H2ME

Hydrogen Mobility Europe

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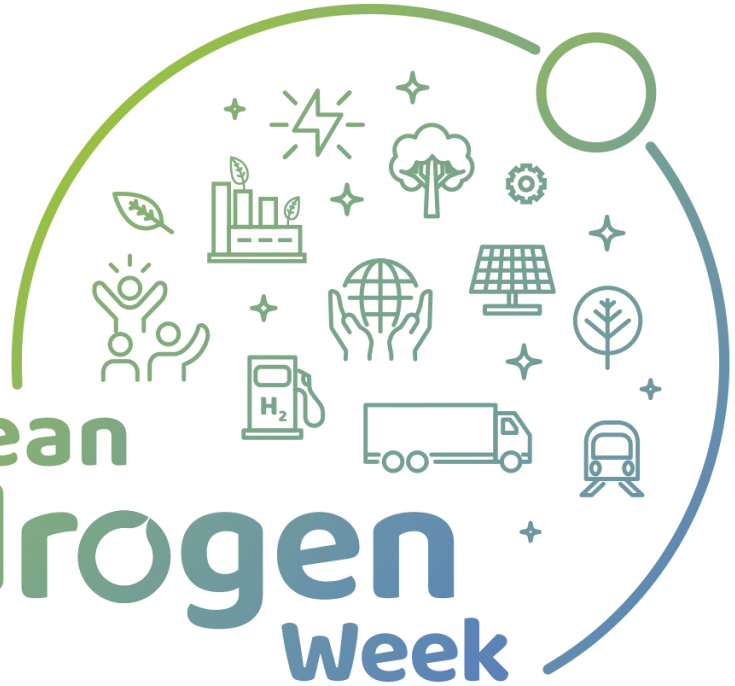

Peter Speers, Cenex

and Benjamin Jödecke, H2Mobility

http://h2me.eu

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FCH

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Project Overview

- Call year: 2014 and 2015
- Call topics:

FCH-01.7-2014 & FCH-03.1-2015

- Project dates:

06/15-11/20 & 05/16-06/22

- % stage of implementation : 77%
- Total project budget: €170m
- FCH JU max. contribution: €67m

- Partners:

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Introduction to H2ME

- H2ME is the FCH JU's largest passenger car/light duty vehicle and HRS deployment-focused project aimed at supporting HFC commercialisation.
- H2ME forms a key part of the EU-wide rollout of HFC technologies.

H2ME 1

29 stations
>300 cars and vans
€60m total cost
€32m funding
Started June 2015

Hydrogen Mobility Europe

- **>45 refuelling stations**
- **>1400 cars, and vans**
- **€160m total cost**
- **€67m funding**
- **~50 organisations**

A major European activity!

H2ME 2

20 stations
>1100 cars, vans and trucks
€100m total cost
€35m funding
Started May 2016

Project Progress
H2ME Deployment and High-Level Metrics

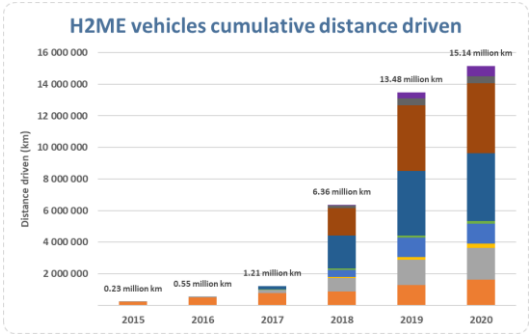
Deployment

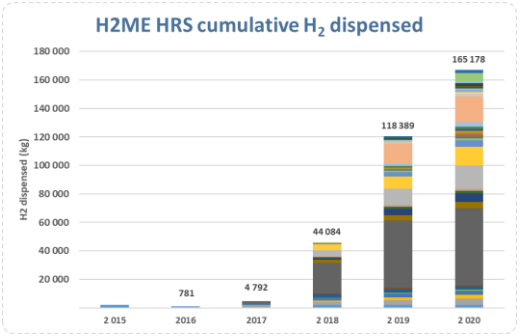
Vehicles: 0%
HRS:0%

Vehicles: 43%
HRS: 76%

Vehicles: 100%
HRS: 100%

25% 50% 75%





Since 2015:

- H2ME **vehicles** have reported over **15 million km** driven.
- H2ME **HRS** have dispensed over **165 tonnes** of H_2.
- (Not all H2ME vehicles use H2ME HRS to fuel, and not all H2ME HRS fuel H2ME vehicles).

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Project Progress
HRS availability: good progress ….

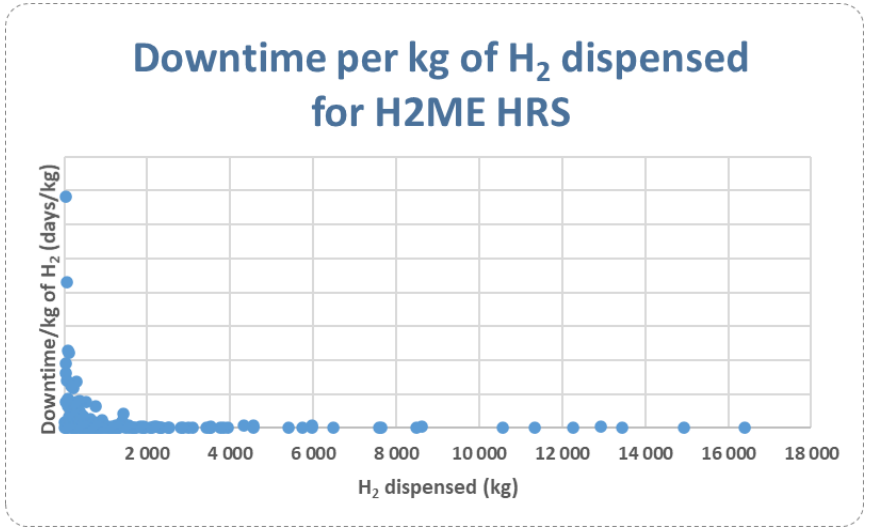
HRS: 95.4% FCEV: >98%

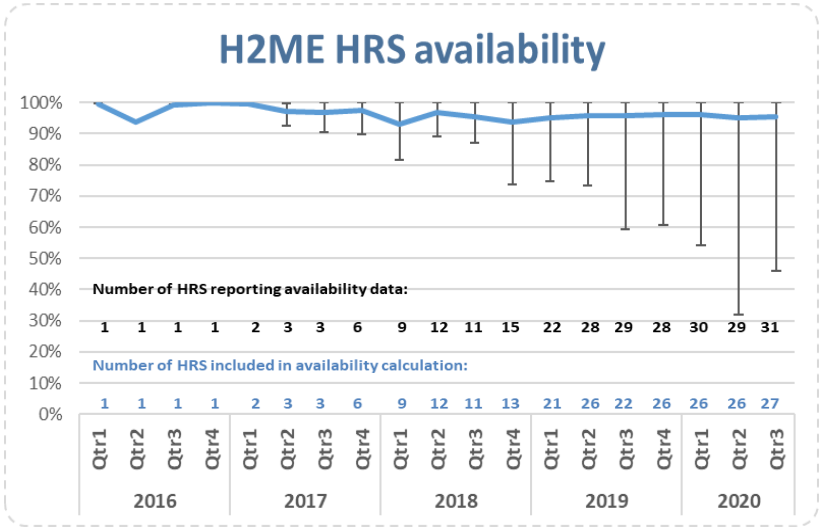
Availability

FCEV: 99%
HRS:98%

FCEV: >98%
HRS: >98%

25% 50% 75%





- Station availability improves after initial teething problems as more H_2 is dispensed (**bathtub curve**).
- Project-average availability is currently **95.4%**.
- (Average availability excludes stations with low availability in one quarter).

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Project Progress
HRS availability: … but challenges remain

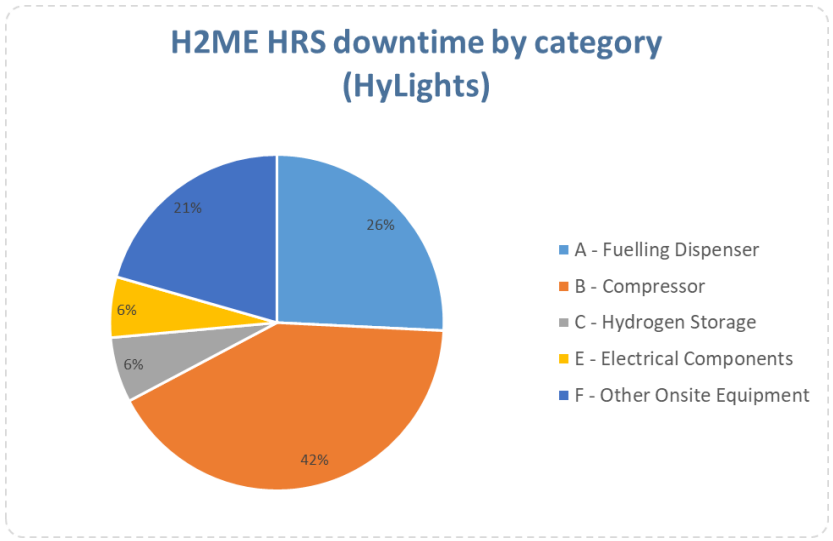
HRS: 95.4% FCEV: >98%

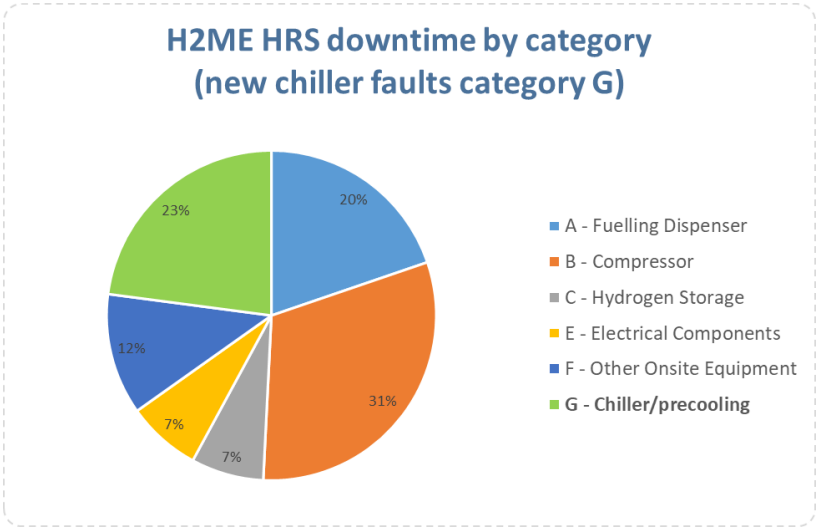
Availability

FCEV: 99%
HRS:98%

FCEV: >98%
HRS: >98%

25% 50% 75%





- "What gets measured gets improved".
- (Chart on left) HyLights MAF (2011) did not consider precooling.
- (Chart on right) Including chiller faults allows more focus on main areas for improvement.
- Compressors, dispensers and precooling main sources of downtime.

European Hydrogen Week

H2MOBILITY

»

… creates and operates the backbone
of the hydrogen refuelling infrastructure

… **provides services to others**
allowing them to benefit from our learning curve.

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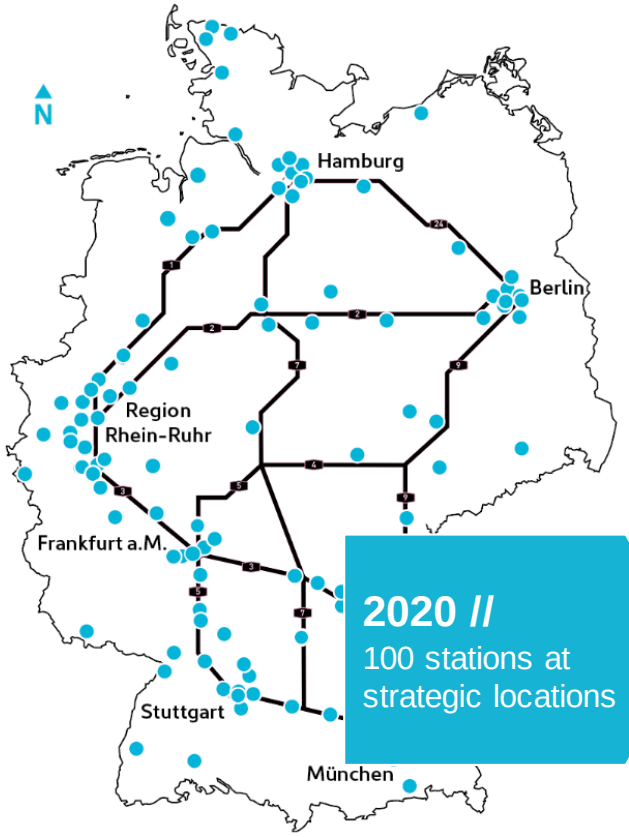
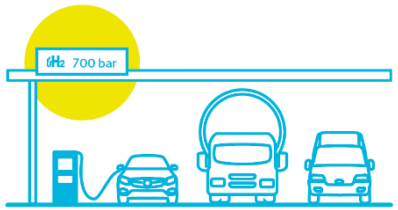
2020: The first ca. 100 stations for Passenger / Light Duty vehicles (700 bar) are in operation



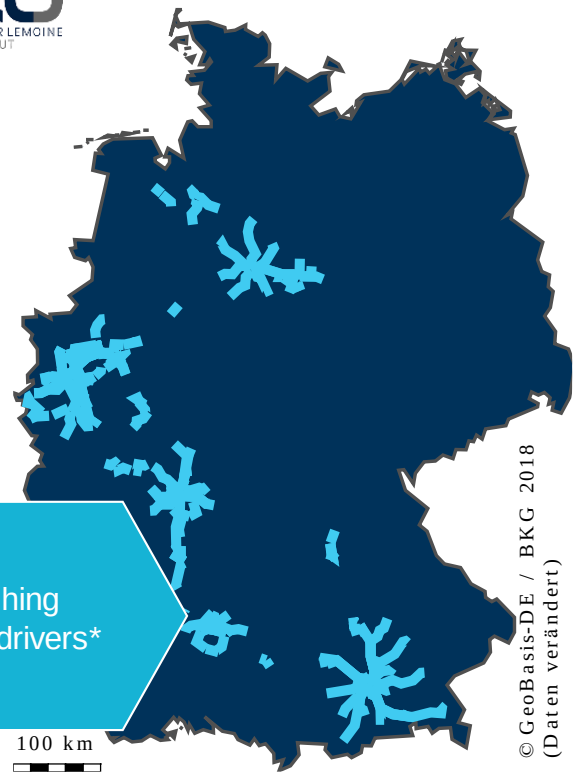


2020 //
100 stations at strategic locations

… with technical capacity for 40.000 vehicles
…

… reaching 6 Mio. drivers*

REINER LEMOINE INSTITUT



© GeoBasis-DE / BKG 2018 (Daten verändert)

Grüger (2018)

*modeling by Reiner Lemoine Institute, Berlin. Parameters: 90% of long distance trips, Station within 5 km from driver's home location, max. 5 km deviation to refuel accepted.

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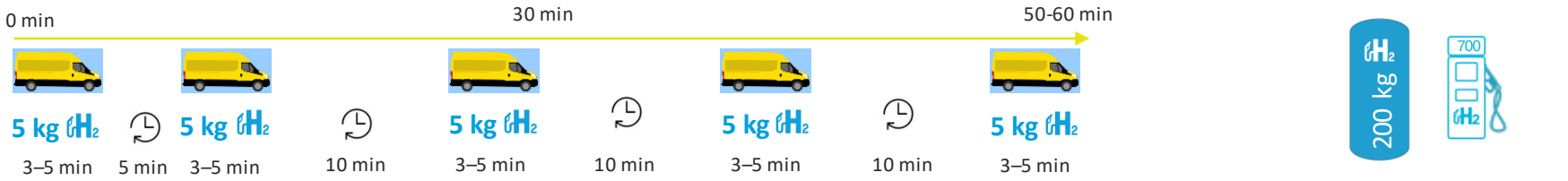
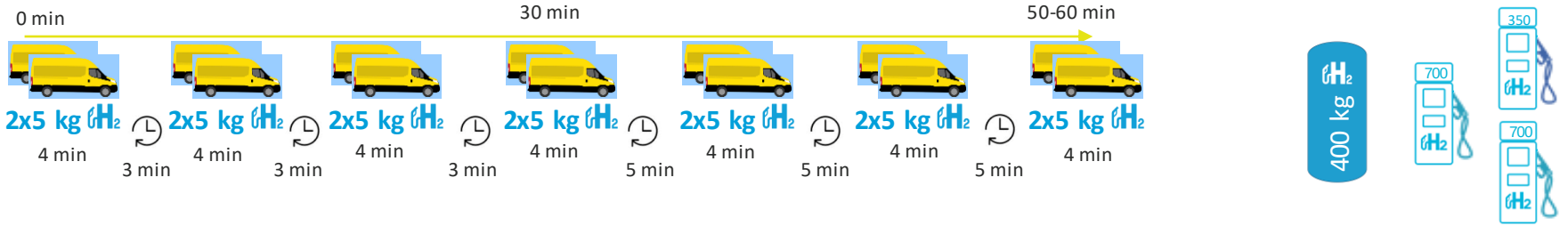
Use Case Light Duty Vehicle: Back to Back Performance as Key Challenge

2020 - Current existing HRS Configuration: Type ‚Small' 700 bar



2022 - Configuration Type ‚Medium' 700 bar (Cooling & Compressor Upgrade) – Back-to-Back Capability; 350 bar; Parallel Refueling



2022+: Configuration Type ‚Large / X-Large' 700 bar

Spec L/XL in discussion for 2022+

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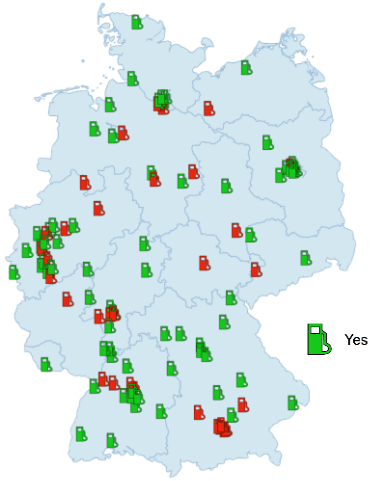
Challenges of upgrading existing Hydrogen Refueling Stations



CURRENT GRID
- 102 HRS reviewed
- 68 expandable

STORAGE SYSTEM
- On site tank
- Trailer swap

REFUELING TYPE
- 350 bar, 700 bar
- LH2

OPERATING
- Downtime of station
- Conflict with PV refueling

SELECTION
- Suitable IOC sites
- Funding criteria
- Partner sites

SUFFICIENT SPACE
- Fitting HRS Components
- Maneuverability
- Buying or leasing

PERFORMANCE
- Simultanous refueling
- B2B performance

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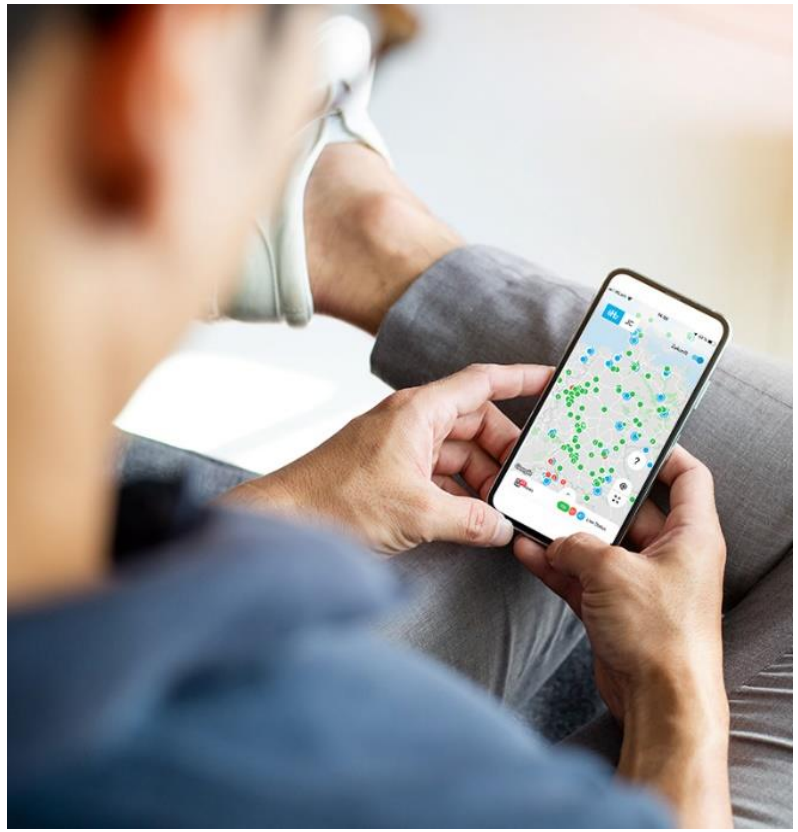
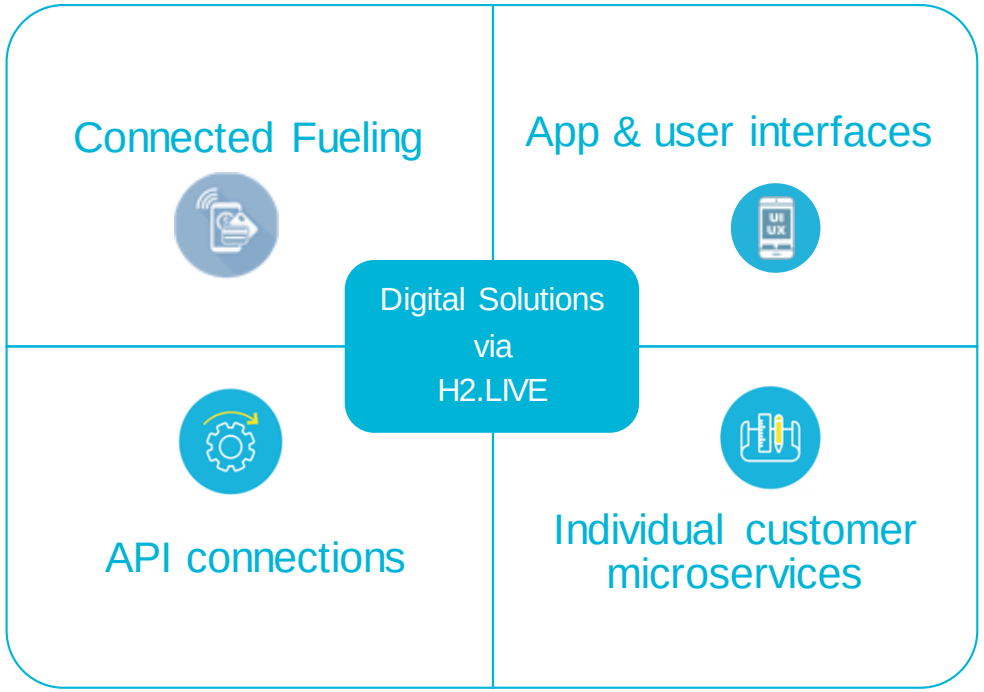
Digital Solutions can be key to customer satisfaction





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Thank you for your attention

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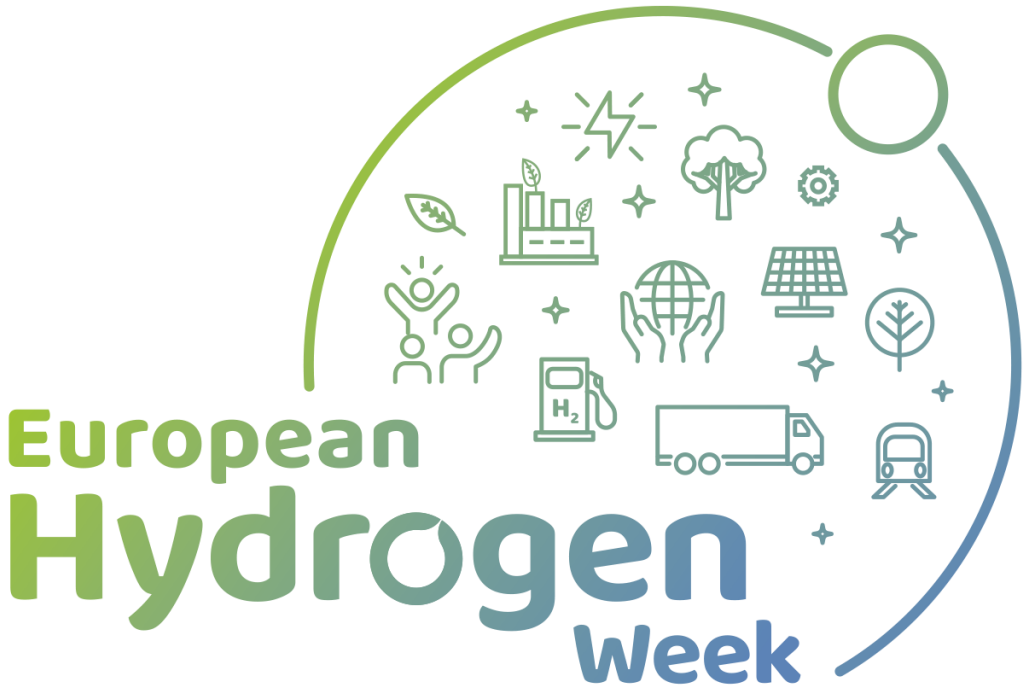

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