



**Hydrogen**  
**Europe**

**Hydrogen Europe Perspective**

HYPER Closing Seminar

Brussels, 10<sup>th</sup> December 2019

- We represents the European Hydrogen and Fuel Cell sector:
  - **134 industry companies** representing the whole value chain, including OEM and end-users
  - **73 research organisations**
  - **19 national associations**
- We partner with the European Commission in the innovation programme Fuel Cells and Hydrogen Joint Undertaking (**FCH JU**).
- We are a supporting organisation of the **Hydrogen Council**. The Hydrogen Council is a global initiative of leading energy, transport and industry companies with a united vision and long-term ambition for hydrogen to foster the energy transition.



**Hydrogen Council**

# Hydrogen Europe: who we are

## FCH techno providers and/or pure players

**H<sub>2</sub> Production & distribution**



**FC Transport**



**FC Stationery**



**Others**



## Energy companies



## National Associations



## Industrial companies



## Transport companies



## Hydrogen Europe RESEARCH



# We have 3 convictions

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- 1. The energy transition in the EU will require hydrogen at large scale. Without it, the EU would miss its decarbonisation objective.*
- 2. FCH 2 JU has been a key instrument: we should build on its success and expand it through several funding opportunities.*
- 3. Hydrogen Technologies and Systems will play a key role in the EU's (re)industrialisation policy*

# These convictions are now well-shared

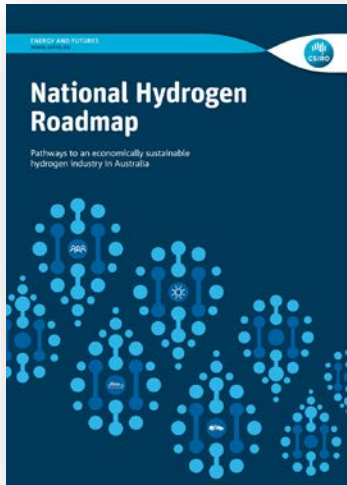
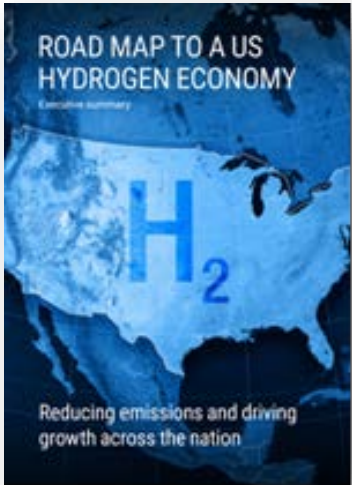
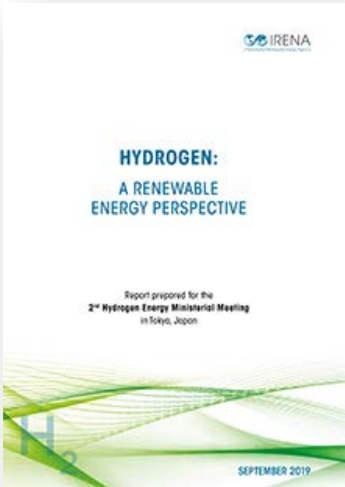
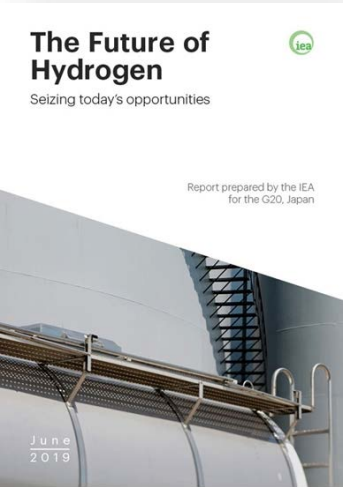


Frans Timmermans  
Executive Vice President of the European Commission  
Responsible for Europe's Green Deal

*“Hydrogen could be a huge opportunity for our economy”*

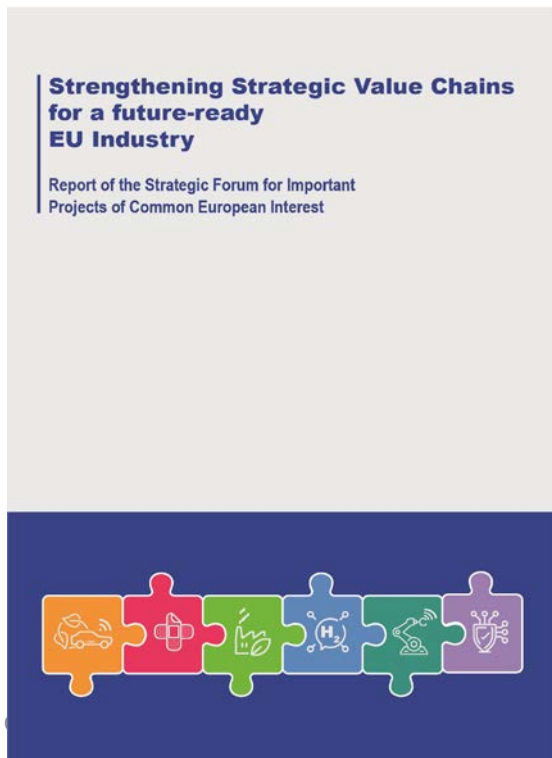
*“It is not that difficult to use gas infrastructure to import [green] hydrogen using gas infrastructure”*

*“we need to protect our industries and [...] help them free themselves from fossil fuels, for example when hydrogen is used in the manufacturing of steel”*



# These convictions are now well-shared

- **FCH JU Mid term review:** « The choice of a Joint Undertaking as instrument continues to ensure good alignment with both policy and industrial objectives. The IEG is of the view that Europe's competitive position would be less favorable without the activities of the FCH 2 JU”
- **Strategic Forum for IPCEI:**



## HYDROGEN TECHNOLOGIES AND SYSTEMS

- Potential to replace fossil-based energy with low-emission renewable hydrogen.
- Could enable and optimise large-scale renewable electricity generation.
- Could increase EU energy security and resilience.

### RECOMMENDATIONS:

- Develop a roadmap for a future European Hydrogen Economy.
- Build a supportive regulatory framework by reviewing legislation on renewable energy, develop common standards.
- Support R&D investments and build an innovative industrial system through cross-border collaboration and partnerships in Horizon Europe.
- Ensure safety and public acceptance through demonstrations and standardisation.

# Hydrogen enables the decarbonisation of all major sectors in the economy

Enable the renewable energy system → Decarbonize end uses

Enable **large-scale renewables integration** and **power generation**



**Distribute** energy across sectors and regions



Act as a **buffer** to increase system resilience



Help decarbonize **transportation**



Help decarbonize **industrial energy use**



Help decarbonize **building heat and power**

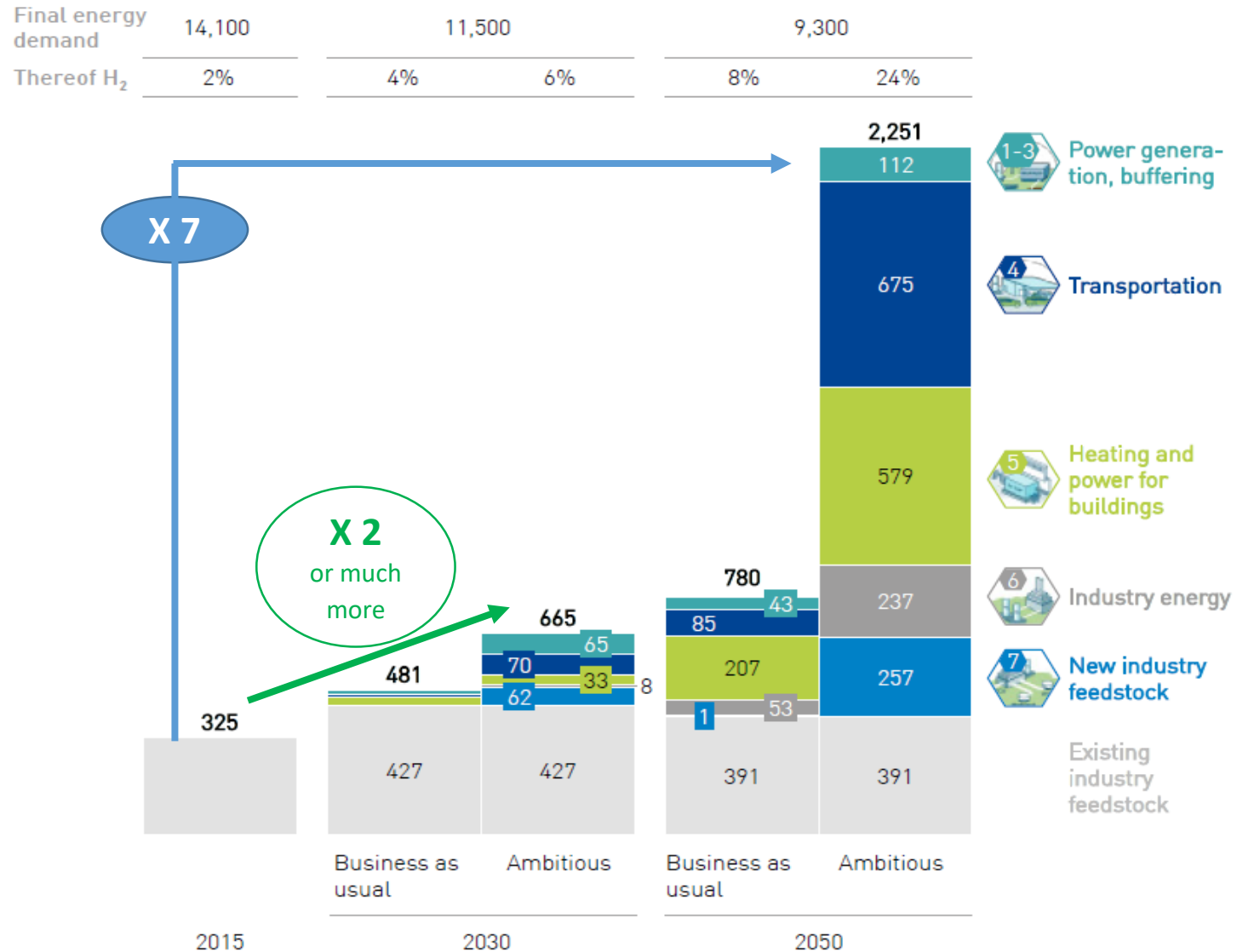


Serve as renewable **feedstock** : steel, refineries, chemicals

SOURCE: Hydrogen Council



# These targets will allow hydrogen to scale up



# What do we need to achieve these and scale up?

## A positive framework for hydrogen requires 2 elements:

1. Positive legislation which acknowledges and supports the role of hydrogen, incl. removing barriers that will hinder its development
2. Funding and financing to overcome the valley of death and create positive investments

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# Positive legislation, as it exists today

Sector	Requirement	Legislative Tools	Hydrogen's role
<b>Transport</b>	<ol style="list-style-type: none"> <li>1. CO<sub>2</sub> reduction</li> <li>2. PM/NO<sub>x</sub>/SO<sub>x</sub> reduction</li> <li>3. Integration of RES</li> </ol>	<ol style="list-style-type: none"> <li>1. <b>Renewable Energy Directive (RED2)</b></li> <li>2. <b>CO2 emission standards for LDVs/LCVs</b></li> <li>3. <b>CO2 emission standards for HDVs</b></li> <li>4. <b>Clean vehicle Directive</b></li> <li>5. <b>Alternative Fuel Infrastructure Directive</b></li> </ol>	<ol style="list-style-type: none"> <li>1. H2 as a fuel</li> <li>2. H2 made fuels</li> <li>3. Renewable H2 for refineries</li> </ol>
<b>Energy-intensive industries</b>	Decarbonisation	None (EU ETS)	Renewable / low - carbon hydrogen as feedstock switch
<b>Gas/ Heating</b>	Decarbonisation (to remain a player) Integration of RES	1. <b>Renewable Energy Directive (RED2)</b>	Renewable / low - carbon hydrogen as feedstock Fuel cell as energy converter
<b>Power</b>	Storage / ancillary services Integration of RES	<ol style="list-style-type: none"> <li>1. <b>Renewable Energy Directive (RED2)</b></li> <li>2. Electricity Market Design</li> </ol>	Rapid response electrolysers Energy Storage + Sectoral Integration

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<b>Energy-intensive industries</b>	Deco	<div style="background-color: #4a86e8; color: white; padding: 20px; text-align: center;"> <h2>Is it enough to trigger the hydrogen contribution ?</h2> </div>	/ low - carbon s feedstock switch
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## RED 2 : RES in Transport

### WHAT

#### Well to tank

- A bit H2 as a fuel ?
- Possibly H2 made fuels
- Hopefully a lot for H2 in refineries

#### CHALLENGE:

- Complex text with many restrictions (distrust ?)
- Now the devil will be in details of implementing acts and national transposition.

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<b>Power</b>	Storage / ancillary services Integration of RES	1. <b>Renewable Energy Directive</b> 2. Electricity Market Design	

## WHAT

### Tank to wheel + Road transport

- « technology neutral » / not H2 specific => Depends on OEM & customer choice
- For long, led to improvement of ICE rather than introduction of ZEV . Now tipping point.
- CVD useful for buses
- AFID (current text): too weak

### Nothing about shipping

## IS IT ENOUGH TO TRIGGER THE MARKET ?



### Bus: yes

- Products exist
- No infrastructure issue
- Policy drivers (CVD, city rules)

### Truck and vans:

- Huge potential + interest from end-users
- Products in development
- Will the rules trigger improvement of ICE + fossil or ZEV ?
- Big deployment requires a government coordinated action on infrastructure

### Cars:

- Product existing + under development
- Fleets
- Nothing big can happen without a government coordinated action on infrastructure



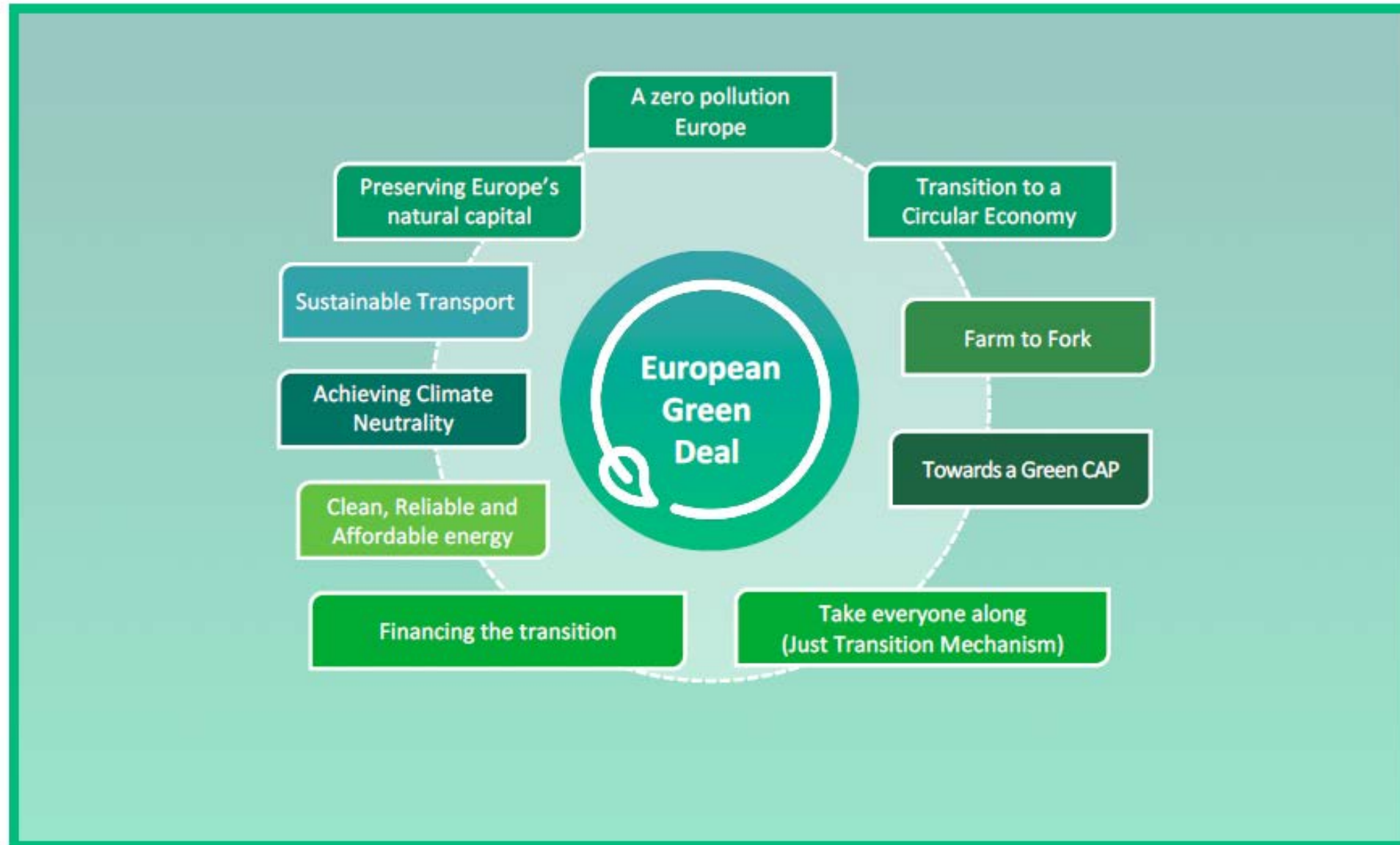
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<b>Power</b>	Storage services Integration	Funding available	Rapid response electrolyzers Energy Storage + Sectoral Integration

**WHAT:**  
 H2 as feedstock  
 H2 for clean steel  
 H2 for industrial heat

**IMPACT:**  
 • ETS not enough  
 • No clear « policy hook »

# Positive legislation: The “Green Deal”



# Positive legislation, as it could exist soon

Sector	Requirement	Legislative Tools	Hydrogen's role	VDL & Green Deal (100days)
<b>Transport</b>	<ol style="list-style-type: none"> <li>1. CO<sub>2</sub> reduction</li> <li>2. PM/NO<sub>x</sub>/SO<sub>x</sub> reduction</li> <li>3. Integration of RES</li> </ol>	<ol style="list-style-type: none"> <li>1. Renewable Energy Directive (RED2)</li> <li>2. CO<sub>2</sub> emission standards for LDVs/LCVs</li> <li>3. CO<sub>2</sub> emission standards for HDVs</li> <li>4. Clean vehicle Directive</li> <li>5. Alternative Fuel Infrastructure Directive</li> </ol>	<ol style="list-style-type: none"> <li>1. H<sub>2</sub> as a fuel</li> <li>2. H<sub>2</sub> made fuels</li> <li>3. Renewable H<sub>2</sub> for refineries</li> </ol>	<p><b>Implement and review:</b></p> <ul style="list-style-type: none"> <li>- RED2</li> <li>- CO<sub>2</sub>,</li> <li>- DAFI / TEN-T</li> </ul> <p><b><u>- Consider application of ETS for maritime and possible land transport</u></b></p>
<b>Energy-intensive industries</b>	Decarbonisation	None (EU ETS)	Renewable / low - carbon hydrogen as feedstock switch	<p><b>Circular Economy ?</b></p> <p><b>Others ?</b></p>
<b>Gas/ Heating</b>	Decarbonisation (to remain a player) Integration of RES	1. Renewable Energy Directive (RED2)	<ol style="list-style-type: none"> <li>1. Renewable / low - carbon hydrogen as feedstock</li> <li>2. Fuel cell as energy converter</li> </ol>	<ol style="list-style-type: none"> <li>1. Implement and review: RED2, EED, upward NECP (55%)</li> <li>2. <b><u>“Smart Sector Integration Package” (2021) Aka Gas regulation incl. TEN-E/CEF</u></b></li> </ol>
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<b>P</b>	services Integration of RES	2. Electricity Market Design	electrolysers Energy Storage + Sectoral	

**WHAT:**

- Reform of market rules
- Decarbonisation of the gas grid
- H2 for heat and industry
- Embryo of H2 infrastructure

**IMPACT**

- The mother of all regulation for H2 ?
- In preparation
- All our attention

# What do we need to achieve these and scale up?

## A positive framework for hydrogen requires 2 elements:

1. Positive legislation which acknowledges and supports the role of hydrogen, incl. removing barriers that will hinder its development

2. Funding and financing to overcome the valley of death and create positive investments

## 2. Funding and financing to overcome the valley of death and create positive investments

1. R&I, Horizon Europe and PPP
2. Infrastructure and CEF
3. EU ETS Innovation fund:
4. IPCEI

## Hydrogen enables the decarbonization of all major sectors in the economy

Enable the renewable energy system → Decarbonize end uses

Enable **large-scale renewables integration** and **power generation**



**Distribute** energy across sectors and regions



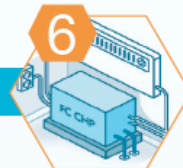
Act as a **buffer** to increase system resilience



Help decarbonize **transportation**



Help decarbonize **industrial energy use**



Help decarbonize **building heat and power**



Serve as renewable **feedstock** : steel, refineries, chemicals

SOURCE: Hydrogen Council

## 7 roles of hydrogen turned into 7 specific objectives grouped in 3 pillars

### PILLAR H2 PRODUCTION

#### SO1: LOW CARBON H2 PRODUCTION

1. Electrolysis
2. Other modes of production

#### SO2: INTEGRATION OF RENEWABLES

3. Role of electrolysis

### PILLAR H2 DISTRIBUTION

#### SO3: H2 STORED & DELIVERED AT LOW COST

4. Large scale storage
5. H2 in the gas grid
6. Transport & storage in liquid carriers
7. Transport by road, ships, etc
8. Key techno for distribution

#### SO4: REFUELING INFRASTRUCTURE

9. HRS for multiple applications

### PILLAR H2 END USES

#### SO5: TRANSPORT VEHICLES

##### Priorities

10. Technology building blocks
11. Truck and large vans (HD)
12. Maritime (Ships & Port)

##### Other new applications

13. Aviation
14. Train
15. Coach

#### SO6: H2 FOR HEAT AND POWER (in building and industry)

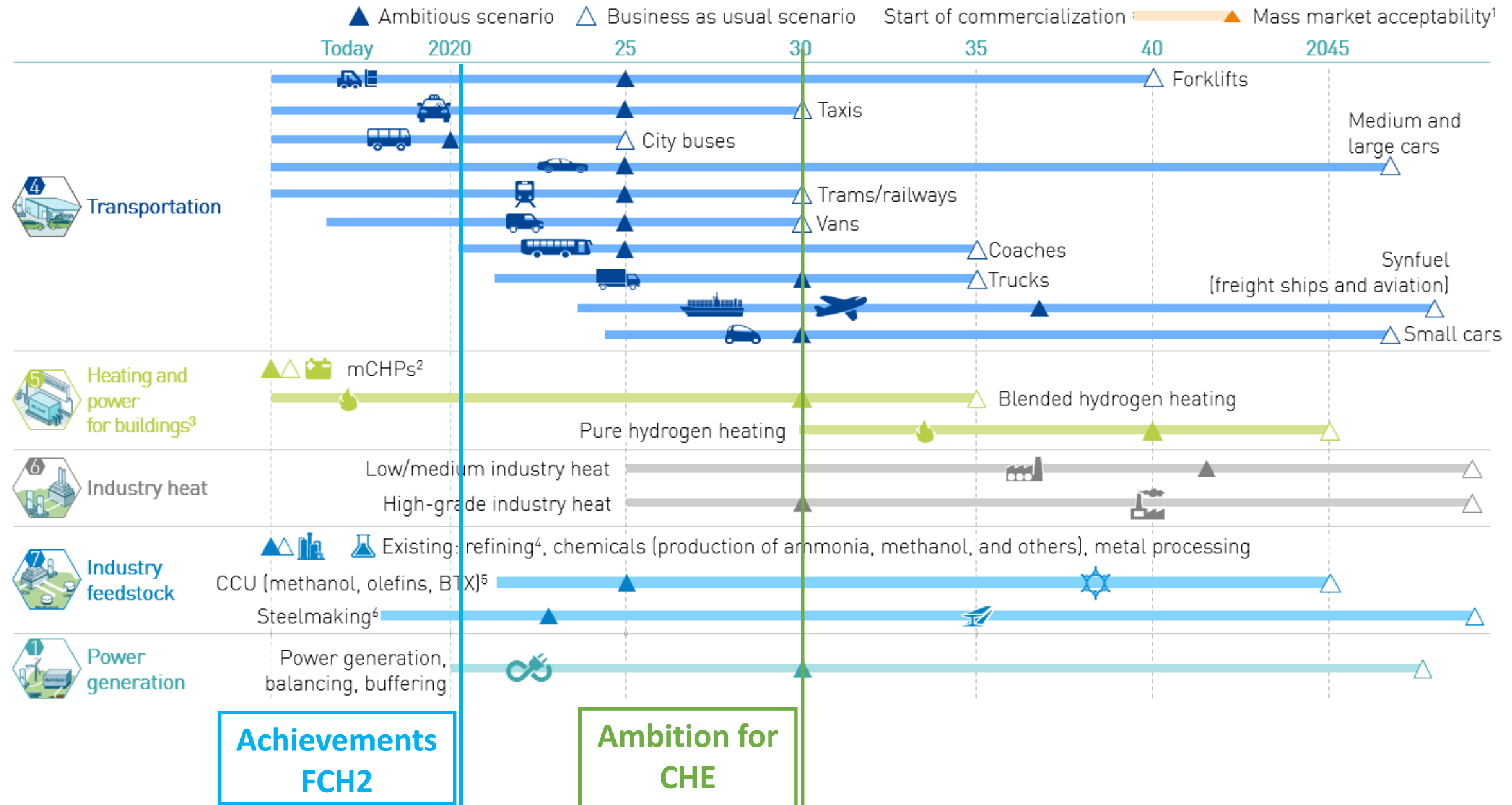
16. H2 Stationary FC
17. H2 Burners and turbines  
(also gas grid cf. distribution pillar)

#### SO7: H2 DECARBONISES INDUSTRY

18. H2 in industry



# GO1: Accelerate the commercial readiness of H2 techno



**Give your opinion on the draft SRIA (by 20.12.2019)**



Go to [www.cleanhydrogenforeurope.eu](http://www.cleanhydrogenforeurope.eu)

TAKE THE SURVEY

**CLEAN HYDROGEN FOR EUROPE**

ABOUT US

A large blue rectangular area with a background of many small, shimmering water bubbles. The text "CLEAN HYDROGEN FOR EUROPE" is overlaid in large, white, bold, sans-serif capital letters.

**CLEAN HYDROGEN  
FOR EUROPE**

## QUESTION:

Can PCI and CEF be tools to promote a shift to hydrogen?

- Treaty basis focuses on interconnections between MS, not sustainability
- Current Regulation does not contemplate hydrogen



## HE REQUEST

- A. Criteria for eligibility for Projects of Common Interest status should be adapted to make the contribution to **decarbonisation a decisive criterion** (i.e.: hydrogen-ready transport grid).
- B. This would ensure the long-term relevance of future investments while **avoiding the risk of stranded assets**.
- C. Furthermore, projects that promote the **connection of renewable and low-carbon hydrogen to the grid**, thereby contributing to the achievement of European decarbonisation objectives should be included.

# First large deployment: EU ETS Innovation Fund

In response to a request from the Commission, we have created an overview of projects in the “pipeline” classified by

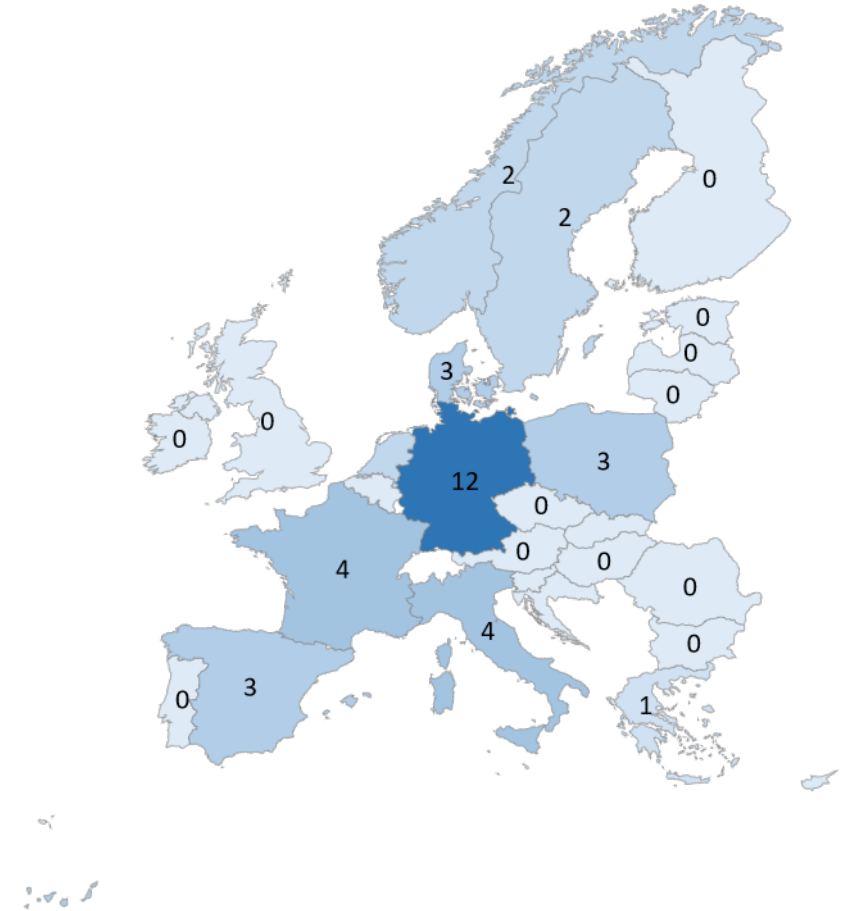
- (1) level of maturity,
- (2) priorities as expressed in the ETS Innovation funds decision and
- (3) country
- (4) indicative level of the project’s budget

+ a short description of each project in separate annexes

At this stage we have a total of 36 projects with a total budget of EUR 3.0 – 4.2 Billion

This includes more than 20 mature and ambitious projects that could be ready for the 2020 call, for a total amount of EUR 2.3 – 3.2 Billion

The rest could be more relevant for a second or third call for proposals.

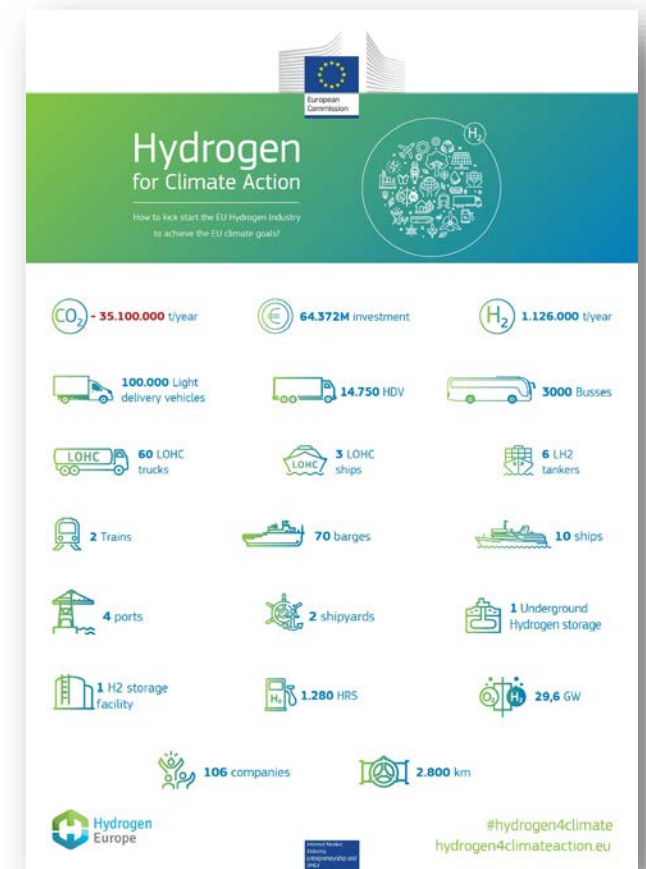


## Important Project of Common Europe Interest (IPCEI)

- Industrial policy aimed at supporting Strategic Value Chain: **Hydrogen Technologies & Systems**
- Financial support through exemption of State Aid Rules for approved projects

### Actions:

- 2 workshops in H1/2019
- 1 conference on 09.10.2019
  - 11 projects presented
  - 65 billion € total investment
  - 35 Mio tons of CO<sub>2</sub> savings per year
  - 30 GW of Renewable Energy
  - 120.000 Hydrogen powered vehicles
  - 1300 Hydrogen refuelling stations
  - 22 Member states covered



# IPCEI (1)

## H2-DEMAND:

150 Trains  
1000 Trucks  
5000 City Bus  
10.000 LDV

1 Fertiliser  
2 Refinery  
2 Steel

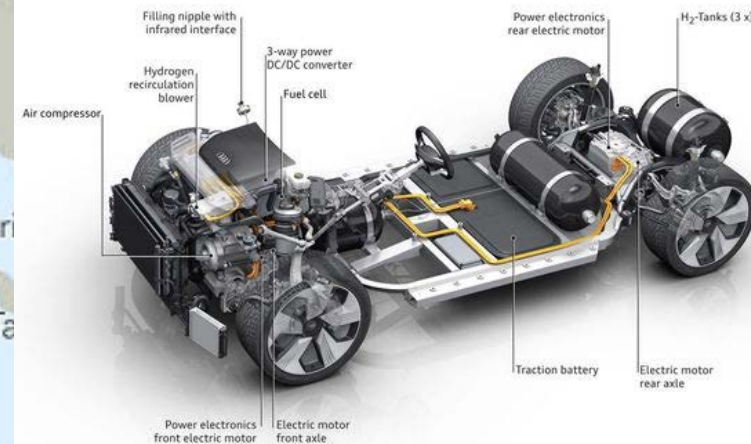
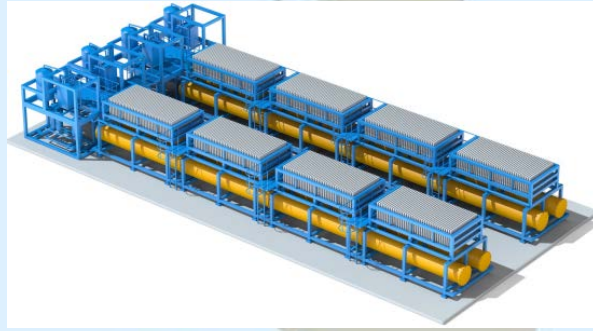


# IPCEI (2)

## STRATEGIC H2-EQUIPMENT:

1 Liquefaction  
1000 H2 Stations  
20 GW Electrolyser

FC Stacks  
H2 Tanks  
Mobility Platform



## Power-to-Gas



## H2 fit pipelines



## Salt caverns for H2 storage

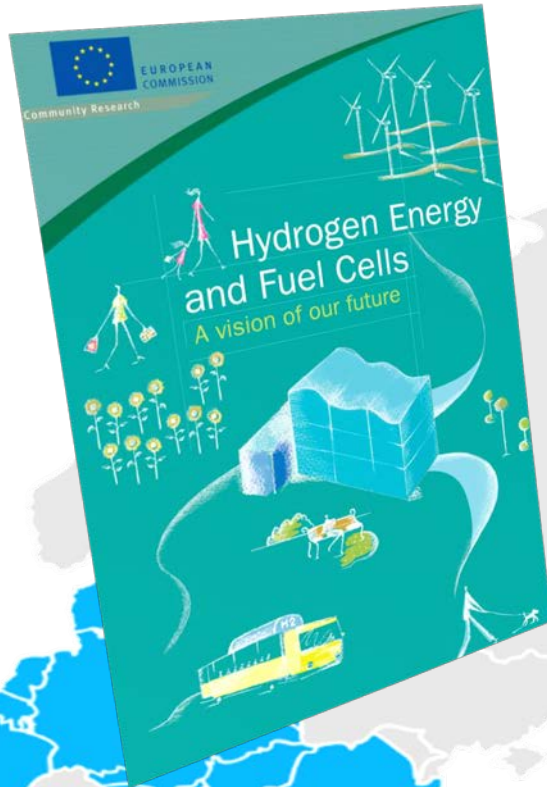


## LOHC storage





# Develop a joint European roadmap for a future hydrogen economy



- An EU-wide vision and masterplan is needed!
- ✓ **R&D policy** for next generation hydrogen technologies;
  - ✓ **Industrial policy** (e.g.: for electrolysers), incl. IPCEI;
  - ✓ Ensuring **national and regional support** in the decision-making process necessary to foster H2 technologies ;
  - ✓ **Across sectors, along the value chain**, incl. a specific timeline;
  - ✓ For both, **renewable and low-carbon hydrogen**
  - ✓ Ensuring **appropriate EU funding and financing coordination**



# Hydrogen Europe

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