



Overview of Hydrogen Fuelled Vehicle Phase 2 Project Global Technical Regulations No.13 GRSP 72nd Meeting

**Martin Koubek
UNECE/WP.29/GRSP**

Outline

1. Hydrogen fuelled vehicle GTR background
2. Scope of work
3. Summary of work in 6 taskforces of IWG
4. Comments addressed in formal document

Chair: USA
M. Koubek/NHTSA

Co-Chair: JPN
K. Sato/ METI

Co-Vice Chair: KOR
S. Kim/KATRI

Co-Vice Chair: CN
Y. He/CATARC

CP: EU
B. Acosta-Iborra
R. Ladret Piciorus

CP: USA NHTSA
I. MacIntire

Secretary: OICA
M. Iwasaki/A. Ryan

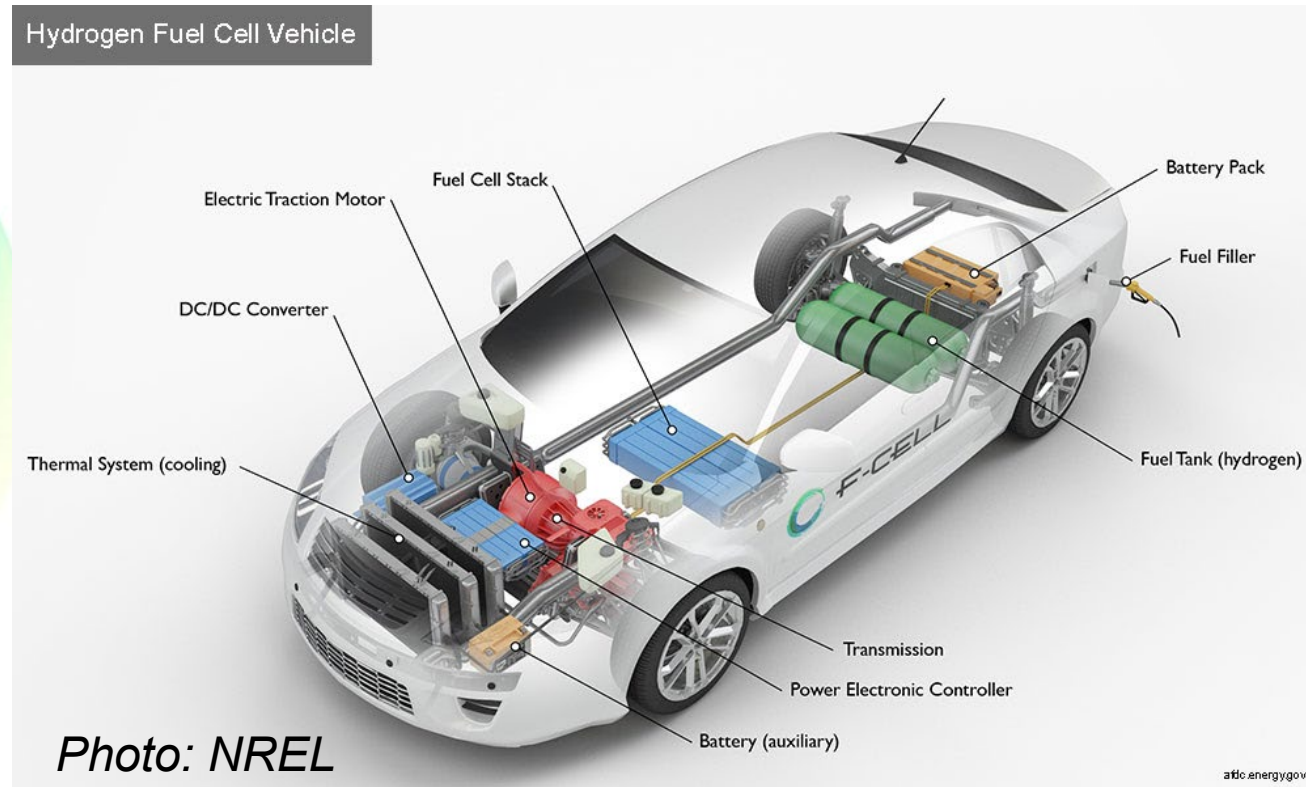
CP: Transport Canada
K. Hendershot

CP: UK DFT
M. Levet

Government
OICA
CLEPA
Container mfrs
Standards Orgs
Laboratories
Academia

Hydrogen Fuelled Vehicle GTR Background

- In 2009, a working group was established under the 1998 Global Agreement to develop a GTR that would address the safety and environmental concerns associated with **fuel-cell compressed gaseous and liquid hydrogen vehicles**.
- Sub-group on Safety (SGS): GTR for hydrogen vehicles ensuring **high pressure container safety, hydrogen fuel system including FC and exhaust system, and high voltage electrical safety**.



Hydrogen Fuelled Vehicle GTR Background

GTR13 Phase 1		GTR13 Phase 2		
2009	2013	2017	2018-2021	2022
<ul style="list-style-type: none"> Wkg Grp est. GTR 	<ul style="list-style-type: none"> <u>Jun</u>- GTR13 adopted by AC.3 Begin transposal to 58 Agreement 	<ul style="list-style-type: none"> <u>Mar</u>-Authorization to start Phase 2 (WP.29, AC.3) <u>Oct</u>- First IWG mtg 	<ul style="list-style-type: none"> IWG mtgs (x10) <u>Nov '20</u>- Mandate extended to Dec '22 by WP.29 	<ul style="list-style-type: none"> <u>Jan-Jun</u> – IWG mtg (x4) <u>Mar</u>- Mandate extended to Dec 2022 by AC.3. <u>May</u>- Informal draft <u>Sep</u>- Formal draft <u>Dec</u>- GRSP

GTR13 Scope Development

Phase 2

Phase 1

- Category 1-1, 1-2
- Compressed gaseous hydrogen system for FCEV
- Liquefied hydrogen system
- High pressure fuel container system: 35/70 MPa NWP
- Fuel system at vehicle level: in-use and post-crash hydrogen leakage limits
- ~~Electrical integrity of high voltage system: in-use and post-crash~~

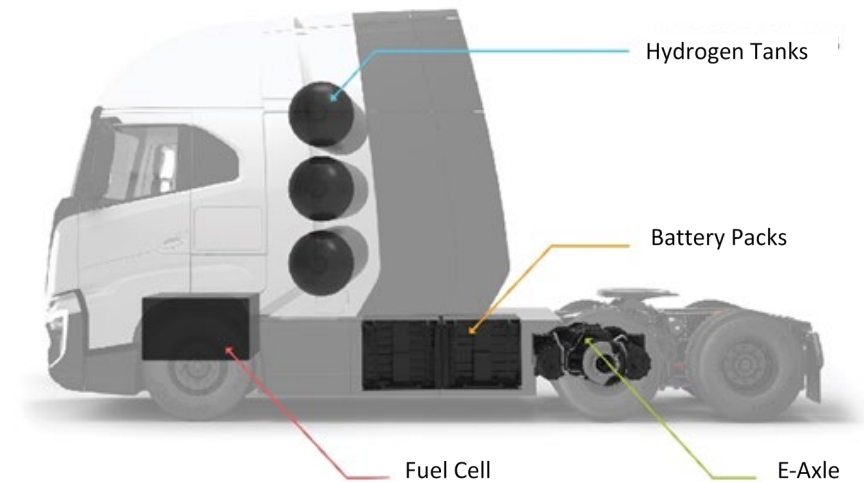
- Category 1, 2
- Receptacle requirements
- Updated test procedures based on research data
- Revised initial burst pressure requirement
- Extended service life

Taskforce #1: Heavy Duty Vehicles & Buses

Co-led by A. Schuessling and Y. He

Goal: Address safety issues associated with heavy vehicles and buses

- Extension of the scope to cover Commercial/Heavy Duty Vehicles
- Service life of the container (15 → 25 years)
- Crash requirements/sled test
- Thermally activated pressure relief device (TPRD) venting direction
- Container permeation and pneumatic cycling





Taskforce #2: Fuelling Receptacle

Led by L. Gambone

Goal: To standardize references to fuelling receptacle designs

- Ensures that vehicles of lower Nominal Working Pressure (NWP) are not fuelled at hydrogen dispensers operating at a higher NWP
- Ensures vehicles fuelled by hydrogen are not fuelled by other gaseous fuel dispensers



Taskforce #3: Test Requirements & Procedures

Led by L. Gambone

Goal: To update qualification test procedures

- To correct editorial errors and test specs from Phase 1
- To modify test procedures based on industry experience
- To incorporate requirements for medium and heavy-duty vehicles
- To incorporate requirements for new storage technologies



Taskforce #4: Fire Test

Led by G. Scheffler

Goal: To improve the repeatability and reproducibility of the fire test

- Burner specifications
- Pre-test check of fire test
- Accommodate vehicle specific components
- Extend the application of the fire test to containers on heavy vehicles and to conformable containers

Taskforce #5: Interoperability

Led by A. Tchouvelev

Goal: To review safety dependencies between hydrogen refuelling station and HFCV

- Fueling station components (e.g., dispenser)
- Fueling protocol
- Vehicle to station communication
- References to relevant industry documents (ISO, SAE)

Taskforce #0: Phase 2 Drafting and Editing

Co-led by: A. Ryan and I. MacIntire

Goal: To develop informal/formal drafts of GTR13 Phase 2

- TF0 members include CP and industry
- Collect agreements among CP, industry from various discussions and taskforces to draft language for Part 1 (Rationale) and Part 2 (Mandatory Requirements)
- Reflected in formal draft submitted in September.

Selected Feedback and Resolutions

“Generic approach in which both HFCV and H-ICE vehicles are included and treated equally from a safety POV”

✓ Revised to make more inclusive: “fuel cell or ICE” or “hydrogen fuelled vehicles”

“Reference to SAE J2601 fueling ramp rates should be replaced by actual values”

✓ Included table of fueling ramp rates per SAE J2601 and extrapolated for large CHSS for HDV

“LPG used in fire test could vary by region or time of year and could cause differences”

✓ The newly added burner pre-test check allows test lab to match fuel flow of LPG to the temperatures produced by the burner

“Horizontal drop test language for conformables is unclear”

✓ Revised: “In case of non-axisymmetric container, the largest projection area of the container shall be oriented downward and aligned horizontally... , the shut-off valve interface location and its centre of gravity should be horizontally aligned as it is feasible;”

Items Identified for Phase 3

- Consideration of research results after Phase 2 (CHSS systems, post-crash safety)
- Fuel system integrity requirements (e.g., acceleration/sled test and side impact test for HDV)
- Review of liquified hydrogen storage system
- Improvements to test procedures
 - Fire (e.g., withstand test)
 - CHSS qualification (e.g., station risk, remote TPRD, etc.)
- Review CP options to achieve further harmonization



Thank You

