HyApproval

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


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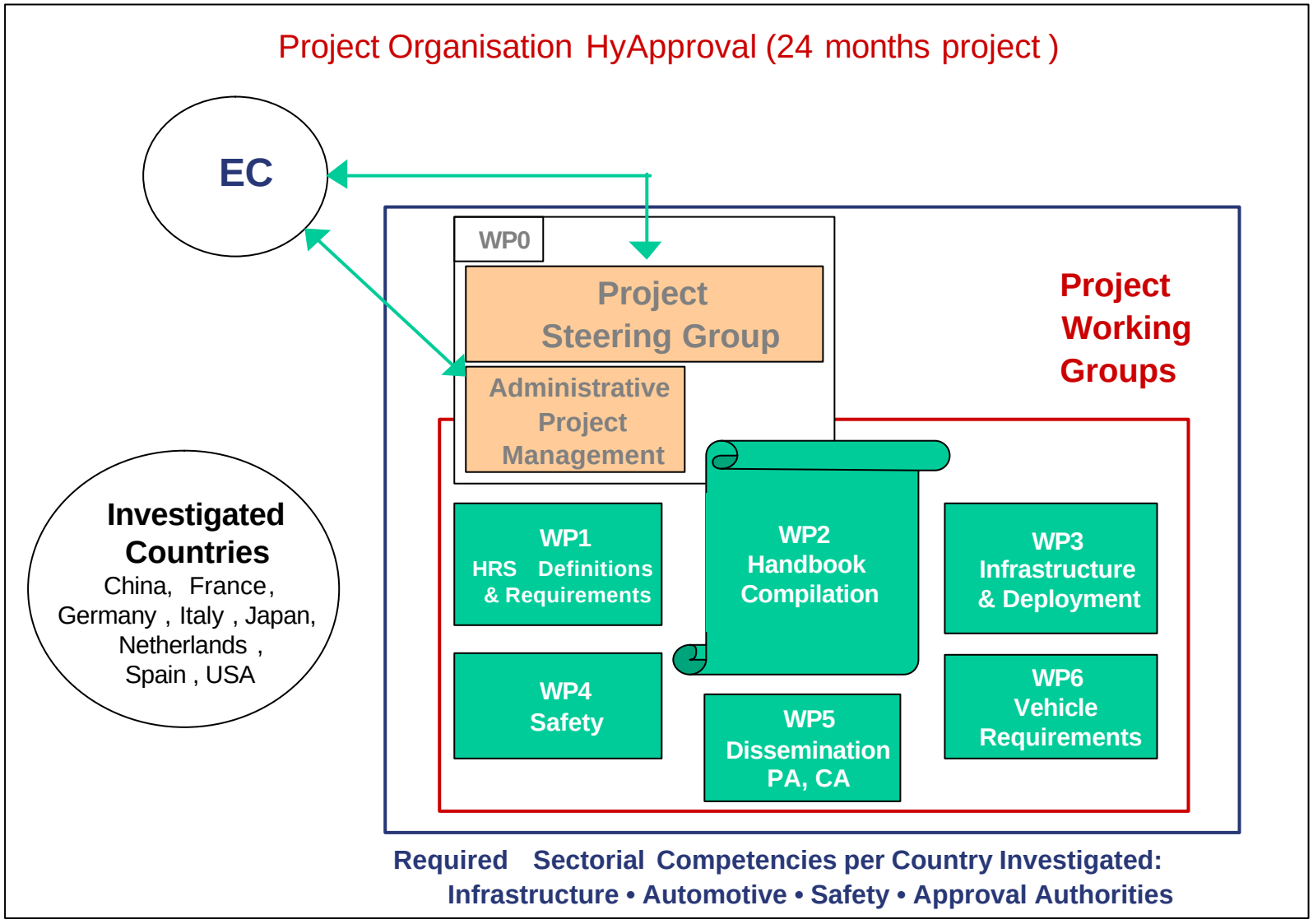
On behalf of the HyApproval consortium
c/o Ludwig-Bölkow-Systemtechnik GmbH

Partnership

- 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 (NCSRD)
- Det Norske Veritas AS (DNV)
- EniTecnologie S.p.A. (ET)
- Engineering Advancement Association of Japan (ENAA)
- Federazione delle Associazioni Scientifiche e Tecniche (FAST) in collaboration with H2IT
- Forschungszentrum Karlsruhe GmbH (FZK)
- GM/Adam Opel GmbH
- Health and Safety Executive (HSE)
- Hydrogenics Europe N.V.
- Icelandic New Energy Ltd. (INE)
- Institut National de l'Environment 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)

Project Organigram



Main Project Goals

- finalise the hydrogen refuelling station (HRS) draft guideline document started under EIHP2 (European Integrated Hydrogen Project) and to be pursued under ISO TC197, WG 11, addressing global recommendations to the technology providers, and representing the initial basis for developing a Handbook for the approval of HRS
- come up with a Handbook which assists all gas technology companies, fuel retailers/ HRS operators and the relevant approval authorities in laying out, installing, approving and operating HRS for CGH_2 or LH_2 on an EU-wide level, with the potential to also apply it to non-EU regions
  [An *Approval in Principle* contributes to reducing uncertainties and improving confidence for stakeholders, investors and funding bodies]

Main Safety Related Tasks

Safety-related tasks regarding HRS

- review and evaluate safety, codes & standards from existing projects
- establish safety matrix (RCS, safety studies, risk assessment criteria, etc.)
- establish best practices for safety
- develop realistic accident scenarios and their likelihood/ max. credible total H_2 leaks and leak rates
- agree on required modelling tools/ techniques for risk assessment and simulations
- finalisation of HRS draft guideline started by EIHP2 (➞ WG11, ISO TC 197)
- prepare safety documentation for Handbook

Main Safety Related Tasks

Safety-related tasks regarding vehicle/HRS-interface

- general data interface description for LH_2 and CGH_2, according to SAE J2601 draft, standard receptacle
- data exchange between vehicle and HRS (one standard data protocol)
- refuelling process, time, frequency, procedures, pressure levels, etc.
- definition of a safe refuelling area and process, e.g. additional grounding
- definition of best practices, usage of FMEA (Failure Mode & Effect Analysis)

→ Only a technical report so far, not yet recommended practice

Main Safety Related Tasks

Pre-normative research task

- Prioritisation and detailing for scenarios/ simulations of HRS component failures:
  - » CGH_2 hose break/ nozzle/ dispenser failure at 35MPa and 70MPa
  - » LH_2 dispenser failure
  - » CGH_2 discharge hose break from tanker at 25 MPa and LH_2 discharge hose break from tanker
    - at dedicated/ multi-fuel HRS
    - of 300kg/ 1,500kg/ 3,500kg onsite storage volume

  investigated in CFD (Computational Fluid Dynamics) simulations, if possible, in 2 independent release and dispersion calculations and 2 independent combustion calculations

HyApproval Achievements in Year 1 [WP1 & WP2]

WP1 – HRS Definitions & Requirements:

- ST1: Basic HRS technology *completed*
- ST2: Safety Analysis of Equipment and Distances *in progress*
- ST3: Integration of ST1 and ST2 into three "generic" HRS sizes
  → Draft Design Paper *established*
- ST4: RCS Review & Comparison *in progress*
- ST5: LH_2 Vehicle Refuelling Station Draft *in progress*

WP2 – HRS Handbook Compilation:

Revised table of contents for Handbook *established*

Draft Handbook *in progress*

– target date for internal revision: NOV2006

HyApproval Achievements in Year 1 [WP3 & WP4]

WP3 – Infrastructure & Deployment:

- Interview protocols *defined*, questionnaires and information package *prepared*, interview phase *first interviews performed – questionnaire continuously improved*

WP4 – Safety:

- Safety matrix *established*
- Identification of accident scenarios *almost finalised* [NCSRD 1 dispersion scenario report, ENI 1 simulation, FZK 1 dispersion scenario and CEA start calculations before beginning of SEP2006]
- Agreement on safety documentation for Handbook *in progress*
- Identification and critical review of reliability data from past data collections and risk studies *in progress*

HyApproval Achievements in Year 1 [WP5 & WP6]

WP5 – Dissemination, Public Awareness, Intl. Cluster Activities:

- Matrix of acceptability and awareness levels of different aspects of HRS *finalised*
- Database of Fire Associations & First Responders *established*
- Contact EU Fire brigades other EU organisations *ongoing*
- Calendar of relevant hydrogen events *established*

WP6 – Vehicle Requirements:

- General interface description for 35 MPa CGH_2 as J2600/ ISO 17268 *finalised* [recommended practice]
- General interface description for 70 MPa CGH_2 as draft *close to finalisation*
- General interface description for LH_2 as draft SAE J2783 *in progress*
- Data interface, refuelling process and safety during refuelling *harmonised* or *in progress*

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