FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

Safety on Toyota FCEVs

Vincent Mattelaer, TME

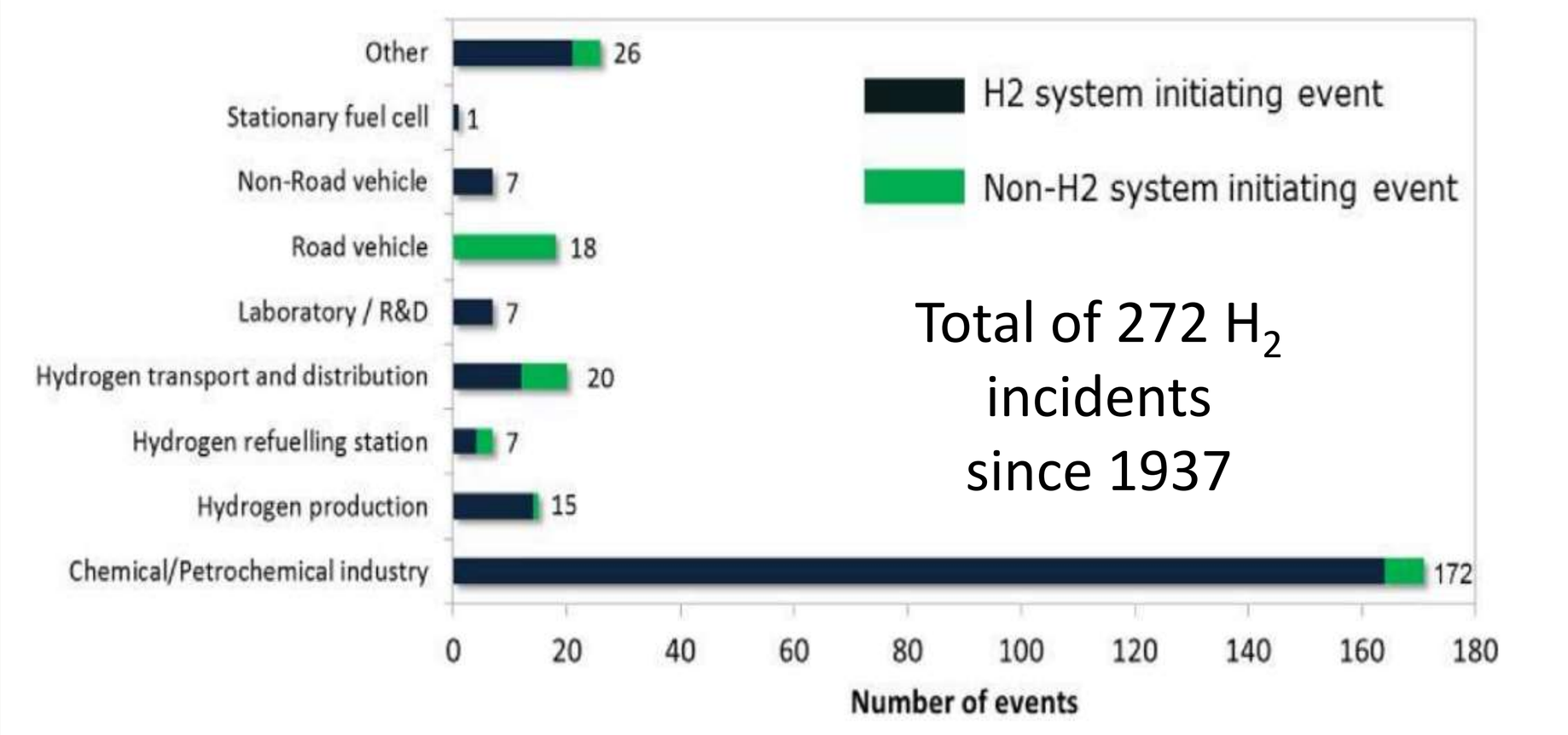
18 November 2021

Stance from Toyota

We build hydrogen fuel cell vehicles with at least the same safety level as vehicles with conventional fuels.

Lessons learnt from H2 incidents

FCEVs do not release hydrogen easily.
Most hydrogen incidents occur at an hydrogen installation (Industry, HRS, transport, ..)



Source: https://fch.europa.eu/sites/default/files/Assessment%20and%20lessons%20learnt%20from%20HIAD%202.0.pdf

Mirai Accidents in Europe

Safety Measures for H_2 in a FCEV

Ensuring that hydrogen does not leak

1

2

Immediate detection and stoppage of hydrogen flow

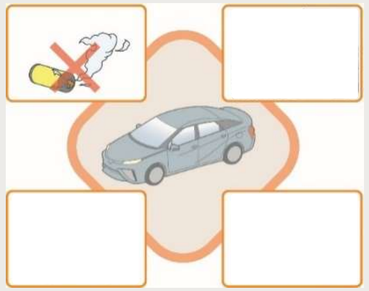
Preventing accumulation of hydrogen within the car body

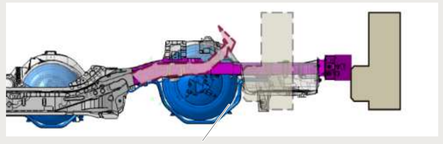
4

3

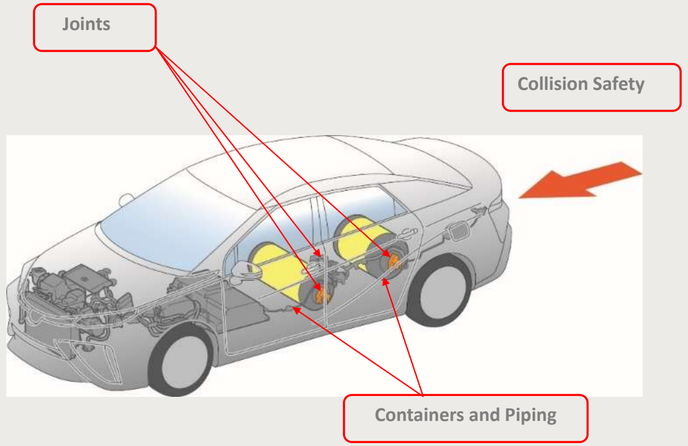
Isolation of hydrogen-related parts from ignition sources

Safety Measures for H_2 in a FCV



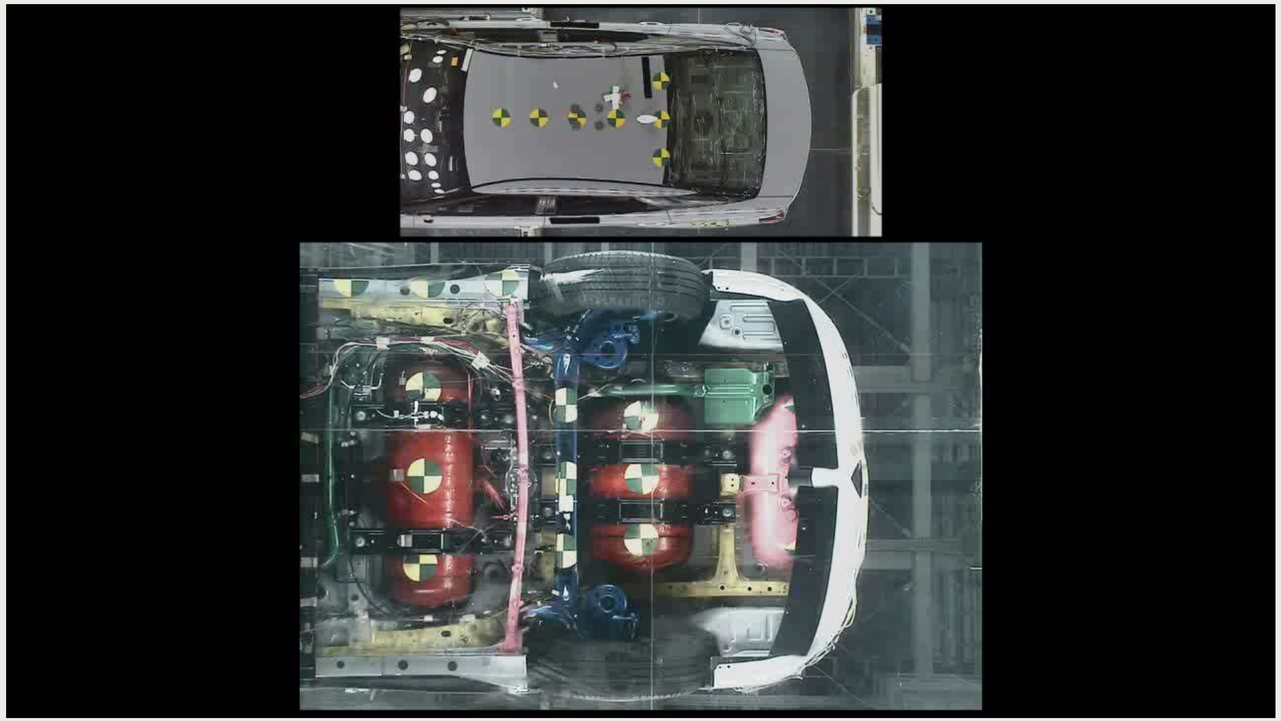


Hydrogen tank positioned to lessen damage



I will come to this point more in detail later.

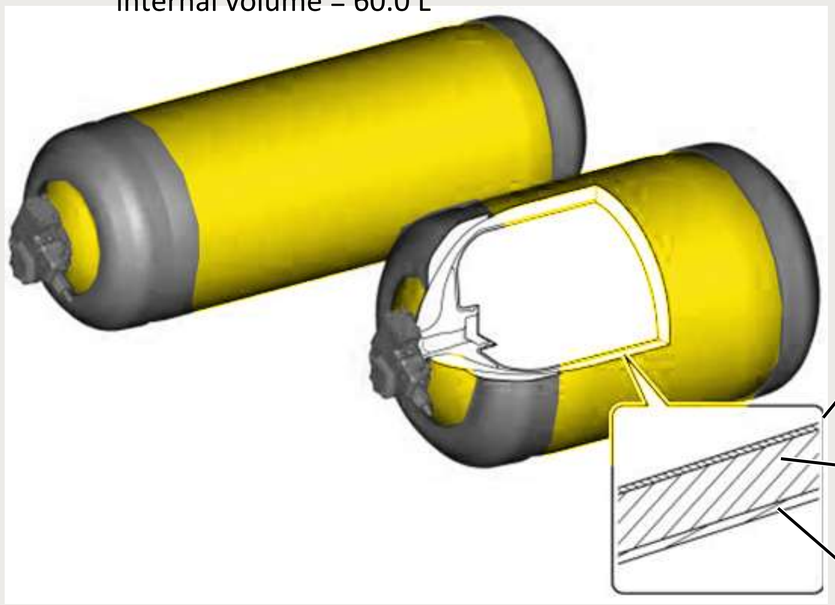
1. Ensure that hydrogen does not leak



Source: https://youtu.be/FgLTUbWyEa0

1. Ensure that hydrogen does not leak

Front tank
internal volume = 60.0 L



Rear tank
internal volume = 62.4 L

Plastic liner

Carbon fiber-reinforced plastic layer (CFRP)

Glass fiber-reinforced plastic layer (GFRP)

1. Ensure that hydrogen does not leak

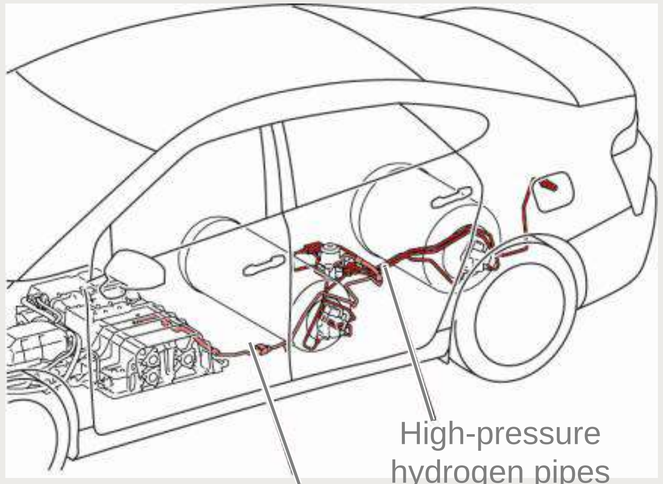
Tank designers run a load of harsh tests in laboratories

- Burst test
- Cycling test
- Bonfire tests
- Crush test (Powertech)
- Cold weather tests
- Gunfire test (tested@Powertech)

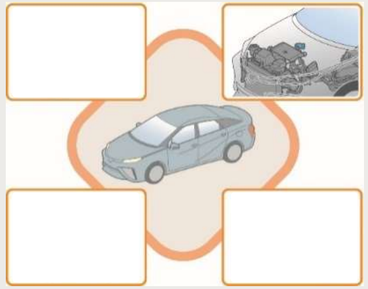
1. Ensure that hydrogen does not leak

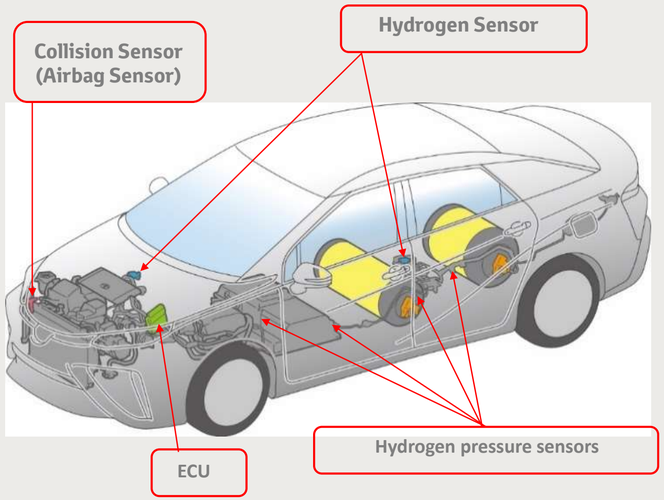
Source: https://youtu.be/jVeagFmmwA0

1. Ensure that hydrogen does not leak



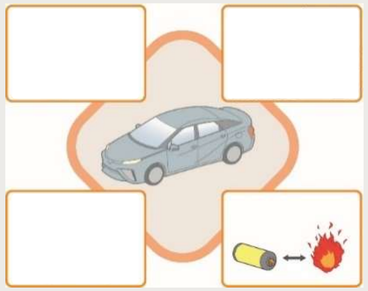
Safety Measures for H_2 in a FCV

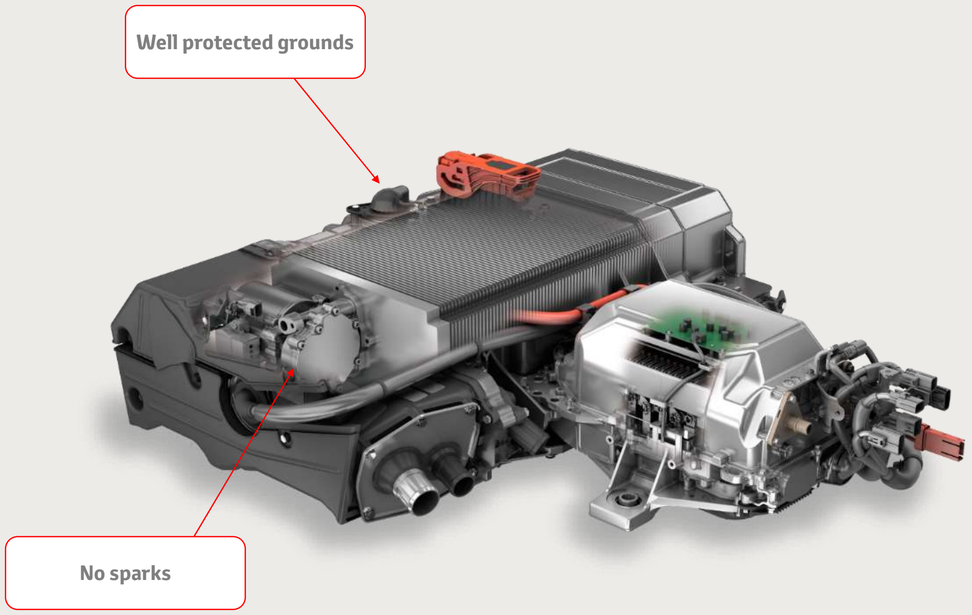




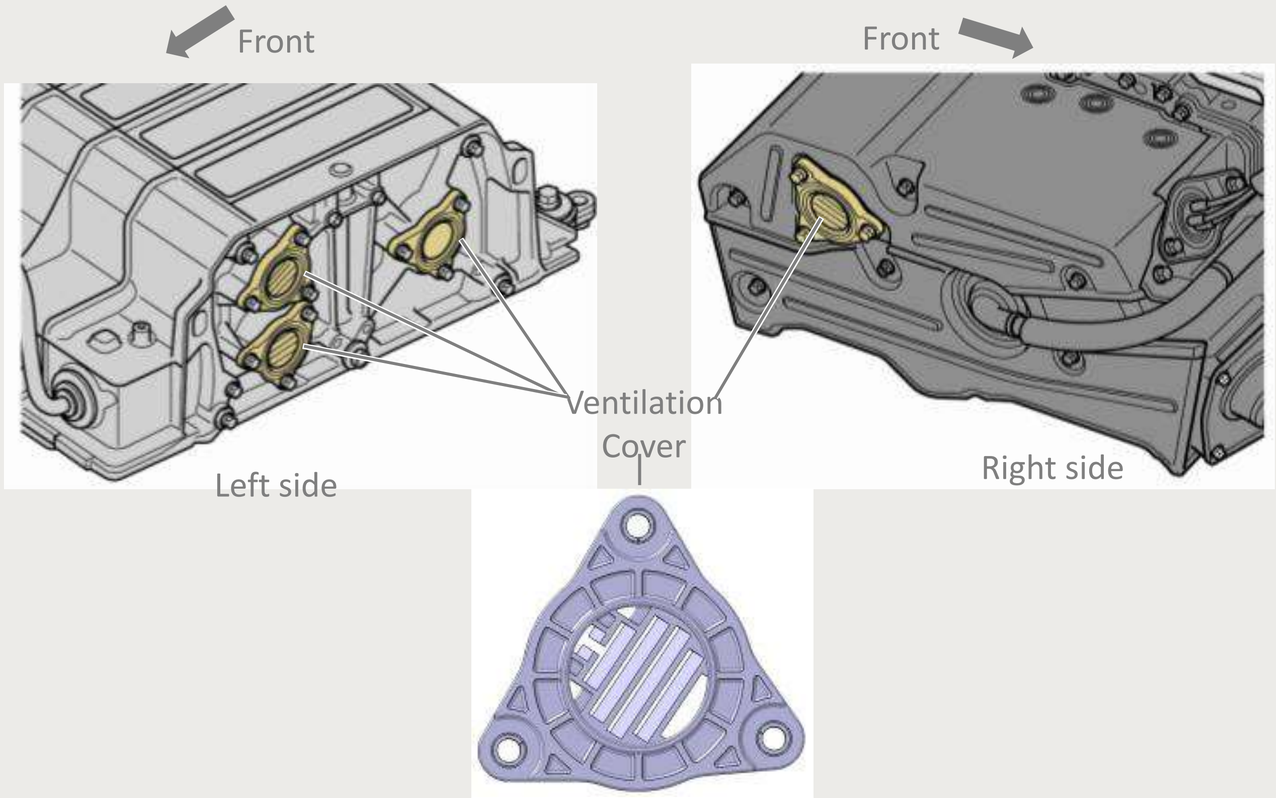
2. Immediate Stoppage of H2 Flow

Safety Measures for H_2 in a FCV





3: Isolation of parts



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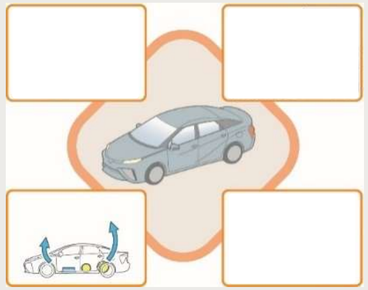
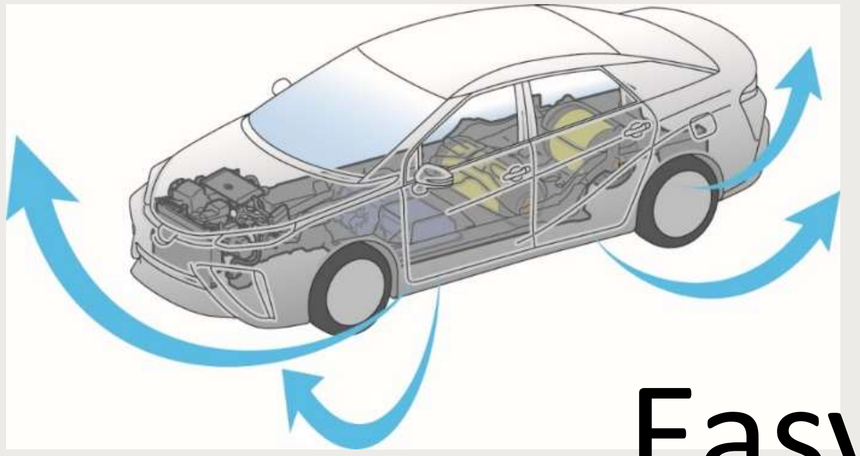
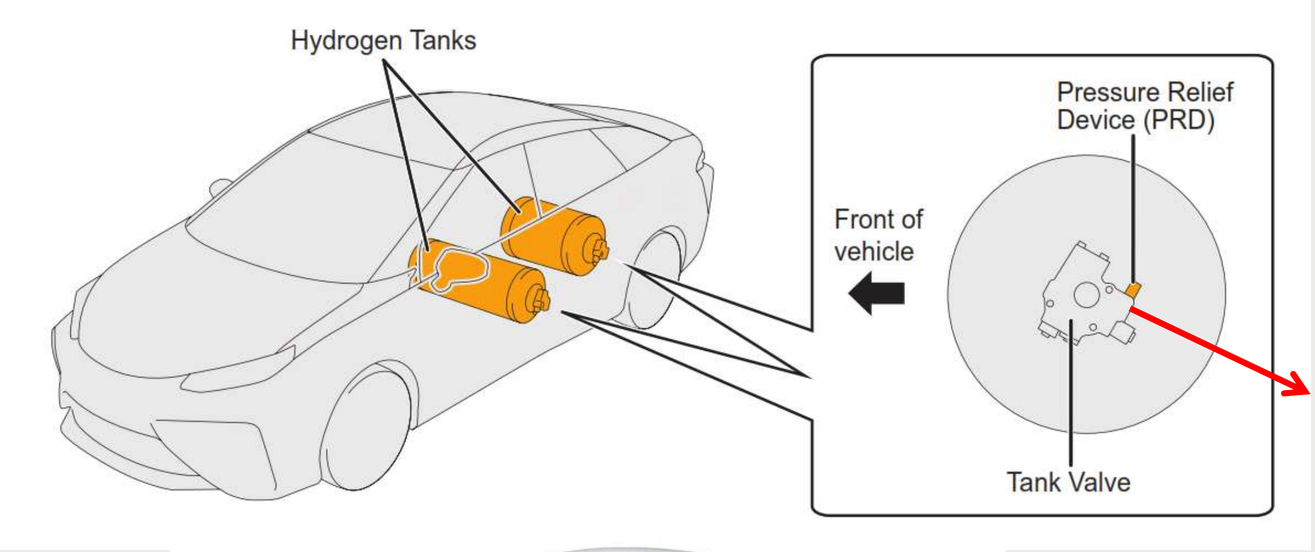
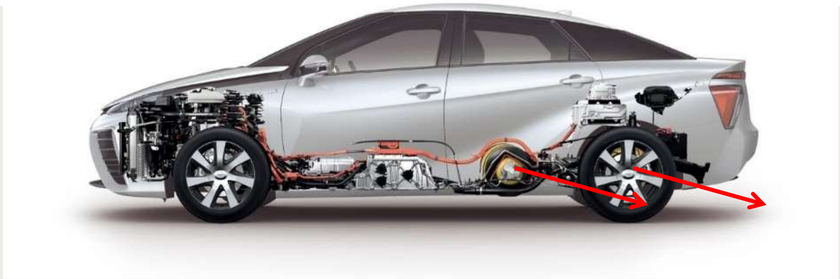




Easy dissipati

Hydrogen Tank





FCEV Underground Parking

Vincent Mattelaer, CEP/TME

18 November 2021

Underground Parking of Hydrogen Vehicles

Workshop on Safe Storage of Hydrogen

Risk of FCEV Underground Parking prohibition

France

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE L'INTÉRIEUR

French ministry of internal affairs states the following at page 23 of their covered parking safety practical guide:

"Therefore, pending further trials and feedback, it is recommended to park vehicles in uncovered spaces (roof terrace for example)."

Source:
https://www.sitesecurite.com/contenu/erpps/guide_2018_01_30_de_preconisations_ps.pdf

Austria

Austrian Building Regulation:
OIB-330.2-014/19 Clause 8.1

"Hydrogen and LPG vehicles are not allowed to park underground."

- >50m²
- Some other conditions (Special fire protection concept)
- Seems not to be the case for CNG

Source:
https://www.oib.or.at/sites/default/files/richtlinie_2.2_12.04.19_0.pdf

The Netherlands

Ministry of Internal affairs

Request to NEN to create a standard about fire safety and risk assessment in underground parking garages.

Dutch Standardization Institute

<u>Current situation</u>:

Risk that FCEVs will not be allowed to park underground

Underground Parking of Hydrogen Vehicles

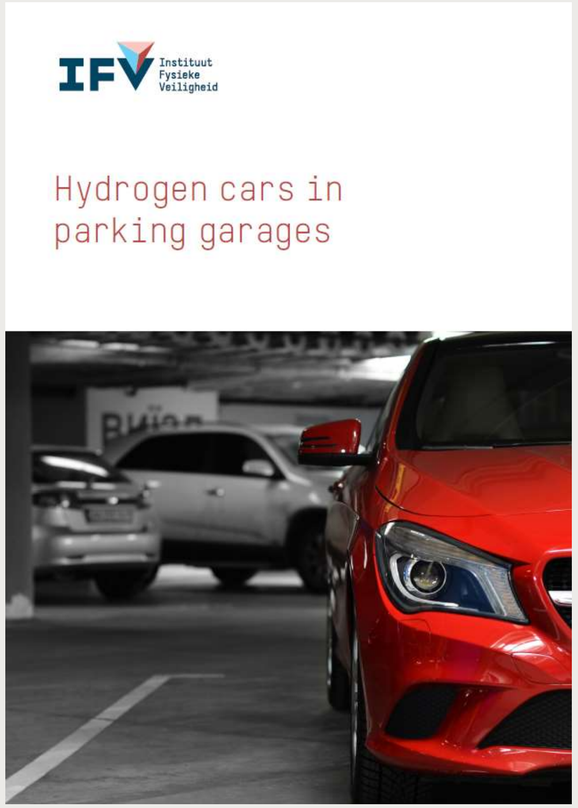
Workshop on Safe Storage of Hydrogen

Root Causes for not allowing FCEVs to park underground

- Not enough information for construction engineers or fire departments
- Many (hydrogen) scientific papers are based on CNG issues. (High failure %)

Countermeasure

- Detailed document or website needed for construction engineers, authorities and fire departments that explains that hydrogen vehicles are safe so they are allowed to park in underground garages or covered areas.



Source: https://www.ifv.nl/kennisplein/Documents/20210209-IFV-Hydrogen-cars-in-parking-garages.pdf

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JOINT UNDERTAKING

Vincent Mattelaer
Senior Engineer
Vincent.mattelaer@toyota-europe.com

For futher information

www.fch.europa.eu
www.hydrogeneurope.eu
www.nerghy.eu

@fch_ju

Fch-ju@fch.europa.eu

FCH JU