

Executive Summary

The European research related to hydrogen safety has been largely fragmented. To overcome fragmentation of this kind, to support the needed integration and focusing of the related efforts the European Commission created a new instrument, the so-called Networks of Excellence NoE. The goal of the NoE HySafe is to provide the basis to facilitate the safe introduction of hydrogen as an energy carrier, by removing the described safety related obstacles. The integration of the dispersed efforts will thus contribute to a sustainable development in Europe. The objectives of the network are to

- strengthen, focus and integrate the fragmented research on hydrogen safety
- form a self-sustained competitive scientific and industrial community
- promote public awareness and trust in hydrogen technologies and
- develop an excellent safety culture.
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The network has been constituted with 24 partners from 12 European countries and one partner from Canada, the University of Calgary. There are 12 partners from public research institutions, 7 industrial partners and 5 universities.

HySafe is coordinated by the Forschungszentrum Karlsruhe. The coordinator contact is:

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More than 110 scientists from these institutions have been nominated to contribute to the network. This number was the basis for the determination of the maximum EC grant, which is 7 Mio Euro for 5 years. The total budget is 13 Mio for the same period.

The HySafe logo



may be downloaded from the website www.hysafe.org/

The formal start of the network has been March 1st, 2004. In the meanwhile the organizational structure described below has been set up and all workpackages started their activities.

<i>Name of Institution</i>	<i>Abbrev.</i>	<i>Country</i>
Forschungszentrum Karlsruhe GmbH	FZK	DE
L'Air Liquide	AL	FR
Federal Institute for Materials Research and Testing	BAM	DE
BMW Forschung und Technik GmbH	BMW	DE
Building Research Establishment Ltd	BRE	UK
Commissariat à l'Energie Atomique	CEA	FR
Det Norske Veritas AS	DNV	NO
Fraunhofer-Gesellschaft ICT	Fh-ICT	DE
Forschungszentrum Jülich GmbH	FZJ	DE
GexCon AS	GexCon	NO
The United Kingdom's Health and Safety Laboratory	HSE/HSL	UK
Foundation INASMET	INASMET	ES
Inst. Nat. de l'Environnement industriel et des RISques	INERIS	FR
Instituto Superior Technico	IST	PT
European Commission - JRC - Institute for Energy	JRC	NL
National Center for Scientific Research Demokritos	NCSR	EL
Norsk Hydro ASA	NH	NO
Risø National Laboratory	Risø	DK
TNO	TNO	NL
University of Calgary	UC	CA
University of Pisa	UNIPI	IT
Universidad Politécnica de Madrid	UPM	ES
University of Ulster	UU	UK
VOLVO Technology Corporation	Volvo	SE
Warsaw University of Technology	WUT	PL

Table 1: HySafe consortium members with their national origin

The structuring of the HySafe work follows a matrix arrangement with risk control levels from release, via ignition and fires, via explosions to mitigation and risk assessment control indicating the different columns. The rows are reserved for the different applications, like large scale production, distribution, street vehicles, other vehicles and portable applications.

The expertise for the columns is manifested in the workpackages WP8 to WP12. The other workpackage have basic support character or are organizing dissemination activities. All 17 workpackages contribute to the network integration.

<i>WP</i>	<i>Name of Workpackage</i>	<i>Abbr.</i>	<i>Lead</i>
1	Biennial Report on Hydrogen Safety	BRHS	INERIS
2	Integration of Experimental Facilities	IEF	FZJ
3	Standard Benchmarking Exercise Problems	SBEP	UPM
4	Scenario and Phenomenon Ranking	SPR	CEA
5	Hydrogen Incidence and Accident Database	HIAD	DNV
6	Principal CFD Exercises and Guidelines	CFDC	FZK
7	Mapping and Prioritisation Activities	MPA	RISOE

8	Release, mixing and distribution		NCSR
9	Hydrogen ignition and jet fires		HSE
10	Hydrogen explosions		FZK
11	Mitigation		GexCon
12	Risk Assessment Methodologies		DNV
13	Website	WS	FZK
14	e-Academy		UU
15	Conference on Hydrogen Safety	ICHS	UNIPI
16	Standards, Legal Requirements		INERIS
17	Overall management		FZK

Table 2: HySafe workpackages

A detailed catalogue of the experimental facilities has been compiled. It contains more than 80 hydrogen specific testing facilities including all relevant details. It has been published on the HySafe website <http://www.hysafe.org/index.php?ID=40&deliverable=9>.

WP4 organised a Phenomenon Identification and Ranking Table (PIRT). PIRT analyses are well established in nuclear research and are based on experts' judgments. For this activity a very detailed table differing and labeling all different phenomena has had to be developed. The major outcome of the first voting is that small releases in confined or partially confined areas especially from small electrolyzers and large scale transportation through tunnels play the most important role and should be treated first.

These results supported by an ad-hoc "Macro-PIRT" helped to define the first set of headlines namely "(Partially) Confined Releases" and the related "Mitigation" measures. The headline concept has been established to orientate the network on intermediate time scale (proposals for experiments, benchmarking,...) internally, but also to indicate "what's going on in HySafe" to the externals.

For the database of WP5 the input template and the data record definition have been agreed. The parallel US DOE activities showed interest for cooperation.

In WP6 the initial set of benchmarking examples has been determined in cooperation with WP7. The results of the first two obligatory benchmarking examples SBEPV1 and SBEPV2 have been delivered by all participating consortium members. Both have been open benchmarks, in SBEPV1 there is a release in a large cylindrical vessel initially filled with air and with a diffusion controlled long phase after the release, SBEPV2 provides the transient combustions of a large hemisphere filled with stoichiometric hydrogen air mixture and covered only with a foil. Despite the simplicity of both experiments the experimental simulations deviate considerably.

WP7 conducted a state-of-the-art survey where all projects the partners are involved in currently are listed and organized and on-line questionnaire where besides all HySafe experts also externals have been asked to give their view on the present gaps and research necessities. All this work had considerable impact on the definition of the second year program and on the formulation of the headlines mentioned above.

The website www.hysafe.org has been set up earlier than planned (see Fig. 3). It consists of a public and an internal part. All members have the ability to edit the pages in a controlled way. The network documents, as there are deliverables, meeting minutes, decision and presentation proposals as well as (external) background information may be up- and downloaded to and from the webpage. Additionally some anonymous email addresses like coordinator@hysafe.org and complete email lists like group.WP16@hysafe.org have been set up.

The newsgroups services have been set up. However, due to the need for special newsgroup reader software the acceptance of this alternative communication channel has not been accepted broadly so far.

The website provides a feature which allows for an online organization of the different meetings. A database for all personal data which may be exhibited deliberately is included. Again every member has full control, especially on his data and data presentation.

The website integrates the online presentation of the experimental facilities, support the online editing of the BRHS and of the curriculum of the e-Academy. It will provide an interface to the HIAD database.

So, effectively the website is the communication platform and pools and supports all the workpackages at one reference location.

The first edition of the biennial report on Hydrogen Safety is going to be published in autumn 2005. It will contain the first edition of the Handbook for Hydrogen Safety.

Educational programs are being designed. They will be the first educational programs of this kind and quality in Europe. The current version of the curriculum designed for safety engineers may be browsed on <http://www.hysafe.org/index.php?ID=68>.

A summer school will be set up already this year, provided some additional financial support from the EC will be granted in the frame of the Marie-Curie-Program.

To open up the network a supporters group has been recently established. Supporters must be registered and will get access to a specific section of the HySafe website, the Supporter Section (internal login via www.hysafe.org/login.php). The state of HySafe Supporter will be granted by the HySafe consortium. A Supporter can be any organisation working in the same field as HySafe or in related fields of hydrogen safety including research, equipment, product development, safety assessments, education, regulations, codes and standards. The origin of the Supporter is not limited to European Union countries.

The first International Conference on Hydrogen Safety will be organized in 2005. It is the first Conference dedicated to the hydrogen safety topic. It will host the first workshop of the IPHE RC&S workshop. The conference is organized in cooperation with the Japanese Project ArdentHy, the EC projects StorHy, NATURALHY and CUTE, the International Association for Hydrogen Energy and the Italian National Firecorps. It will take place in September 8-10, 2005 at the Congress Palace, Pisa, Italy.

The sessions will chaired pair wise by industry and research specialists.

For further information see the HySafe website or go directly to <http://conference.ing.unipi.it/ichs>.