GREEN LIQUID FUELS OF THE FUTURE

12.02.2021

HYDROGEN EUROPE

Jorgo Chatzimarkakis, Secretary General

Hydrogen Europe


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ABENGOA
Advent
AFHYPAC
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AGFA
Air Liquide
AIR PRODUCTS
AIRBUS
ALSTOM
AMF
AngloAmerican
ANSALDO ENERGIA
aperam
AREVA
AsahiKASEI
atawey
AVL
AVGUSTA
Baker Hughes
BALLARD
Bioway
BMW Group
bp
Brintbranchen
CaetanoBus
capitalenergy
CCS GLOBAL
CeresPower
CENERGY
CHANTIERS DE L'ATLANTIQUE
CHART
CHEREAU
CNH INDUSTRIAL
COLRUYTGROUP
DAIMLER
DAM GROUP
Danish Power Systems
DENSO
Crafting the Core
DEME CONCESSIONS
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enagas
ENGIE
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convion
ESB
Energy for generations
EFCF EUROPEAN FUEL CELL FORUM
DWV
DKV
elcogen
ENERGINET
ervia
EATON
KEPCO
galp
Falck Renewables
faurecia
elringklinger
FINCANTIERI
Estonian Association of Hydrogen Technologies
Fronius
FTI CONSULTING
FUEL CELL POWERTRAIN
FEV
Finnish Energy
fortum
Hinicio
GAZ system
gasunie
GENCELL
FLUXYS
HY2GEN AG
H2V
Haskel
HDF
Helion
FREUDENBERG
GRTgaz
H2energy
H2B2
HOLTHAUSEN
HYTEP
CZECH HYDROGEN TECHNOLOGY PLATFORM
HONDA
HELLENIC PETROLEUM
Howden
Hungarian Hydrogen and Fuel Cell Association
HyET
HYDROGENICS
hydrogenious
LOHC TECHNOLOGIES
HYDROPOLE
HYGEAR
HyMove
EDF
HYSYTECH
HYUNDAI
ÍSLENSK NÝORKA
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INEA
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Energy Storage | Clean Fuel
JSW SA
John Cockerill
hypion
kiwa
Lithuanian Hydrogen energy association
KLASTER
H2LV
Q8 Research
Linde
Logan Energy
MAYFAIRMARINE
McPhy
Mercedes-Benz FuelCell
JM
Johnson Matthey
Inspiring science, enhancing life
LOTOS
ORLEN
Open Grid Europe
The Gas Wheel
metacon
CLEAN ENERGY FOR INDEPENDENCE
MICHELIN
Lhyfe
LANDIRENZO GROUP
LIEBHERR
LUXFER GAS CYLINDERS
MOTOR OIL (HELLAS) CORINTH REFINERIES S.A.
INTSA TECHNOPOWER
group
NEA GROUP
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PLUG POWER
Nedstack
Port of Antwerp
NOVA SWISS
ontras
PM PROTON MOTOR
H2RO
RWE
PLASTIC OMNIUM
NESTE
SIEMENS
Port of Rotterdam
POWERCELL
PowiDian
REPSOL
RICARDO
planetpower
SAINT-GOBAIN
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SALZGITTER MANNESMANN FORSCHUNG
sfice
SMA
SMARTENERGY
PGNiG
Slovak National Hydrogen Association
SHV ENERGY
SNCF
SOLARIS
SOLENCO POWER
SOLID POWER
storengy
Sumitomo Benelux s.a./n.v.
sunfire
Swagelok
SYMBIO
snam
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Thyssengas
TOMO GROUP
'TORAY'
Innovation by Chemistry
TOYOTA
UKHFCA
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TÜV SÜD
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TOTAL
UKRAINIAN HYDROGEN COUNCIL
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Wystrachi
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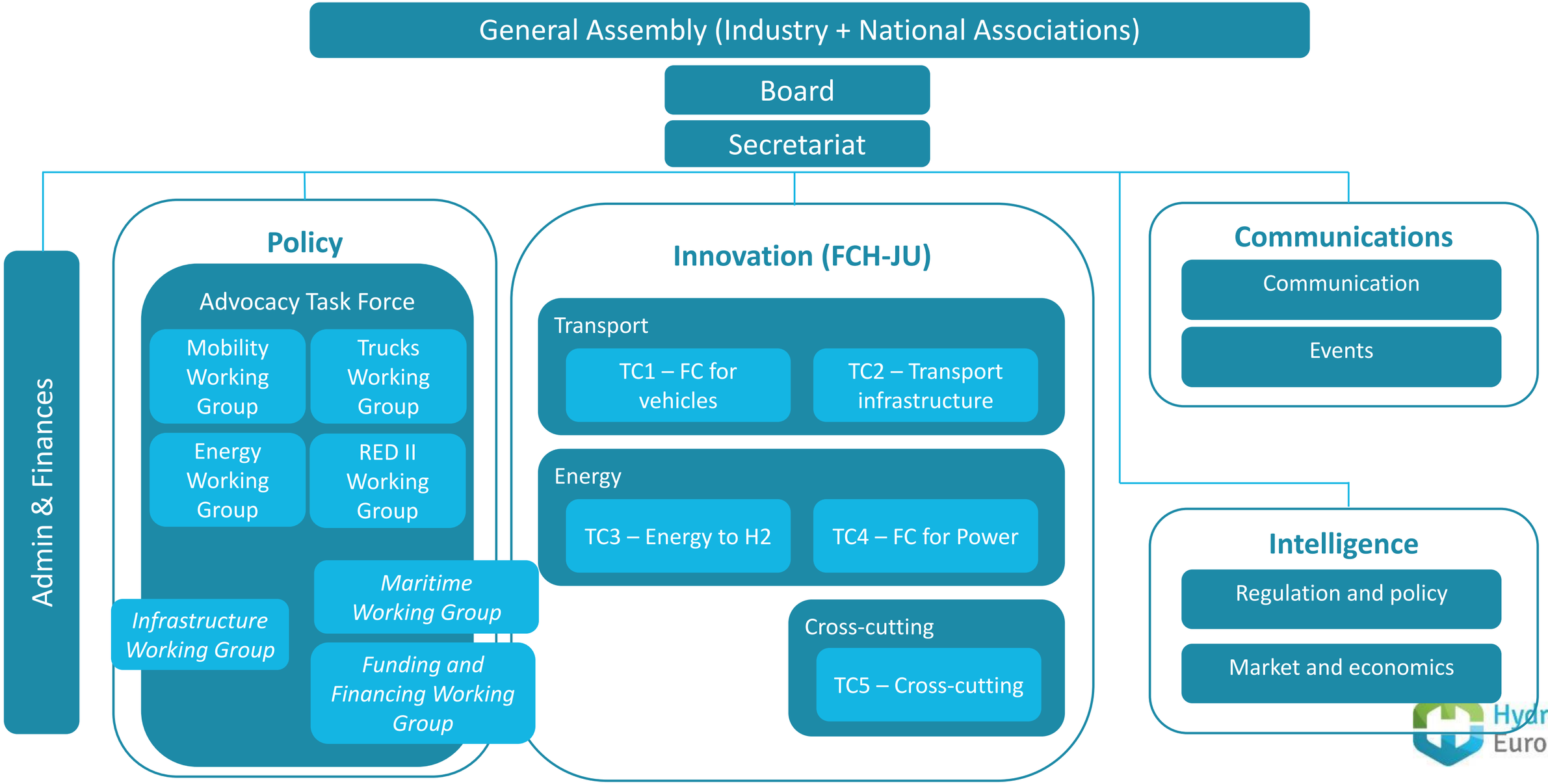
voestalpine
ONE STEP AHEAD
ZEG Power

Hydrogen Europe – a fully fledged lobbying association



Hydrogen historical day: 3 important EU initiatives

8th JULY 2020

ENERGY SYSTEM INTEGRATION

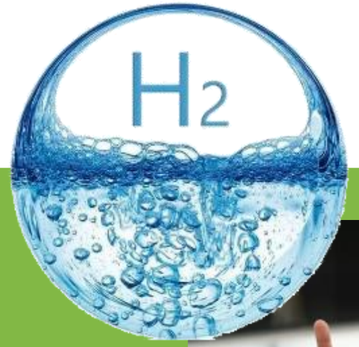
EU HYDROGEN STRATEGY

EU CLEAN HYDROGEN ALLIANCE

European Clean Hydrogen Alliance

Hydrogen Europe

At EU level – Green Deal leaders & hydrogen



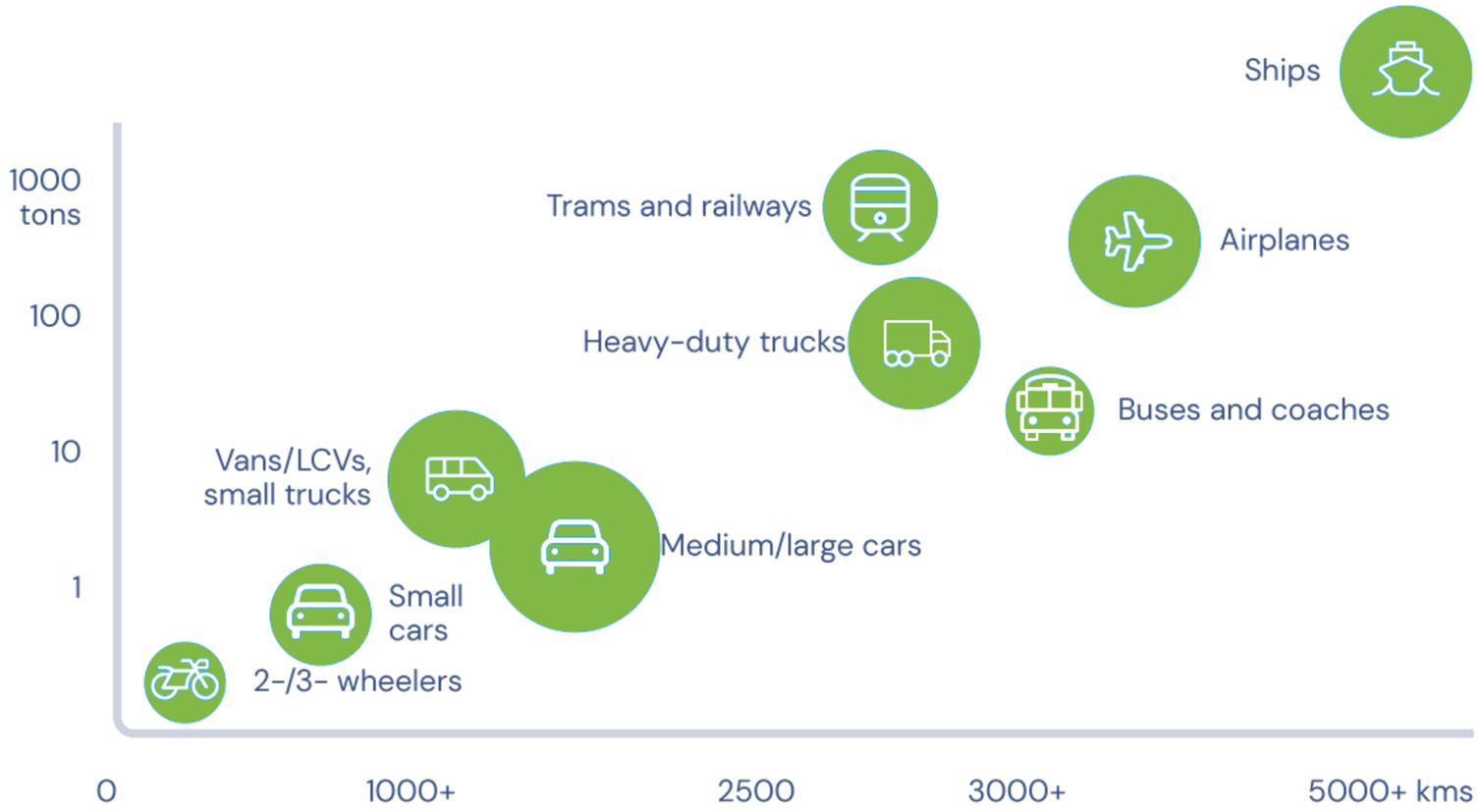
“Next Generation EU should invest in Hydrogen.”
Ursula von der Leyen @State of Union speech, September 2020

“H2 rocks, and I am committed to making it a success!”
Frans Timmermans- Executive Vice-President for the European Green Deal

Timmermann’s cabinet reinterred importance of hydrogen mobility at a meeting with Hydrogen Europe mid-January, highlighting among other synergies between transport end energy networks, role of synthetic fuels

FCEVs and BEVs as complementary options for new vehicles

Comparison of range, payload, and preferred technology



- BEV and FCEVs offer complementary solutions depending on the use
- Hydrogen is particularly well suited for heavy load, high energy use and harsh operational conditions.
- The vehicles can operate 24/7 in all climate conditions without energy loss.
- Energy efficiency: look at the whole system efficiency - and not just at vehicle efficiency

At EU level – DG MOVE

Coalition statement signed by the whole value chain on 23 November 2020: OEMs, fuel cell and hydrogen technology suppliers, refuelling and hydrogen infrastructure providers, truck operators, users of road freight services and related industry associations joined forces to announce that they foresee that up to 100,000 hydrogen-powered trucks and 1,500 stations will be deployed by 2030

*"I **would like to applaud your coalition's commitment** […] **we need this kind of impulse in parallel** to the AFID revision which will be likewise ambitious. The study you presented today is valuable **because it makes a compelling case for FCH trucks as an upcoming zero emission alternative**"*

*"H2 and FC are sure to have a leading role and the fact that **the EU is a technological leader** in this area will help."*

*"**The next step is to make H2 a real option** for coaches and lorries, **long distance road haul is challenging to decarbonise and H2 provides a promising way for that**. But **we need to move quickly from pilot tests to demonstration** to make the technology available from a commercial point of view "*

Adina Valean, Commissioner for transport, 23 November 2020

National Hydrogen Strategies

H2 strategy adoption

- Six countries have officially adopted an H2 strategy
- These include Netherlands, Germany, France, Spain, Portugal, and Norway
- Nine countries are currently working on their national H2 strategies

Adopted H2 strategy Planned H2 strategy

Notes: 1. Illustrative as exact number of policies continues to change
Source: Hydrogen Europe, Fuel Cells and Hydrogen Observatory

Germany 	**€7bn (+ €2bn** external partnerships)
Spain 	**€8.9bn** (estimated mobilised investment)
France 	**€7.2bn** (of which €1.5bn for an IPCEI project)
Portugal 	**€7-9bn** (estimated mobilised investment). As public funds around €1bn (½ national, ½ from EU funds)
Austria 	**€2bn (draft)** of public support requested by 2030 (of which €1bn by 2024) [**tbc** – 1-2 GW by 2030]
Italy 	**€10bn (draft):** estimated mobilised investment of which 5bn will be EU and Italian public funds [**tbc** – 5GW by 2030]

Hydrogen Europe

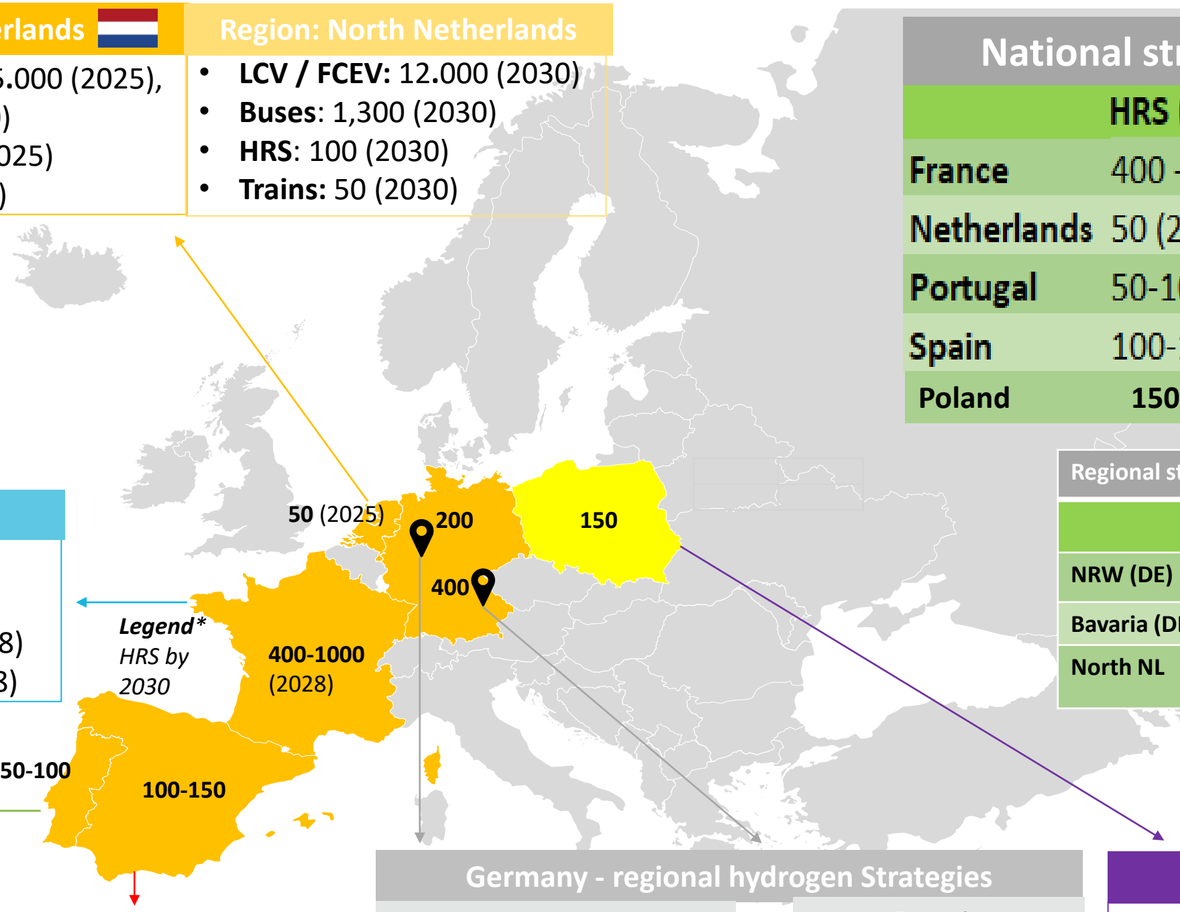
National & Regional Hydrogen Strategies: Mobility targets

The Netherlands

- **LCV / FCEV:** 15.000 (2025), 300.000 (2030)
- **HDV**: 3.000 (2025)
- **HRS**: 50 (2025)

Region: North Netherlands

- **LCV / FCEV:** 12.000 (2030)
- **Buses**: 1,300 (2030)
- **HRS**: 100 (2030)
- **Trains:** 50 (2030)



National strategies

	HRS (2030)	FCEV	HDV
France	400 - 1000	20.000-50.000 (2028)	800-2.000 (2028)
Netherlands	50 (2025)	15.000 (2025) 300.000 (2030)	3000 (2025)
Portugal	50-100	N/A	N/A
Spain	100-150	N/A	5000-7500 (2030)
Poland	**150**	**N/A**	**2,000 buses (2030)**

Regional strategies

	HRS (2030)	FCEV	HDV
NRW (DE)	200	6,000	11,000
Bavaria (DE)	400	80,000	3,000
North NL	100	12,000	1,300 buses; 50 trains

France

- **LCV / FCEV:** 5000 (2023), 20.000 – 50.000 (2028)
- **HDV**: 200 (2023), 800-2.000 (2028)
- **HRS**: 100 (2023), 400-1.000 (2028)

Portugal

By 2030

- **HRS**: 50-100

Share of hydrogen in:

- Road transport: 5%
- Domestic maritime transport: 3-5%

Spain

By 2030:

- **Buses:** 150 – 200
- **LDV/HDV:** 5.000- 7.500
- **HRS:** 100 – 150
- **Trains:** 2

Germany - regional hydrogen Strategies

North-Rhine Westphalia

By 2030:

- **FCEV:** 6.000
- **HDV:** 11.000
- **Buses:** 3.800
- **HRS:** 200
- **Garbage trucks:** 1000

Bavaria

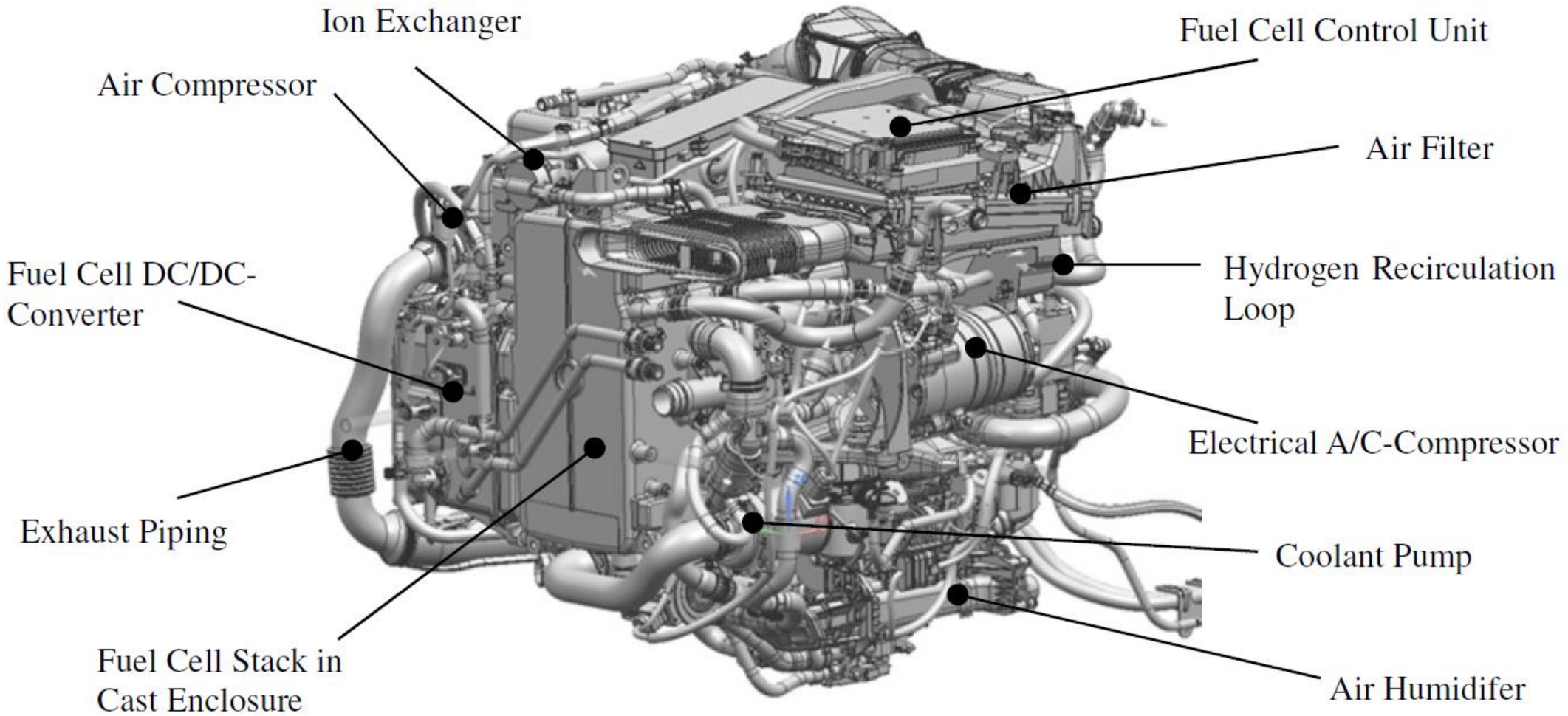
By 2030:
FCEV: 80.000
HDV/Buses: 3.000
HRS: 400

Poland (draft)

By 2030:

- **Buses:** 500 (2025) 2.000 (2030)
- **HRS:** 32 (2025) 150 (2030)
- **Trains:** 1st H2 train
- Synthetic fuels fuel ramp-up (237 GWh demand approximately)

Fuel cells will keep the value chain in Europe



App. same number of components as a conventional vehicle

Hydrogen Europe

Fuel cell production plans in Europe

Non exhaustive list of fuel cell production plans (incl. IPCEIs))

Existing fleets – Hydrogen Europe views

Pieces of legislation are in place or under review for NEW vehicles

→What to do with the existing fleet?

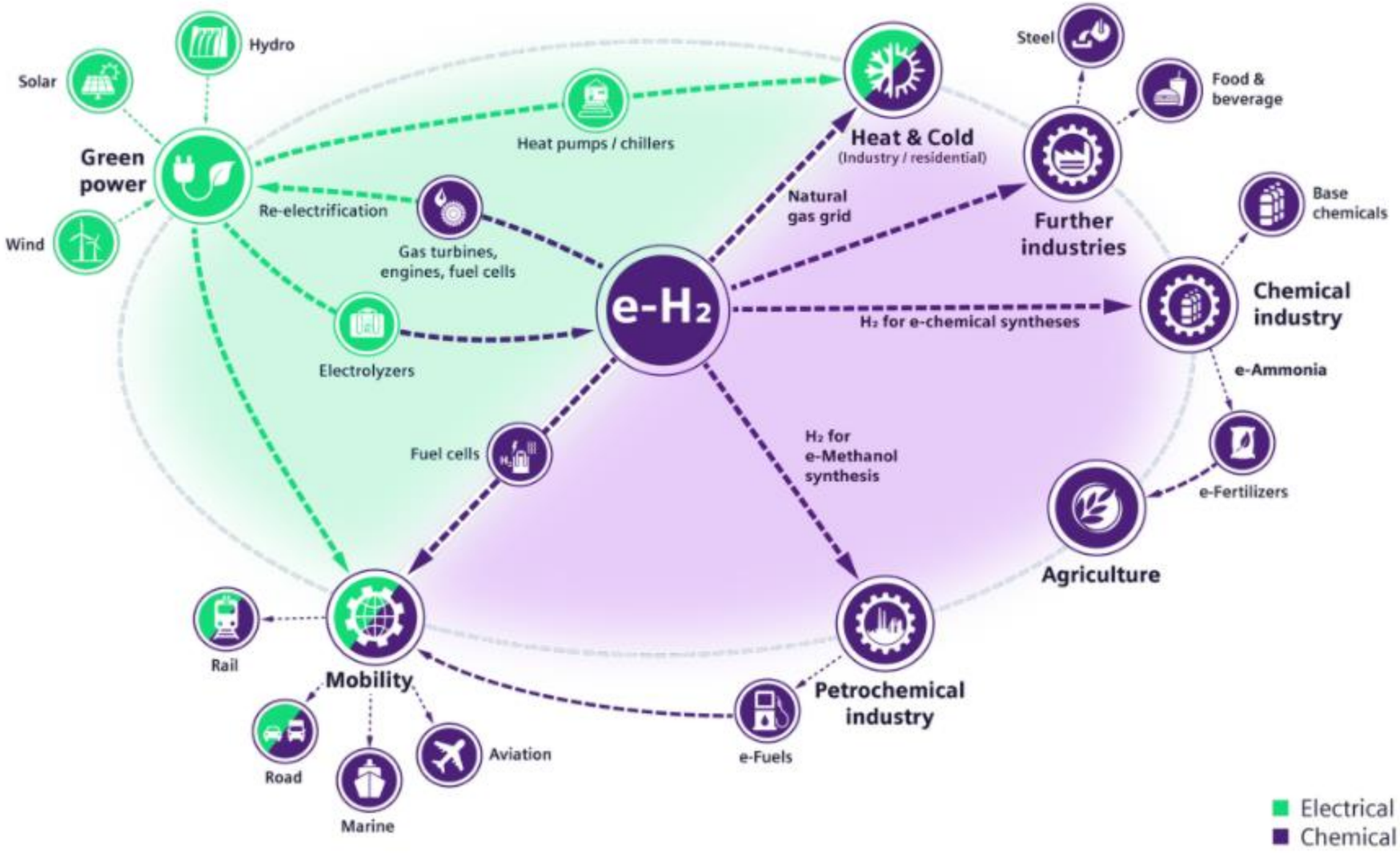
“Unlike for new vehicles, no EU legislation is in place to tackle GHG emissions from existing vehicle fleets.
Considering the size of the existing fleet, and in light of the Green Deal’s objectives, thoughts on tackling GHG emissions from existing vehicles should kick-start.
The potential role that carbon-neutral hydrogen-made fuels (i.e. hydrocarbons synthesised with carbon from biomass or air) could play in this respect should be further investigated. “

Hydrogen Europe’s position paper on the Sustainable and smart Mobility Strategy, December 2020

→ Use of synthetic (hydrogen-made) fuels in the road transport sector, along with use in maritime and aviation (economy of scale, costs decrease)

→ Affordability and circular economy to meet Green Deal objectives

The role of Power to X



Source:

Power-to-X describes methods for converting electrical energy into liquid or gaseous chemical energy sources through electrolysis and further synthesis processes. Using electrical current, water is split into oxygen and hydrogen – a 100% CO_2 emission-free process. Being a key technology for the energy transition, Hydrogen can be easily stored and further used or processed in many ways.

Sustainable and Smart Mobility Strategy Communication

"Overall, we must shift the existing paradigm of incremental change to fundamental transformation. Thus, this Strategy sets out a roadmap for putting European transport firmly on the right track for a sustainable and smart future."

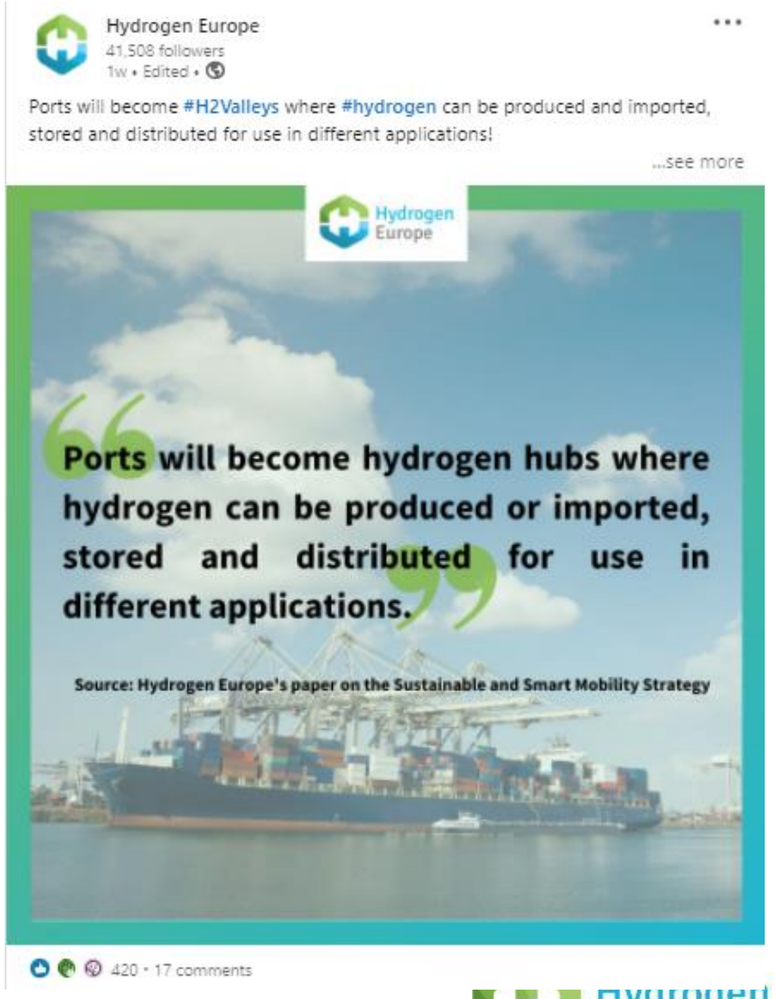
SSMS Communication released on 9th December 2020

Sustainability targets & approach in SSMS:

- Integrated approach looking at demand, supply, infrastructure, fuels
- Vehicles: 30 Million ZE cars by 2030; 80,000 ZE lorries by 2030
- HRS targets: 500 HRS by 2025/1,000 HRS by 2030
- Ports and airports as zero emission hubs
- The 'polluter pays' and 'user pays' principles need to be implemented without delay
- 100 climate neutral cities; focus on ZE last mile delivery
- Multimodality/intermodality focus incl. doubling rail freight traffic by 2050, 25% increase of inland waterways/short sea shipping by 2030
- Role of Clean Hydrogen for European partnership & European Clean Hydrogen Alliance

Read HE's reaction here

Sustainable and Smart Mobility Strategy- HE’s position paper



Hydrogen Europe

TRUCKS: How to boost H2 powered trucks role on the EU political agenda?

Hydrogen fuel cell trucks: paving the road to a carbon-neutral Europe, 5th March 2020

Hydrogen Europe

Joint call for the deployment of hydrogen fuel cell trucks

A needed shift towards a carbon-neutral society

Hydrogen is particularly suitable for long-haul trucks of over 16 t. For long-distance, hydrogen is expected to represent the most promising carbon-neutral solution. Hydrogen can also be a suitable solution for **regional distribution and other applications requiring high energy use** (e.g. refrigerated/garbage trucks).

We aim to make **large-scale deployments of fuel cell trucks a reality soon**, with pre commercial series ready by 2025 and full commercialisation by 2030 and beyond: **with 5,000-10,000 vehicles, and with up to 95,000 vehicles by 2030, in all segments**. We estimate that we would need approx. **100 hydrogen refuelling stations by 2025 and 1000 stations by 2030 to fill these trucks.**

We will strive to deliver low carbon, renewable hydrogen at a competitive cost at the nozzle. The fact that renewable electricity prices are going down is a sign in this direction. This is in line with the EU's ambition to work on developing a carbon-neutral society, in which not only the tank-to-wheel approach would be considered as is the case in current EU regulations.

Hydrogen supply chain together

Hydrogen Europe

Hydrogen Europe Research

Strategic Research and Innovation Agenda
Final Draft
July 2020

Clean Hydrogen for Europe Partnership preparation

Hydrogen Europe

TRUCKS: How to boost H2 powered trucks role on the EU political agenda?

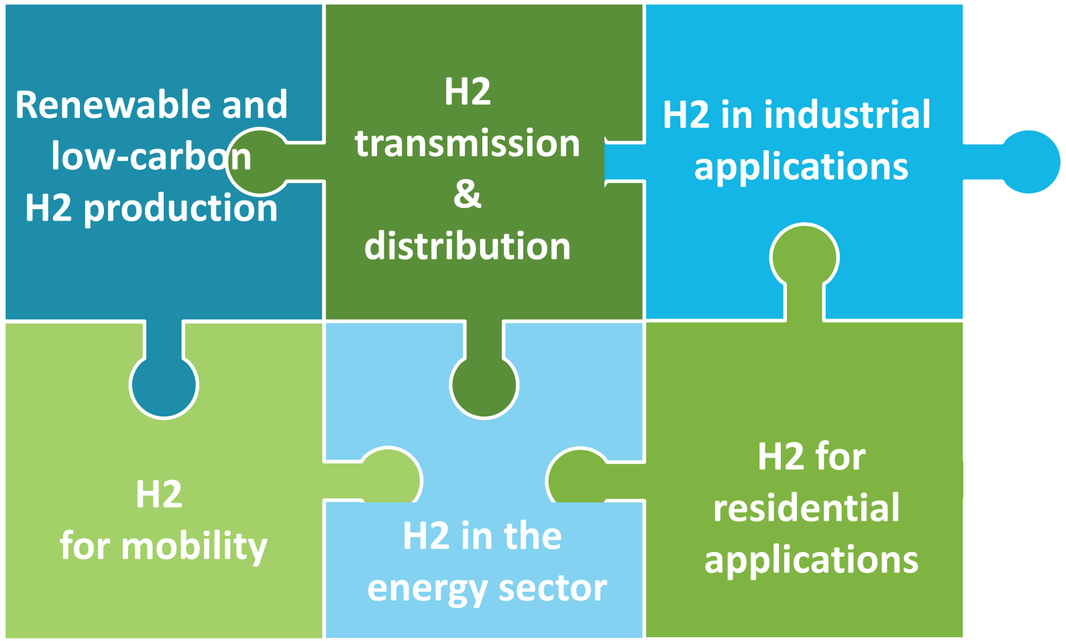
Hydrogen Europe

European Clean Hydrogen Alliance

Kick-starting the EU Hydrogen Industry to achieve the EU climate goals

Hydrogen Europe

The organisation of the Alliance



6 Roundtables

European Clean Hydrogen Alliance

High level progress meeting

openness

inclusiveness

partnership

transparency

diversity

Hydrogen Europe

Thank you for your attention!

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