e-Forum Ενέργειας 2020
14 Ιουλίου 2020

Το υδρογόνο ως ενεργειακός φορέας

ΘΑΝΟΣ ΣΤΟΥΜΠΟΣ – ΜΑΝΟΣ ΣΤΑΜΑΤΑΚΗΣ
ΕΚΕΦΕ «ΔΗΜΟΚΡΙΤΟΣ»

ΔΗΜΟΚΡΙΤΟΣ
DEMOKRITOS

CYRUS

Hydrogen as Energy Carrier I

- Storage of Renewable Energy (solar, wind…) in the Form of Hydrogen via Electrolysis
- Use of Hydrogen in NG grids and Industry
- Re-electrification of Hydrogen for Stationary and Mobile (Transport) Applications via the Use of Fuel Cells…

Hydrogen as Energy Carrier II

- The technology (Hydrogen & Fuel Cells) exists (production, storage, safety, use in stationary applications and vehicles (FCEVs, buses, trucks, trains…))
- The issue of infrastructures remains open…

Hydrogen Fueling and Electric Charging of Vehicles in Germany

2018, JULY, 12TH | JOCHEN LINSSEN, MARTIN ROBINIUS, THOMAS GRUBE, MARKUS REUSS, PETER STENZEL, KONSTANTINOS SYRNANIDIS, DETLEF STOLTEN

6th Hellenic Forum for Science Technology and Innovation, Athens Greece

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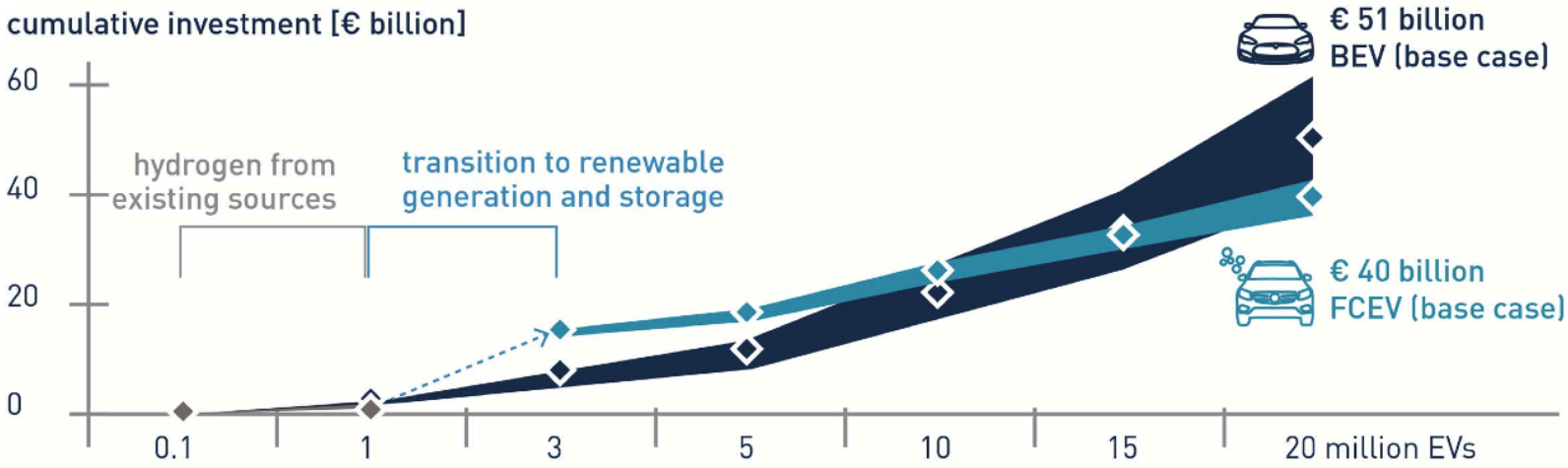
Institute of Electrochemical Process Engineering (IEK-3)

Cumulative Investment

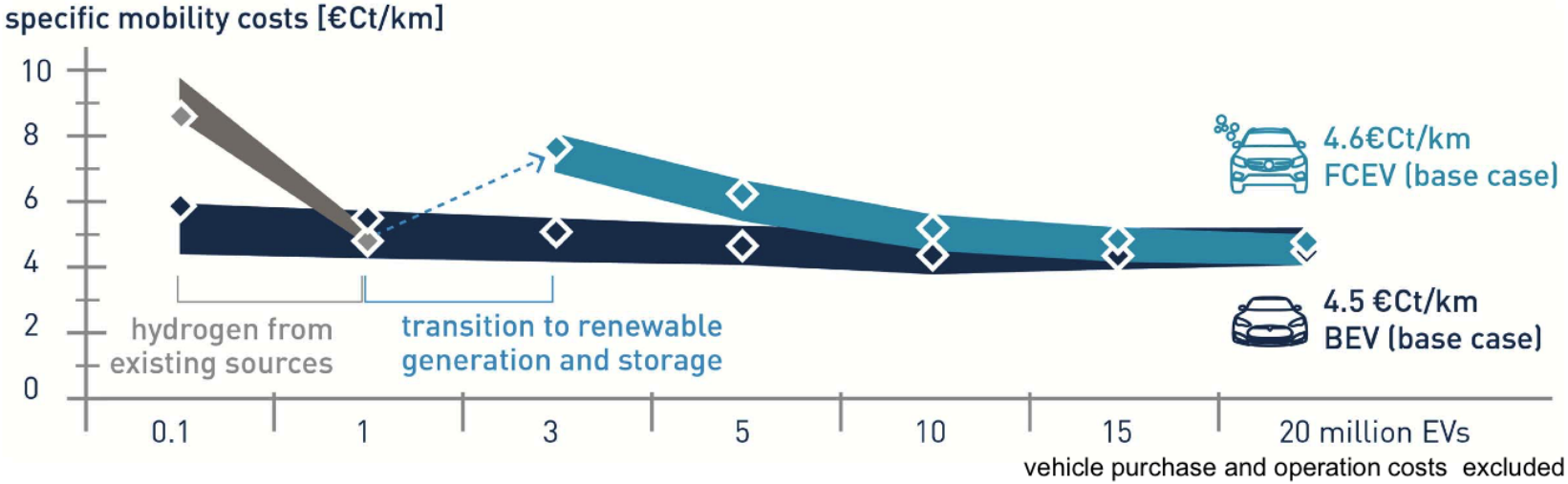
Infrastructure Roll-Out



- Hydrogen more expensive during the transition period to renewable electricity-based generation
- High market penetration: battery charging needs more investment than hydrogen fueling
- For both infrastructures investment low compared to other infrastructures

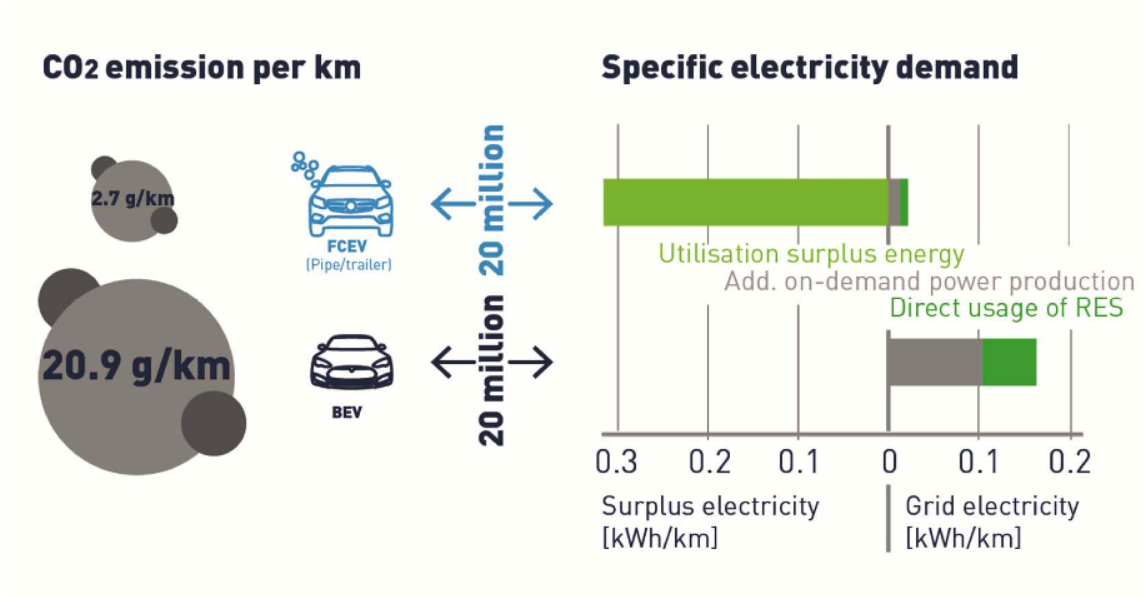
	Investment [€ billion]
Renewable electricity generation scenario	374
Electric grid enhancement plan 2030	34
Federal transport infrastructure plan 2030	265
Hydrogen fueling infrastructure	40
Electric charging infrastructure	51

Comparison of Mobility Costs



- For small vehicle fleets, i.e. 0.1 million cars, BEV fuel costs are significantly lower compared to FCEVs.
- Increase for hydrogen between 1 and 3 million cars results of switching to exclusive utilization of renewable energy for hydrogen production via electrolysis
- Mobility costs per kilometer are roughly same in the high market penetration scenario at 4.5 €ct/km for electric charging and 4.6 €ct/km → the lower efficiency of the hydrogen pathway is offset by lower surplus electricity costs.

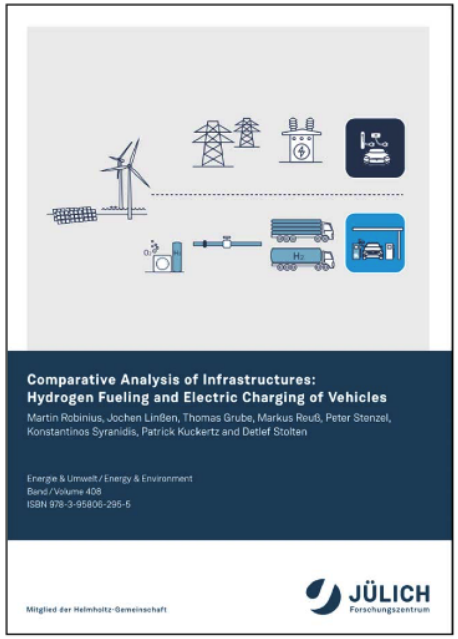
CO_2 Emissions & Electricity Demand



- Efficiency of charging infrastructure is higher, but limited in flexibility and use of surplus electricity
- Fueling infrastructure for hydrogen with inherent seasonal storage option
- Low specific CO2 emissions for both options in high penetration scenarios with advantage for hydrogen, well below the EU emission target after 2020: 95 g_{CO2}/km

Full Report Available

http://hdl.handle.net/2128/16709



Project team:

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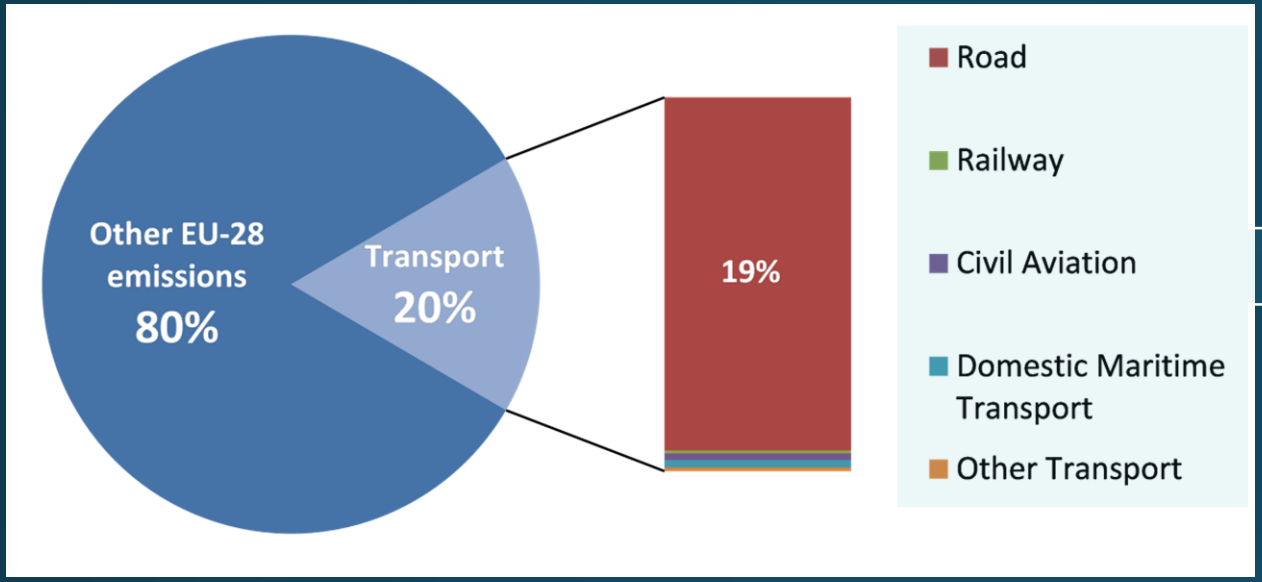
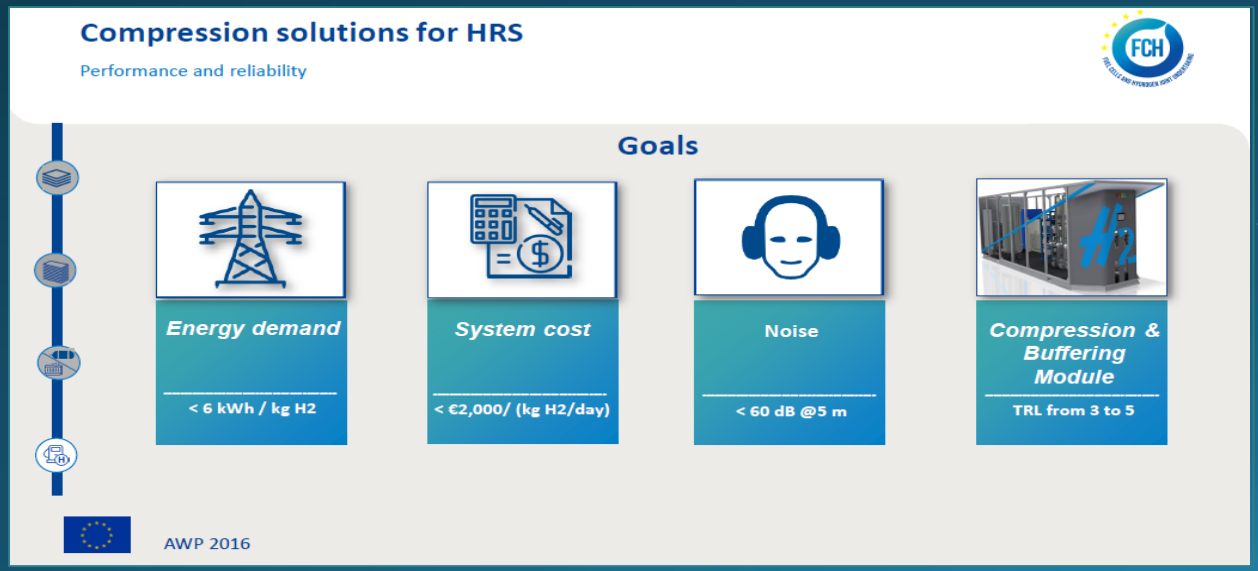
Funded by

H2 MOBILITY
FUELLING HYDROGEN

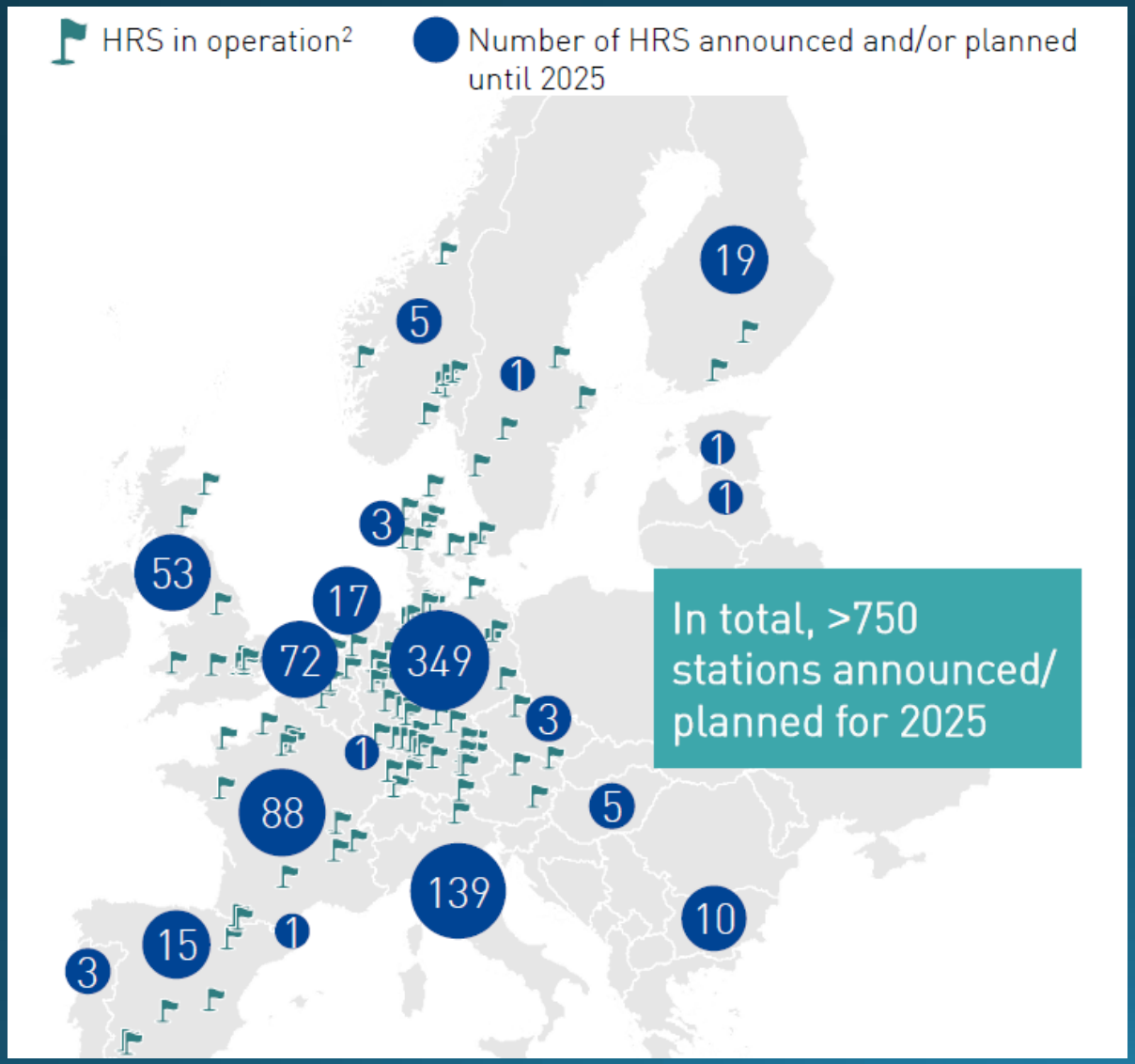
NEED FOR NEW INFRASTRUCTURES

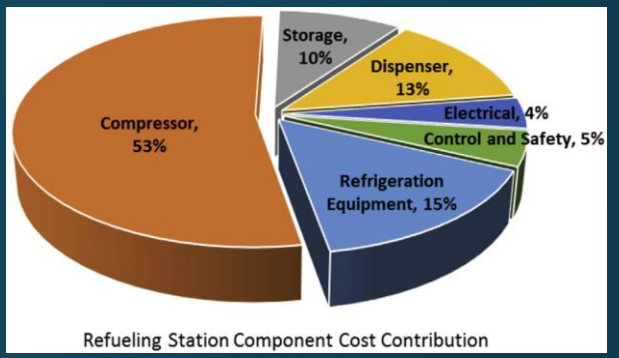


Need of compression



The market



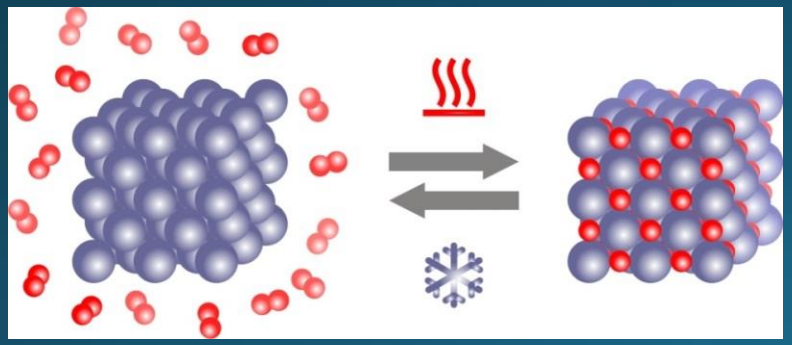


The envisaged main market for the MHHC is the one of Hydrogen Refuelling Station (HRS):

The size of the Total Addressable Market in Europe for HRS and Hydrogen Vehicles has been assessed by the European Commission in the COM (2017) 652 final document

A NEW TECHNOLOGY FOR H_2 COMPRESSION

A noise free hydrogen compression system based on metal hydrides using only water as the cooling / heating medium achieving hydrogen pressures > 350 bar



Metal hydrides basic principle

UNIQUE ADVANTAGES

ZERO NOISE LEVELS

ability to install Hydrogen Refueling Stations (HRS) in residential areas

VERY LOW O&M COSTS

use only cheap, low-grade thermal energy; do not include mechanical parts

LOW ENVIRONMENTAL IMPACT

no use of Critical Raw Materials; can be driven only by RES or/and Waste Heat

MODULARITY, AVAILABILITY & RELIABILITY

modular product with hgh availability and reliability

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