

HyApproval

Handbook for Approval of Hydrogen Refuelling Stations
(SES6 - 019813)

HyApproval



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HyApproval Partnership

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Air Liquide S.A. (AL)

Air Products PLC (APL)

BP plc

Chinese Academy of Sciences, Technical Institute of Physics and Chemistry (CAS)

Commissariat à l'Energie Atomique (CEA)

Demokritos National Center for Scientific Research (NCSR)

Det Norske Veritas AS (DNV)

Eni S.p.A. (ENI)

Engineering Advancement Association of Japan (ENAA)

Federazione delle Associazioni Scientifiche e Tecniche (FAST) in collaboration with H2IT

Forschungszentrum Karlsruhe GmbH (FZK)

GM/Opel

Health and Safety Executive (HSE)

Hydrogenics Europe N.V.

Icelandic New Energy Ltd. (INE)

Institut National de l'Environnement Industriel et des Risques (INERIS)

Instituto Nacional de Técnica Aeroespacial (INTA)

Joint Research Centre of the European Commission (JRC)

Linde AG

National Renewable Energy Laboratory (NREL)

Norsk Hydro ASA (Hydro)

Netherlands Organisation for Applied Scientific Research (TNO)

Shell Hydrogen B.V.

Total France

Ludwig-Bölkow-Systemtechnik GmbH (LBST)

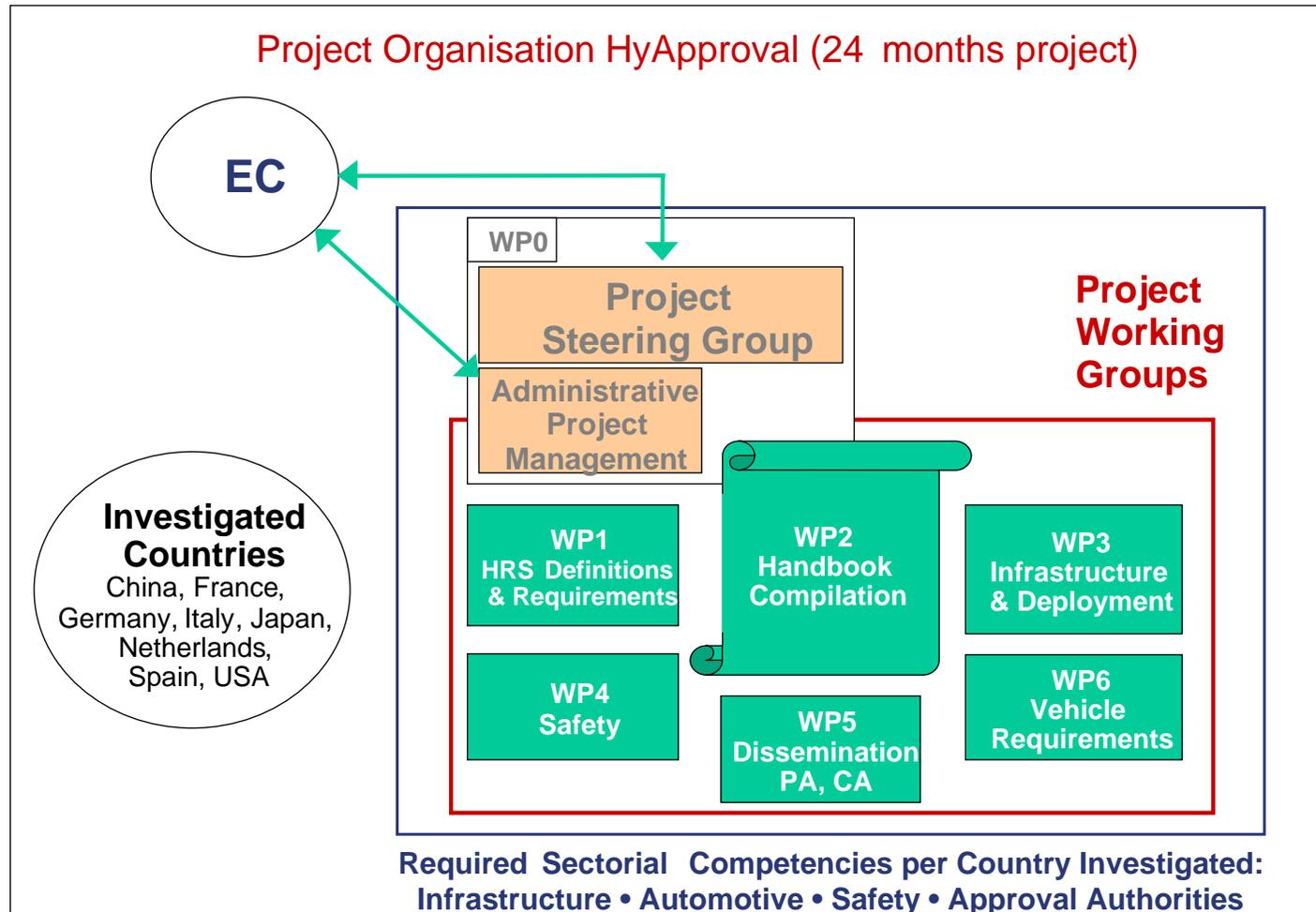
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Project Organigram

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Main Achievements

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- Originally planned *Final Design Paper* will become a *side-document* to the Handbook containing this *information* which has been *collected in the framework of the HyApproval project* and which would have disturbed the integrity of the HB document. [WP1]
- *Handbook for HRS approval* in Europe providing *guidelines for design, operation & maintenance* of HRS [WP2]
- Outline of the *permitting process* for obtaining an approved HRS [WP2]
- *Authority feedback* from five European countries, the US and China on the Handbook structure and contents [WP3]
- *List of contact* to European fire brigades, *General seminar outline & calendar*, *Dissemination models* for different countries, *Dissemination packages* – Dissemination in preparation for Q4 of 2007 [WP5]
- General refuelling *interface description*, *data exchange* vehicle-HRS, *refuelling process* and *safety during refuelling* [WP6]

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Main Achievements

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- Safety findings [WP4]:
 - *Review of Best Practices* based on actual experiences with Hydrogen Refuelling Stations across Europe, US & Japan / Risk acceptance criteria / Safety studies (D4.1)
 - *Establishment of Best Practices for Safety* (D4.2)
 - Agreement on *safety documentation* for Handbook and actions to complete HRS documentation & Agreement on required *safety documentations* (D4.3&4.5)
 - Identification and critical review of *databases for reliability data* (D4.4)
 - Agreement on required *modelling tools & techniques* for *risk assessments* and simulations, *accident scenarios, credible leak rates* (D4.6)
 - *Guidance for Safety Aspects* of Hydrogen Infrastructure Projects including safety documentation and safety plan checklist (D4.7&D4.10)
 - *Proposed list of scenarios* for the modelling task (D4.8)
 - *Quantitative risk assessment* of hydrogen refuelling stations with on-site production (D4.9)
 - *Risk assessments & accident simulations* including assumption and study basis, consequence assessments, description of example case study HRS, frequency assessments and event tree assessments (D4.11&D4.12)

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Lessons Learned

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- Everything takes much longer than anticipated
- Safety analysis work took almost half of all efforts in the project well into year two
- Handbook compilation and finalisation, also a time critical and iterative activity, therefore delayed and now in its finalisation phase
- Diverging views on how soon certain processes should be fixed and proposed as guideline (e.g. based on still not sufficiently mature technology or processes applied)
- Common position among partners for the need of maintaining the Handbook alive after project end
- No common position among partners for an immediate effort to transfer the Handbook to an EC Regulation or Directive



Lessons Learned

The development of an EC Regulation for H2 Motor Vehicles took almost 11 years from the start of EIHP1 on 01FEB1998 to the expected date of approval in FEB2009



Industry participating in HyWays [www.hyways.de] has identified a H2 vehicle population of between 1 and 5 million units on European roads by 2020 with a rapidly growing introduction after 2015.

This requires about $\leq 1,000$ HRs between 2010 and 2015 and between 13,000 and 20,000 between 2015 and 2025.

This required a regulatory framework for HRS approval in Europe shortly after 2010 in place.



Discussion Topics

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Elements to be integrated into a coherent and coordinated EU strategy for RCS within the context of the JTI:

Support for regulatory and standardisation activities (for example via ISO, IEC and UN/ECE) will be required to achieve EU-wide and global harmonisation of the emerging hydrogen technology. [adapted from HarmonHy]

An organisation for enabling service, support and maintenance of the Handbook should be nominated. This organisation preferably could have the capability to develop the Handbook together with the European Commission towards an EC regulation or directive at a later stage.

Establishing this activity as a "*HRS Approval Industry Grouping*" could be beneficial as positioning towards the future JTI activities and there in the *JTI Program Office*. [HyApproval]



Discussion Topics

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RCS actions needed for coordinating EC RCS contributions for HRS to international bodies:

- Prepare strategies on HRS-relate RCS matters in the field of transportation and stationary applications [adapted from HarmonHy]
- Develop a multi-year budget [adapted from HarmonHy]
- Assign priorities of Europe's RCS needs and ensure European interests are well represented in any global forum [adapted from HarmonHy]
- Ensure that the lessons learned from the EC and Member State funded R&D (e.g. *HyApproval*) and demo projects (e.g. *HyFleet:Cute*, *CEP*, *ZeroRegio*, etc.) are fed back into the RCS process [adapted from HarmonHy]
- ISO has issued a draft HRS standard (ISO/DTS 20012). Restrictions and requirements in the handbook can be streamlined/ simplified by using these in cross-references and thus avoid mismatching/ contradicting information. [HyApproval]



Discussion Topics

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Type of structures to be put in place to ensure a systematic and strategic approach and transfer of knowledge from projects to relevant international regulatory and standards-making bodies:

- The *JTI Program Office* would support the transport and stationary (including refuelling infrastructure), portable, hydrogen supply and cross-cutting issues and coordinate regulatory and standardization efforts [adapted from the HFP IP]
- The *JTI Program Office* would facilitate and prioritise RCS issues within the EC, including all EC funded activities [adapted from the HFP IP]



Role of international cooperation:

- International cooperation on PNR work should be encouraged through forums such as IPHE and IEA or international R&D projects [adapted from HarmonHy]
- The RCS work should be done at the international level (ISO, IEC and UN ECE) [adapted from HarmonHy]
- The use of an Independent Global Harmonization Body (e.g. the GCG) is also seen as an important feature to resolve RCS conflicts that are inevitable in order to reach global consensus [adapted from the HFP IP]
- Contact and cooperation with other key national organisations, e.g. DOE and ENAA should be formalised [HyApproval]



Acknowledgement

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