



HyResponse

Grant agreement No: 325348

Deliverable Number – D7.2

**Final report of RCS recommendations for international standardisation
bodies**

Status: Final

Dissemination level: PU – Public

Partner responsible for the deliverable: CCS

Contributing partner: AL



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Date of this document: 12 September 2016

File name: D7.2_HYRESPONSE_RCS recommendations_v2.doc

Document history

Revision	Date	Modifications made	Author(s)
V1	19/07/2016	First draft	Randy Dey
V2	12/09/2016	Final report	Randy Dey

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1.0 Introduction

This document represents the final report of the RCS recommendations for international standardisation bodies. This report compiles the RCS recommendation topics identified by the HyResponse consortium. Due to the nature of the HyResponse project the list of the RCS recommendations proposed in this document is not exhaustive but it is based on the latest versions of the RCS available to-date. It incorporates feedback from work done in other Work Packages, the ACP group and pilot training sessions.

2.0 International RCS relevant to HyResponse

- Short list

- **World Forum for Harmonization of Vehicle Regulations (WP.29)**
 - Working on revision of GTR: 2013 for hydrogen and fuel cell vehicles
 - Working on the revision of the UN ECE Regulations applicable to electric power train (UNECE R100) and Hydrogen and fuel cell vehicles (UNECE R134)
- **ECOSOC Sub-Committee of Experts on the Transport of Dangerous Goods**
 - Working on the development of UN Recommendations on the Transport of Dangerous Goods (Orange Book) (e.g. UN 3468: Hydrogen in a metal hydride storage system)
 - Working on the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)
- **79/2009/EC Regulation** on Type Approval of hydrogen-powered motor vehicles.
- **EU 406/2010** implementing the above regulation
- **97/23/EC Directive** on the approximation of the laws of the Member States concerning pressure equipment (PED)
- **2010/35/EU Directive** on transportable pressure equipment (TPED)

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- **BS 7974:2001** Application of fire safety engineering principles to the design of buildings. Code of practice
 - **EN 60079-10-1:2015** Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres.
 - **ISO/TR 15916:2015** Basic considerations for the safety of hydrogen systems.
 - **ISO 26142:2010** Hydrogen detection apparatus – Stationary applications

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- **ISO 22734-1:2008** Hydrogen generators using water electrolysis process – Part 1: Industrial and commercial applications.
 - **ISO 22734-2:2011** Hydrogen generators using water electrolysis process – Part 2: Residential applications
 - **ISO 16110-1:2007** Hydrogen generators using fuel processing technologies – Part 1: Safety
 - **ISO 16110-2:2010** Hydrogen generators using fuel processing technologies – Part 2: Test methods for performance
 - **ISO/TS 20100:2008** Gaseous hydrogen - fuelling stations (Note: This standard has been withdrawn.)
 - **ISO/TS 19880 -1:2016** Gaseous hydrogen - fuelling stations- Part 1: General Requirements
 - **ISO/TS 15869:2009** Gaseous hydrogen and hydrogen blends – Land vehicle fuel tanks
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- **IEC 62282-3-100:2012** Fuel cell technologies – Stationary fuel cell power systems - Safety
- **IEC 62282-3-200:2015** Fuel cell technologies – Stationary fuel cell power systems – Performance test methods
- **IEC 62282-3-201:2013** Fuel cell technologies – Stationary fuel cell power systems - Performance test methods for small systems
- **IEC 62282-3-300:2012** Fuel cell technologies – Stationary fuel cell power systems – Installation
- **IEC 62282-4-101:2014** Fuel cell technologies – Fuel cell power systems for propulsion other than road vehicles and auxiliary power units - Safety of electrically powered industrial trucks
- **IEC 62282-5-1:2012** Fuel cell technologies – Portable fuel cell power systems – Safety

3.0 RCS recommendations in general

The nature of the project is educational training, therefore it is expected to have few RCS recommendations, unlike a PNR project that concentrates on a specific hydrogen research topic that is actually aimed to produce outcomes related to RCS improvements. HyResponse has some generic RCS recommendations and also a few technical ones.

This section deals with generic recommendations to improve standards:

3.1 Define scope clearly with respect to the application (service conditions)

3.2 Performance-based instead of purely design-based requirements

3.3 Clear description of test methods

4.0 RCS recommendations for FCH applications

This section deals with technical recommendations to improve safety:

4.1 Use of emergency shut down (ESD) devices:

Number and location (at entrance) of hydrogen sensors on-site must be specified. Instructions for First Responders on how to manipulate them must also be included.

The ESD

- Shuts off electrical power supply and hydrogen supply
- Closes all the automatic shut off valves in the hydrogen system
- Shuts down the hydrogen system

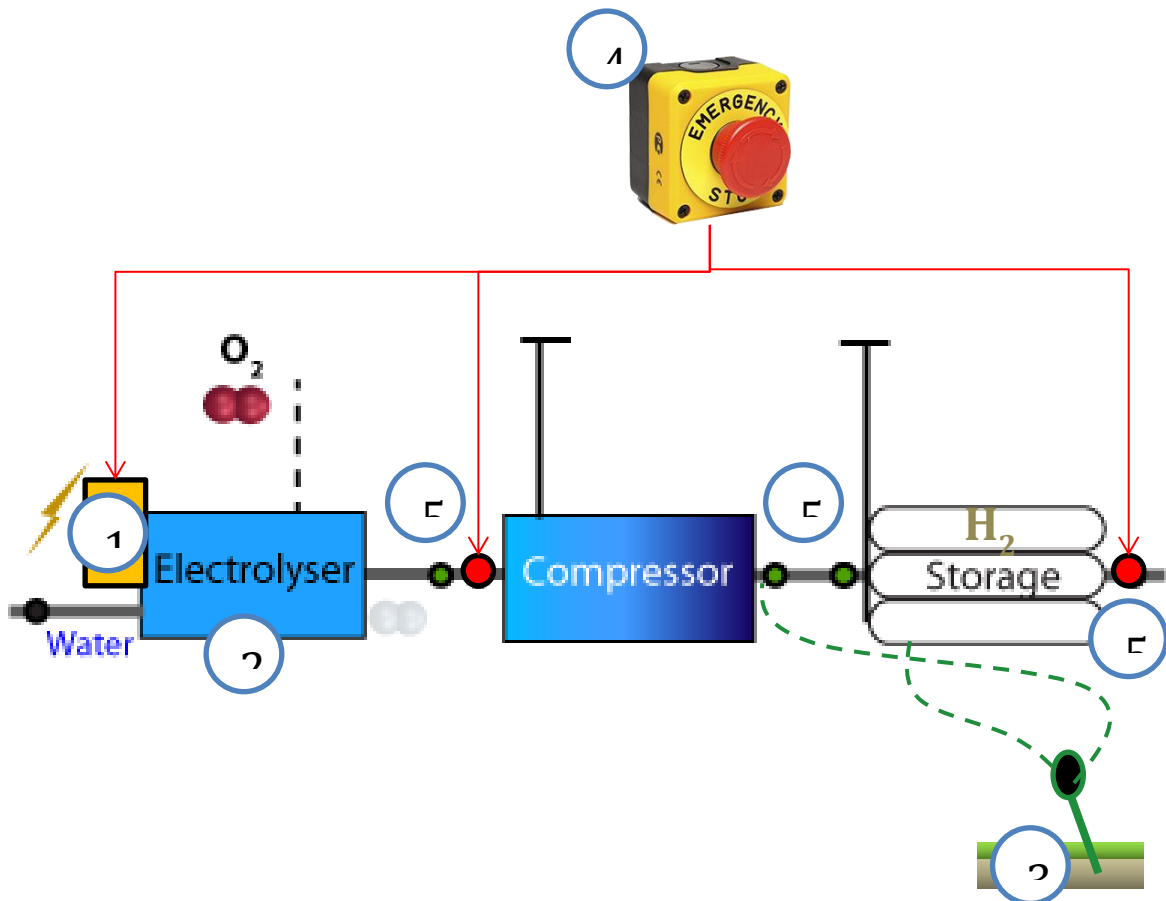


Figure 1: Typical schematic diagram for Electrolysers (See HyResponse Lecture on RCS for First Responders, slide #20)

4.2 Thermal Pressure Relief devices (TPRD):

Hydrogen tanks must be protected from fire effects using non-reclosing TPRDs.

Placement (location and angle) of TPRDs must be specified.

Generally, hydrogen tanks come with a solenoid valve with three safety valves to:

- prevent backflow while refuelling
- stop hydrogen flow when signalled by the controller
- release pressure (TPRD) when temperature > 108°C

If TPRD opens, hydrogen flows out through relief line under the trunk, passenger side.

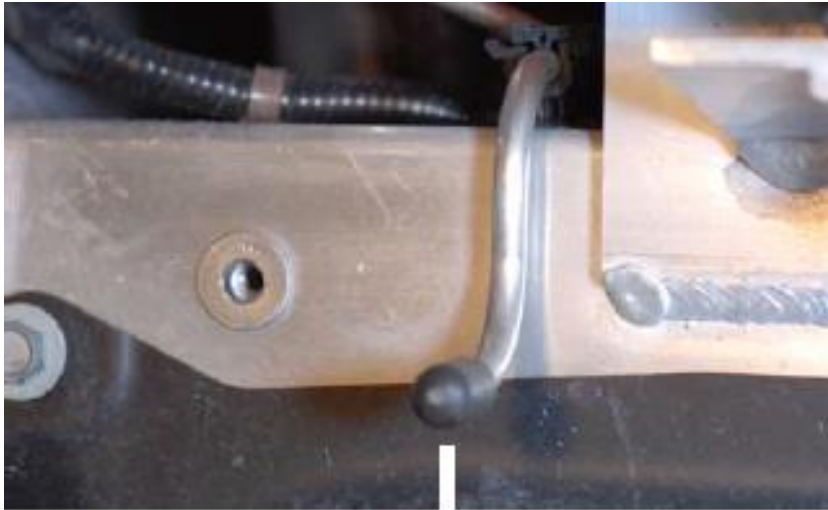


Figure 2: Honda FX Clarity (See HyResponse Lecture on RCS for First Responders, slide #45)

4.3 Standardization of Labels and symbols for FCH applications:

Used for identification of hydrogen fuel and hi-voltage systems.

On the matter of standardization of labels and symbols, HyResponse supports the efforts of CTIF and in particular, their work with ISO/TC22/SC36/WG7

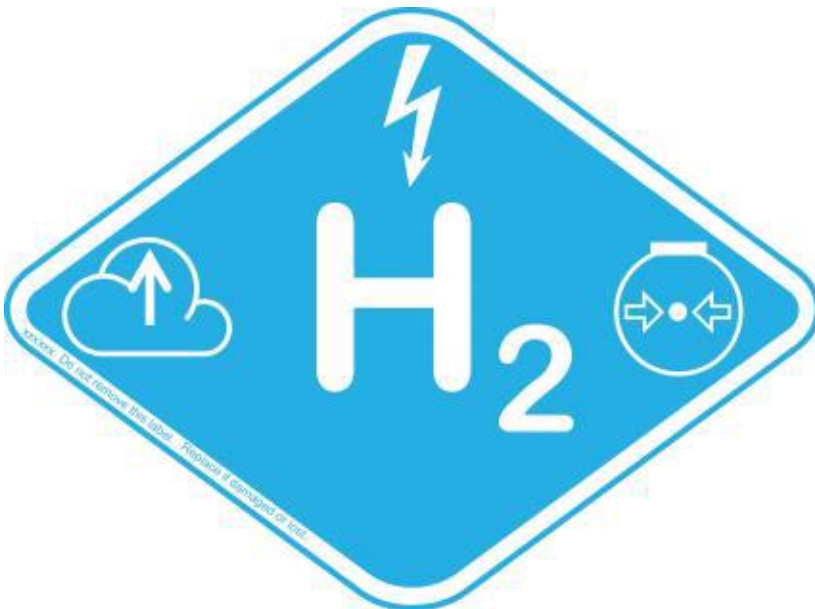


Figure 3: Proposed sign for Hydrogen Fuel Cell Electric Vehicle. Refer to: ISO/CD 17840-4 " Road vehicles - Information for 1st and 2nd responders – Part 4: Propulsion energy Identification" – CD ballot.

5.0 Path forward for RCS recommendations to international standardisation bodies

Aimed to approach the Secretariat of the following Technical Committees:

- CEN/TC 268/WG5. Secretariat: AFNOR, France.
- CEN-CENELEC/TC 6. Secretariat: NEN, The Netherlands.
- ISO/TC 197. Secretariat: BNQ, Canada.
- On the matter of standardization of labels and symbols, HyResponse supports the efforts of CTIF and in particular, their work with ISO/TC22/SC36. Secretariat: AFNOR, France.
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