposal*

11. LAST RESULTS ON VOTING

Document	Standard Title	Result of Voting
IEC 62282-3-2 Ed. 1.0	Fuel cell technologies - Part 3-2 : Stationary fuel cell power plants - Test methods for the performance	Approved (67%) on January 2005

12. MEMBERSHIP

- **16 participating countries**
  - Australia, Canada, China, **Denmark**, Finland, **France**, **Germany**, **Italy**, Japan, Republic of Korea, **Netherlands**, **Spain**, Sweden, Switzerland, **United Kingdom**, United States of America

- **8 observer countries**
  - Austria, Belgium, Egypt, , **Norway**, Poland, Portugal, Serbia and Montenegro, Thailand, Yugoslavia

2.3 WORK PRIORITISATION QUESTIONNAIRE

Based on agreed objectives, a questionnaire has been submitted to partners to prioritise work topics. The proposed questionnaire is given below.

HYSAFE WP 16
Standardisation and regulation aspects

Mapping of priorities : ranking matrix

****

1. LIST OF CRITERIA : CLASSIFICATION

- technology maturity

☐	Very mature
☐	Mature
☐	No mature

- potential market size

☐	Great
☐	Medium
☐	No important

- potential market location (*is it a priority if not in Europe or is it an opportunity for EU companies?*)

☐	International
☐	Europe
☐	National

- likely date of first commercialisation

☐	<2010
☐	2010-2020
☐	>2020

- existing standards or regulations

☐	Do not exist

☐	Exist but no adequate
☐	Exist and adequate

- hazard potential or risk

☐	Very hazardous
☐	Hazards exist but can be assessed
☐	No hazardous

- Interface to the public

☐	Not established
☐	Needs some progress
☐	Well established

2. RANKING MATRIX

HYDROGEN INFRASTRUCTURE

	MATURITY	MARKET SIZE	MARKET LOCATION	1ST COMMERC.	R&S	HAZARD OR RISK	INTERFACE TO PUBLIC
H_2 PRODUCTION							
1.1 STEAM REFORMING							
1.1.1. Size							
1.1.1.1. Small reforming							
1.1.1.2. Industrial reforming							
1.1.2. Type of fuel							
1.1.2.1. Methanol steam reforming							
1.1.2.2. Natural Gas steam reforming							
1.1.2.3. Gasoline/diesel fuel reforming							
1.1.2.4. Oil/naphta refroming							
1.2. ELECTROLYSIS							
1.2.1. Size							
1.2.1.1 Small electrolysis (associated small scale compression/liquefaction).							
1.2.1.2. Industrial electrolysis							
1.2.2. Type							
1.2.2.1. Water electrolysis							
1.2.2.2. Photoelectrolysis							
1.3. BIOMASS GASIFICATION AND PYROLYSIS							
1.4. COAL GASIFICATION							
1.5. NUCLEAR PRODUCTION							
1.6 AMMONIA SPLITTING							
1.7 COMPRESSOR TECHNOLOGY							
1.8 VALVES AND FITTINGS							
1.9 PURIFICATION TECHNOLOGY							

	MATURITY	MARKET SIZE	MARKET LOCATION	1ST COMMERC.	R&S	HAZARD OR RISK	INTERFACE TO PUBLIC
2. HYDROGEN DISTRIBUTION							
2.1. TRUCK TRANSPORT							
2.1.1. Cryogenic hydrogen							
2.1.2. Gaseous hydrogen							
2.2. PIPELINES							
2.2.1. Pure H_2							
2.2.2. H_2 + CH_4							
2.3. SEA TRANSPORT, BARGE TRANSPORT							
3. HYDROGEN STORAGE (IN BIG QUANTITIES)							
3.1. CRYOGENIC H_2							
3.2. GASEOUS H_2 / COMPRESSION							
3.3. HYDRIDES							
4. TRANSPORTATION APPLICATIONS							
4.1. FILLING STATIONS							
4.1.1. Source of hydrogen							
4.1.1.1. Cryogenic H_2 tanks							
4.1.1.2. Compressed H_2 pipes							
4.1.1.3. Reforming onsite							
4.1.1.4. Electrolysis onsite							
4.1.1.5. Tube trailers							
4.1.2. Type of filing station							
4.1.2.1 H_2 filling station							
4.1.2.2. H_2 refilling stations integrated in conventional refilling stations							
4.1.3. Infrastructure/vehicle interface							
4.1.4. Compressor technology							
4.1.5. H_2 Dispenser							
4.1.6. Valves and fittings							
4.1.7. Purification technology							

4.1.8 Detection

APPLICATIONS

	MATURITY	MARKET SIZE	MARKET LOCATION	1ST COMMERC.	R&S	HAZARD OR RISK	INTERFACE TO PUBLIC
4. TRANSPORTATION APPLICATIONS							
4.2. VEHICLE (PRIVATE AND PUBLIC TRANSPORT)							
4.2.1. Fuel Cell							
4.2.2. Fuel storage							
4.2.2.1. Hydrides							
4.2.2.2. Liquid hydrogen							
4.2.2.3. Gaseous H_2 at 350 Bar							
4.2.2.4. Gaseous H_2 at 700 Bar							
4.2.3. Internal combustion engine							
4.2.4. A.P.U							
4.3. TUNNELS							
4.4. PARKING (PUBLIC PARKING, PRIVATE GARAGE)							
4.5. VEHICLE MAINTENANCE (E.G. MAINTENANCE GARAGE)							
4.6. OTHER TRANSPORT APPLICATIONS							
4.6.1. Rail							
4.6.2. Marine							
4.6.3. Air							
4.6.4. Off-road, e.g. specialist construction or forestry equipment							
5. STATIONARY APPLICATIONS							
5.1. ≈100 KW TO MW (E.G. : COGENERATION)							
5.2. FEW KW (RESIDENTIAL)							
5.2.1. Residential appliance maintenance/repair							
5.3. POWER BACK-UP							
6. PORTABLE APPLICATIONS							
6.1. FUEL							
6.1.1. Hydrogen cartridge							

6.1.2. Methanol cartridge

2.4 FEASABILITY STUDY FOR A EUROPEAN STANDARD WORKING GROUP ON SAFETY

A feasibility study has been done on whether a dedicated european standardisation working group on safety would be possible and appropriate. Detailed of this study are given in the power point in appendix B

2.5 DOW FOR THE NEXT PERIOD

Work package / project number	16	**Start date or starting event:**		month 1			
Activity type	Other specific activities						
Application addr. /project support	V5 / All						
Participant ID	AL	BAM	BMW	BRE	CEA	HSL	INERIS
Person-months per participant	1	1.5	0.8	0.9	0.8	0.8	2.5
Participant ID	JRC	NH	Risø	Volvo	UNIPI	UU	
Person-months per participant	0.5	0.8	0.8	0.8	0.8	0.8	

Objectives

Technical objectives

- Ensure by active participation to targeted standardisation (ISO, IEC) / UN ECE groups that consensual knowledge on hydrogen safety is adequately taken into account in the process of building new standards and regulatory requirements related to hydrogen technologies.
- Promote consensus within EC countries on safety related standardisation / regulatory aspects in order to strengthen the interest of EC countries when voting take place at ISO, IEC, UN or other relevant organisations,
- If requested by other projects (HYAPPROVAL, HYCOM, HYGUIDE,…), review guidelines / safety report produced under these projects and forward them our opinion about their content,
- Identify knowledge gaps that would require further studies prior to standardisation or the development of regulatory requirements.

Information

- Follow progress of ISO TC 197 and appropriate TC22 SC25 new working group dedicated to review existing standards regarding their suitability for hydrogen,
- Follow and report on the progress made by the European Hydrogen and Fuel Cell Technology Platform (Informal group on regulations, codes and standards) and the HarmonHy project
- Follow and report on the progress made by the CEN ad-hoc group on review of existing standards and identification of gaps,

Communication

- Pursue official links with ISO and IEC organisations,
- Provide up to date information to HySafe partners on the status of standardisation and UN ECE regulatory development through our webpage,
- Report on standardisation and regulatory development and related WP16 contribution to the HySafe partners,
- Make visible WP16 activity to external stakeholders trough our website.

Update
During the first period, WP16 members have defined the level and nature of contribution they could give to standardisation and UN ECE regulatory groups. A matrix has been filled by most of the partners in order to identify priorities this group will focus on. Result of this matrix still has to be thoroughly analysed. Still, drafting few priorities seems to be difficult due to heterogeneous interests showed by partners.
As a consequence and in order to get our work started, changes will be brought in the way we are organised.
First of all, up-to-date and regular information on standardisation development within IEC and ISO (as a start) will be posted on HySafe web-page. Partners will be invited to comment on documents submitted to vote and eventually call for a meeting when appropriate. Information agreed on in the course of these meetings should be forwarded to European mirror groups in an attempt to harmonise their response to ISO or IEC votes (NB: All European P-members are not yet partners in WP16). Regarding UN ECE activity, a spokesperson will be identified to deliver our point of view to this group.

Meetings will take place **at least** twice a year in conjunction either with general meetings (co-ordination committee meetings or NGB meetings). These meetings will be divided into three main parts:

1. Information / update on standardisation – regulatory development and related working group progress. Partners will be appointed to report on a given subject,
2. Technical discussion on draft standard document submitted to vote as well as on technical documents submitted by other EC funded projects when requested,
3. Wrap up and conclusions to be delivered to HySafe partners.

Representatives of technical work packages (dispersion, ignition, and explosion) will also be invited to these meetings in order to collect their views on phenomenological aspects that might be exposed in reviewed documents.

The only regulatory related activity to be considered during this JPA will be the UN ECE automotive regulations and any related European activities.

Description of work

Partner INERIS in conjunction with BAM will lead this activity.

Sub-task 16.1: Organising and structuring the work
INERIS will be responsible for:

- creating and keeping our pages on the website, including the list of delegates, up to date (INERIS),

- distributing documents for comments (unless the access is restricted to standardisation organisation members),
- collecting comments from partners on draft standards under vote or any other document distributed for comment,
- calling for meetings and organise them to discuss technical issues.

To further communicate on the RC&S issues, the list of HySafe representatives and the working groups they take part into will be made available on our web site. Remarks made on behalf on WP16 within these working groups will also be available through the web site.
Partners will also report on standardisation activity through the biennial report on hydrogen safety.

Lead: INERIS, BAM. Partners: all

Sub-task 16.2. Follow up and action

Work of ISO, IEC, UN, IG-RCS (technology platform), CEN, hydrogen safety related projects (HYAPPROVAL, HYGUIDE,…) will be followed up by HySafe representatives still to be chosen.

HySafe representatives will be in charge of:

- reporting on progress in the course of our meeting,
- representing HySafe WP16 within the working group they take part into and convey remarks we made consensus upon during our technical discussion.

Lead: BAM. Partners: all

Sub-task 16.3. (InsHyDe contribution)
This task consists in writing a draft "guide" on the "safe use of hydrogen systems in confined spaces". Uncertainties revealed in the process of writing this draft shall contribute to the design of planned confined experiments. An updated version of this guide should then be written based on experimental results.
Lead: INERIS. Partners: InsHyDe

Milestones Input to WP1 (month 15) List of delegates and standardization information on the website (month 15) InsHyDe contribution “Review of existing literature” InsHyDe contribution D73 draft “guide” on the “safe use of hydrogen systems in confined spaces”.
Deliverables D18. Activity report (month 11) D48. Activity report (month 22) D73 Draft safety guidelines (InsHyDe)

APPENDIX A : PARTNERS PARTICIPATION IN STANDARDISATION GROUPS

Standardisation group	Partner taking part to
- **ISO TC 197 "Hydrogen technologies"**	- BAM, NH, AL,INERIS, CEA
- ISO TC 58 & CEN TC 23 « Pressure vessels »	- BAM, Air Liquide,
- ISO TC 22 « Road vehicles »	
- ISO TC 20 « Aircraft and space vehicles »	- BAM
- ISO TC 92 «Fire safety »	- BAM
- ISO TC 220 « Cryogenic Vessels »	- Air Liquide
- CEN TC 197 « Road tankers »	- BAM
- ISO TC 21 « Equipment for fire protection and fire fighting »	- BAM
- **IEC TC 105 « Fuel Cells »**	- Air Liquide, BAM, INERIS,CEA
- CEN TC 305 « Potentially explosive atmospheres – explosion prevention and protection »	- BAM, INERIS
- CENELEC working group on **FC gas heating appliances**	

APPENDIX B : DOE PROCEDURE FOR PROJECT EVALUATION BASED ON SAFETY CRITERIA (SEE ATTAHCED PRESENTATION)