



Hydrogen
Europe

Hydrogen in Europe

4th March 2020

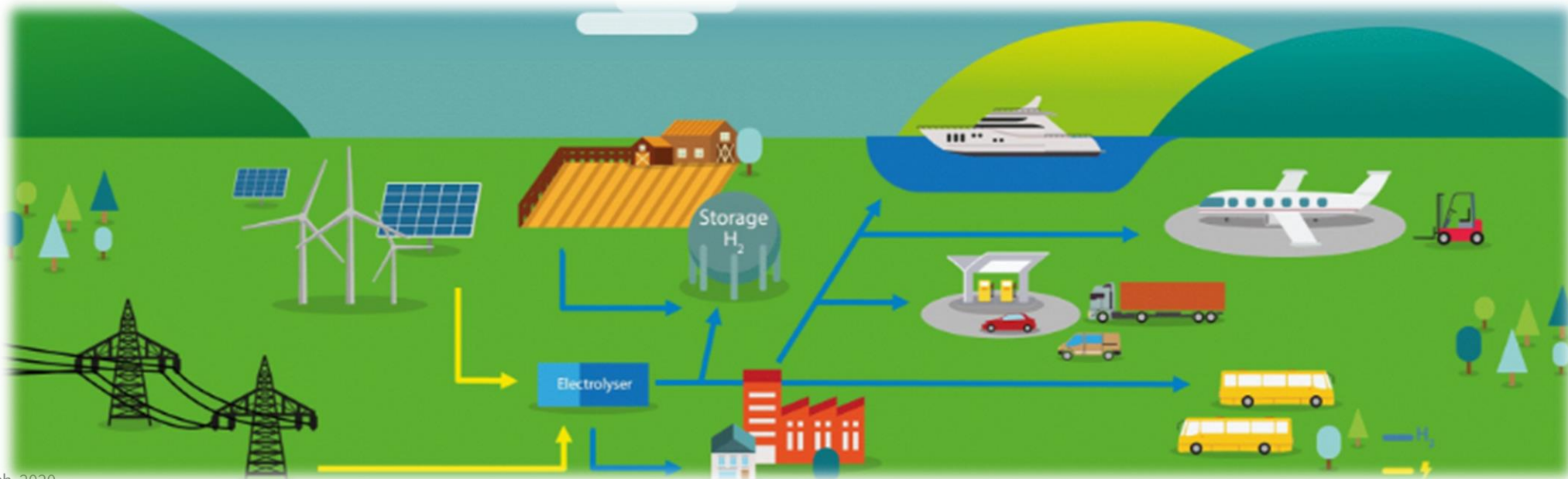
Hydrogen Europe: Who we are

Our Vision

Hydrogen enabling a zero emission society

Our Mission

We bring together diverse industry players, large companies and SMEs, who support the delivery of hydrogen and fuel cells technologies. We do this to **enable the adoption of an abundant and reliable energy which efficiently fuels Europe's low carbon economy.**





Hydrogen Europe: who we are

FCH techno providers and/or pure players

H2 Production & distribution



FC Transport



FC Stationery



Others



Energy companies



National Associations



Industrial companies



Transport companies



We have 3 convictions

- 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

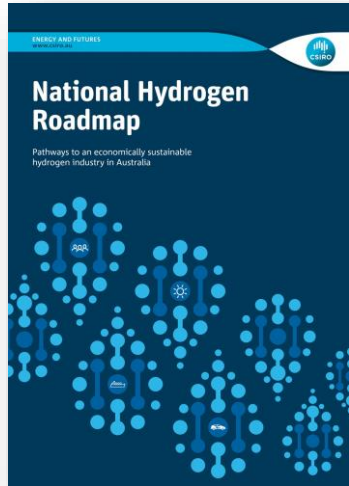
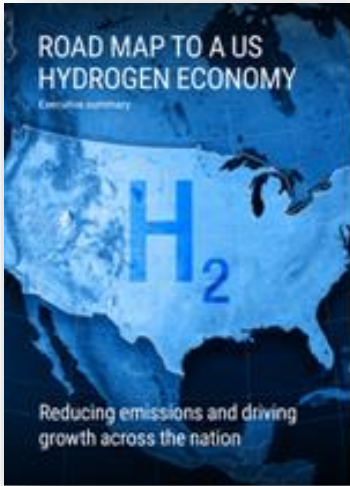
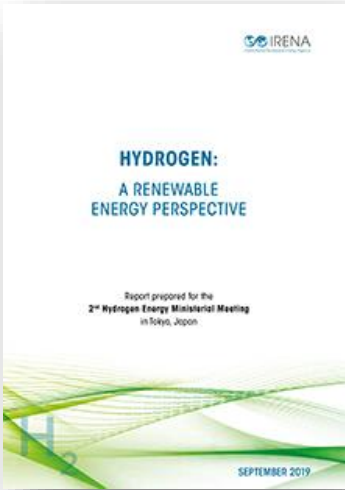
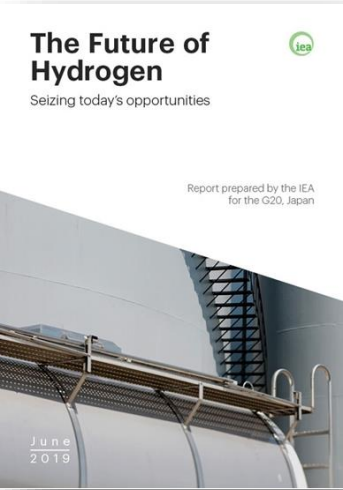


Frans Timmermans
Executive Vice President of the European Commission
Responsible for Europe's Green Deal

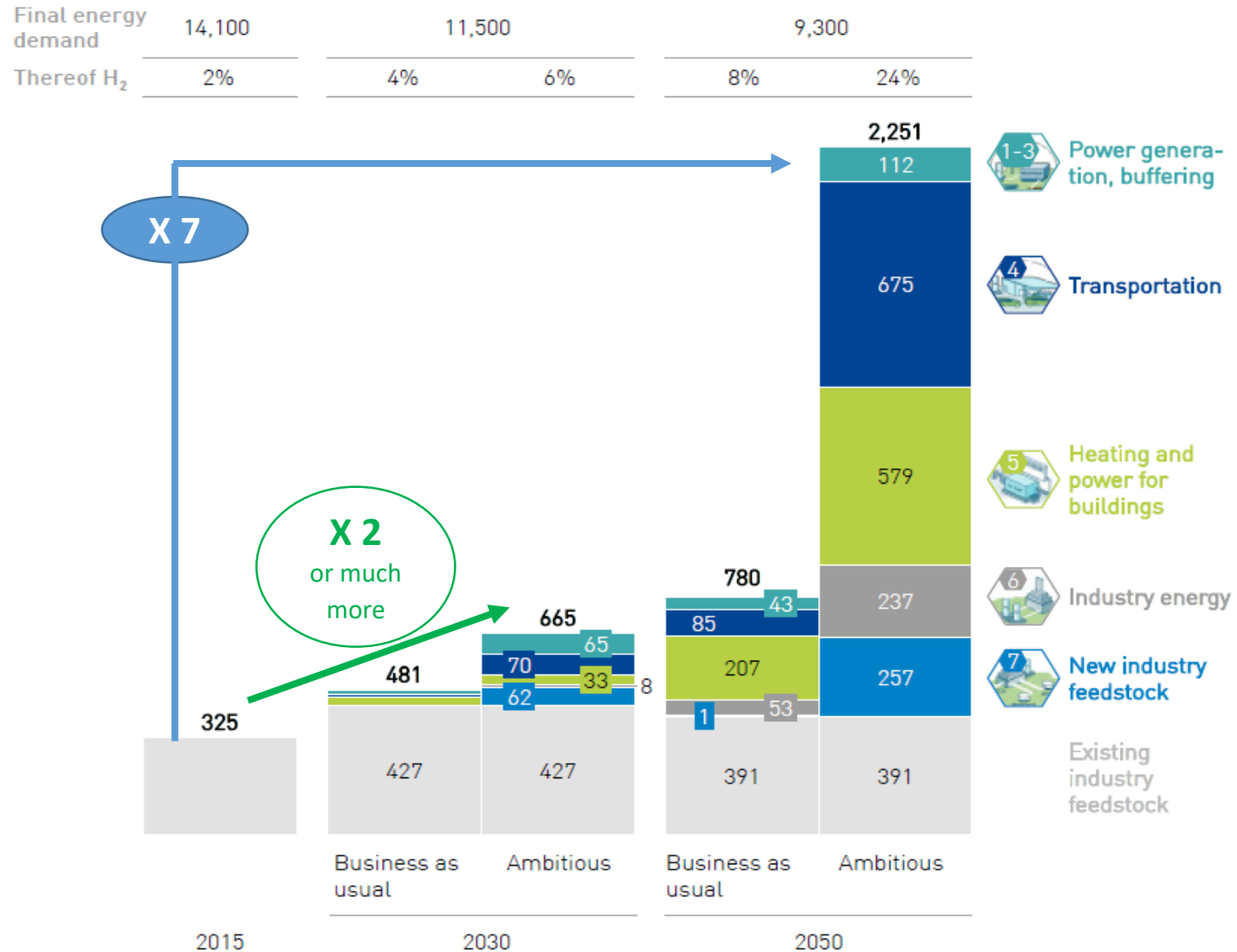
“Hydrogen could be a huge opportunity for our economy”

“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”



Hydrogen must 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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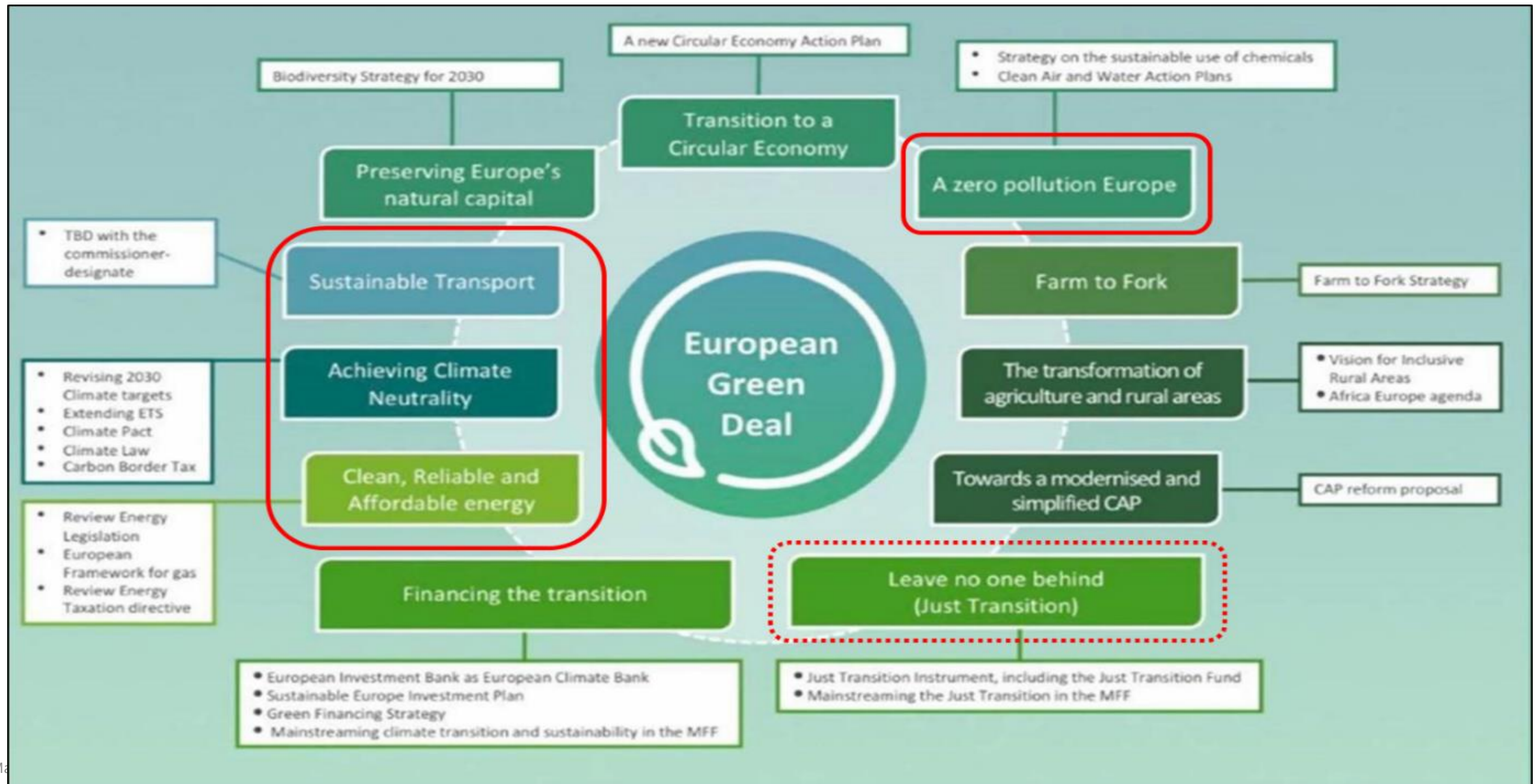
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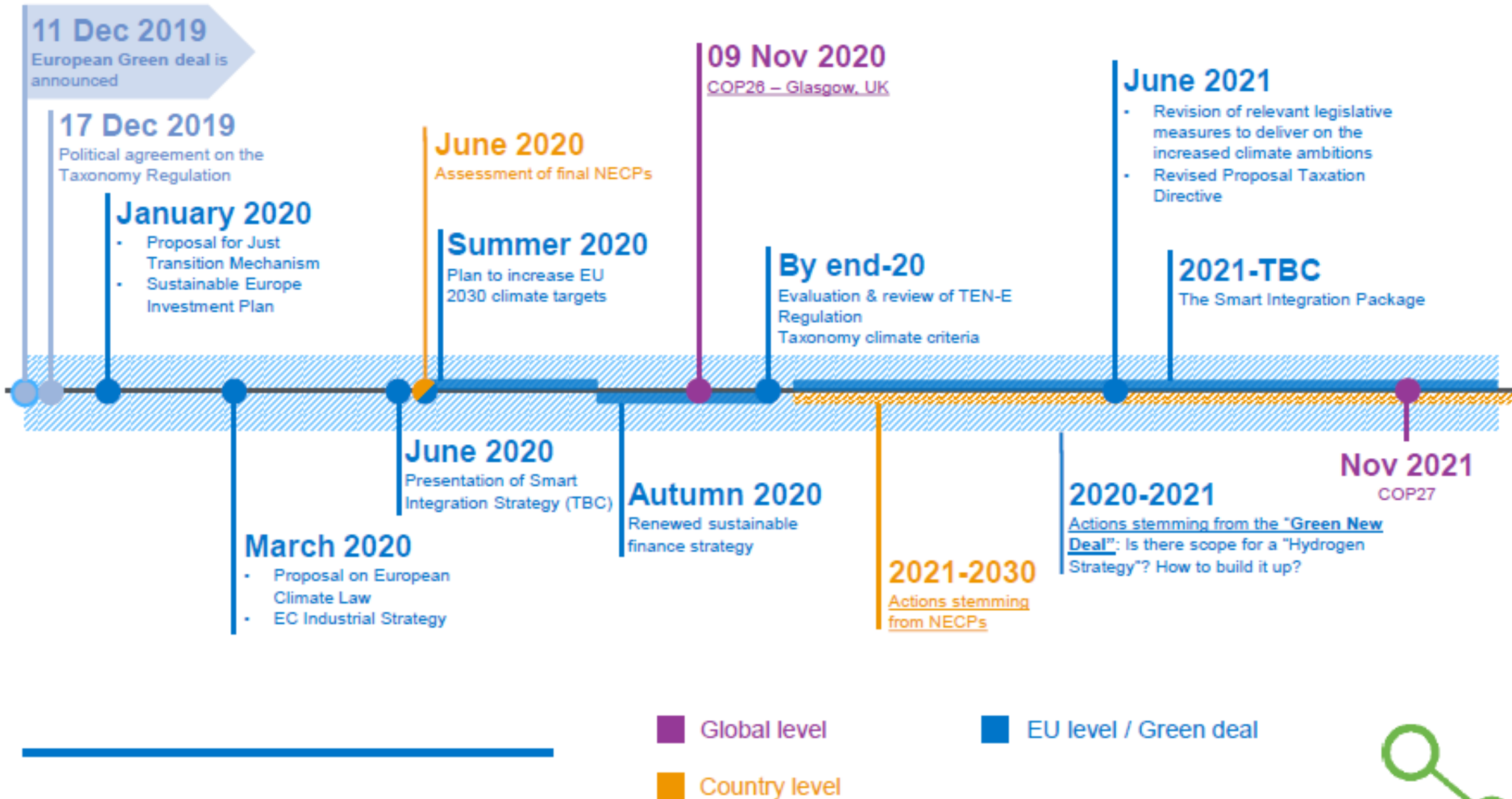
Positive legislation, as it exists today

Sector	Requirement	Legislative Tools	Hydrogen's role
Transport	1. CO ₂ reduction 2. PM/NO _x /SO _x reduction 3. Integration of RES	1. Renewable Energy Directive (RED2) 2. CO2 emission standards for LDVs/LCVs 3. CO2 emission standards for HDVs 4. Clean vehicle Directive 5. Alternative Fuel Infrastructure Directive	1. H ₂ as a fuel 2. H ₂ made fuels 3. Renewable H ₂ for refineries
Energy-intensive industries	Decarbonisation	EU ETS	Renewable / low - carbon hydrogen as feedstock switch
Gas/ Heating	Decarbonisation (to remain a player) Integration of RES	1. Renewable Energy Directive (RED2)	Renewable / low - carbon hydrogen as feedstock Fuel cell as energy converter
Power	Storage / ancillary services Integration of RES	1. Renewable Energy Directive (RED2) 2. Electricity Market Design	Rapid response electrolysers Energy Storage + Sectoral Integration

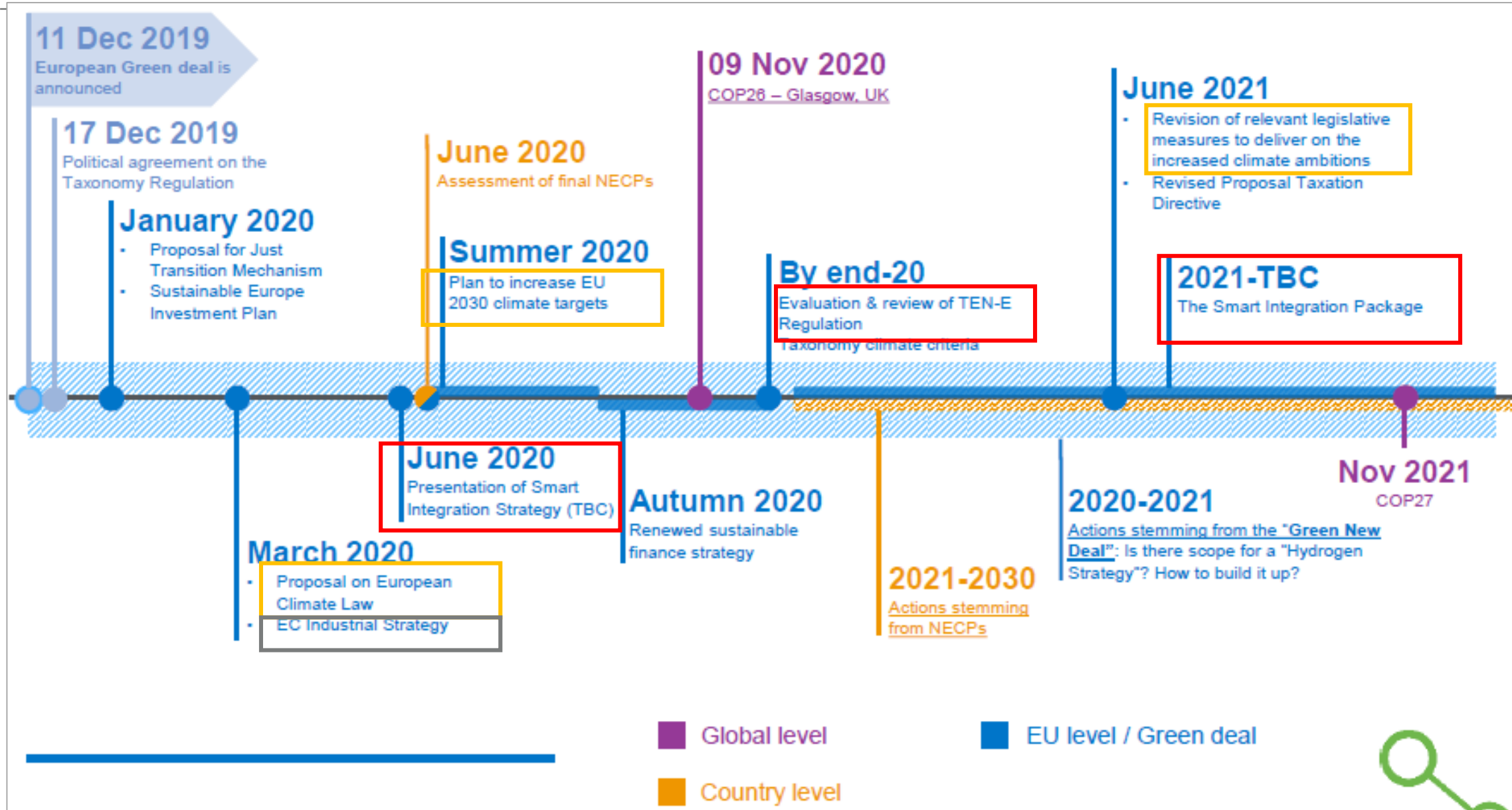
Coming Positive legislation: The “Green Deal”



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

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

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

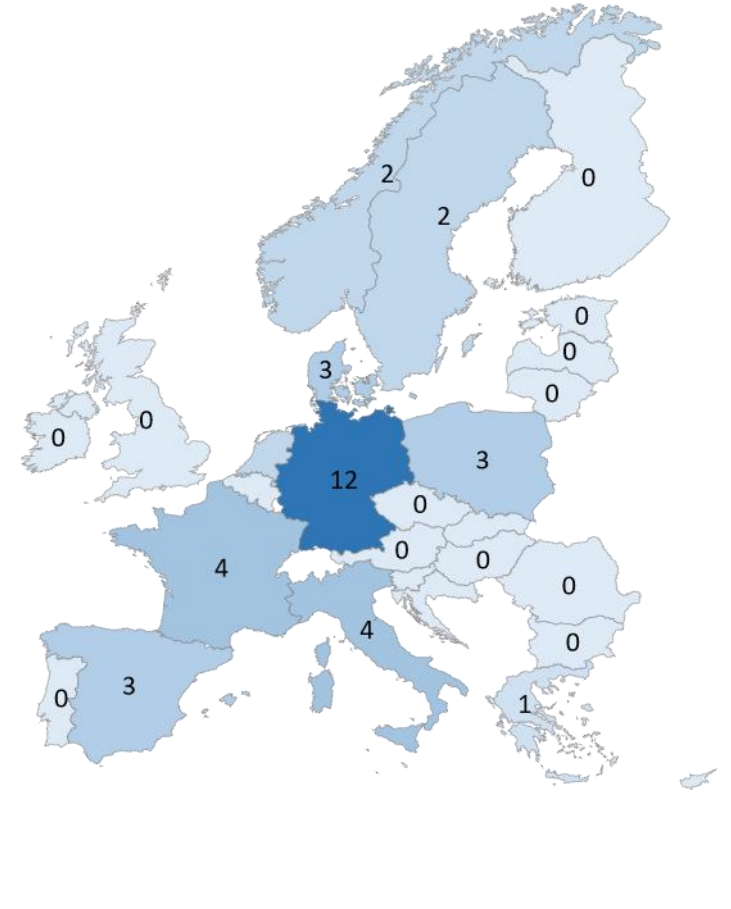
- (1) level of maturity,
- (2) priorities as expressed in the ETS Innovation funds decision and
- (3) country
- (4) indicative level of the project’s budget

+ 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.

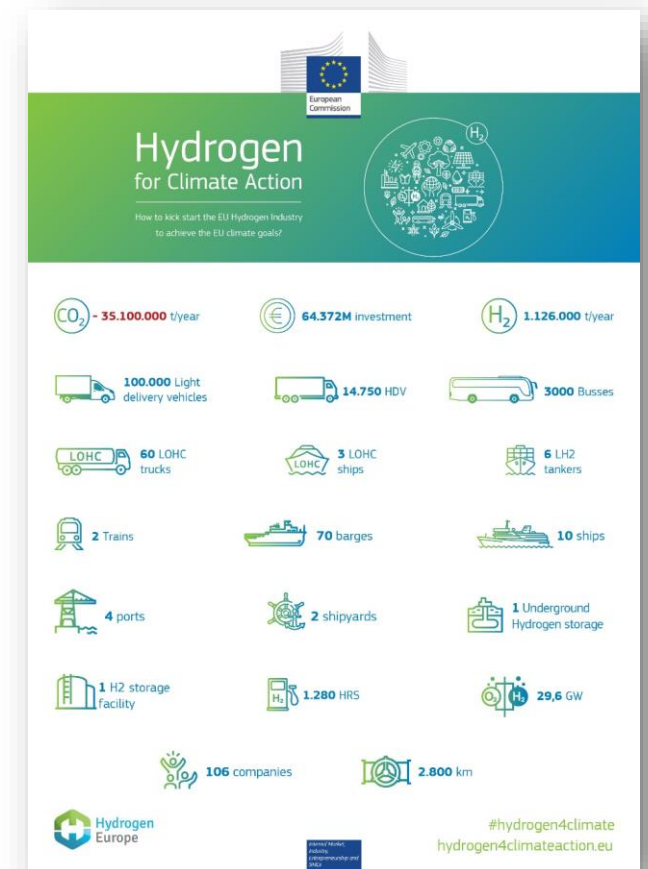


Important Project of Common Europe Interest (IPCEI)

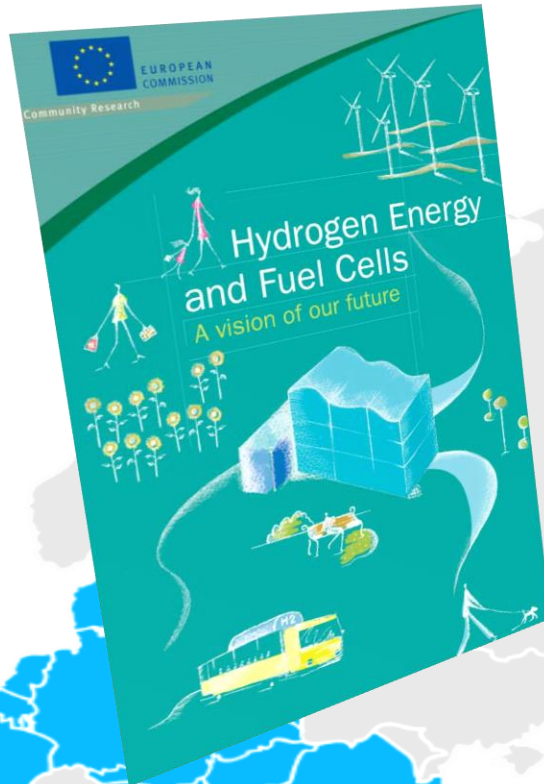
- Industrial policy aimed at supporting Strategic Value Chain: **Hydrogen Technologies & Systems**
- Financial support through exemption of State Aid Rules for approved projects

Actions:

- 2 workshops in H1/2019
- 1 conference on 09.10.2019
 - 11 projects presented
 - 65 billion € total investment
 - 35 Mio tons of CO₂ savings per year
 - 30 GW of Renewable Energy
 - 120.000 Hydrogen powered vehicles
 - 1300 Hydrogen refuelling stations
 - 22 Member states covered



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**

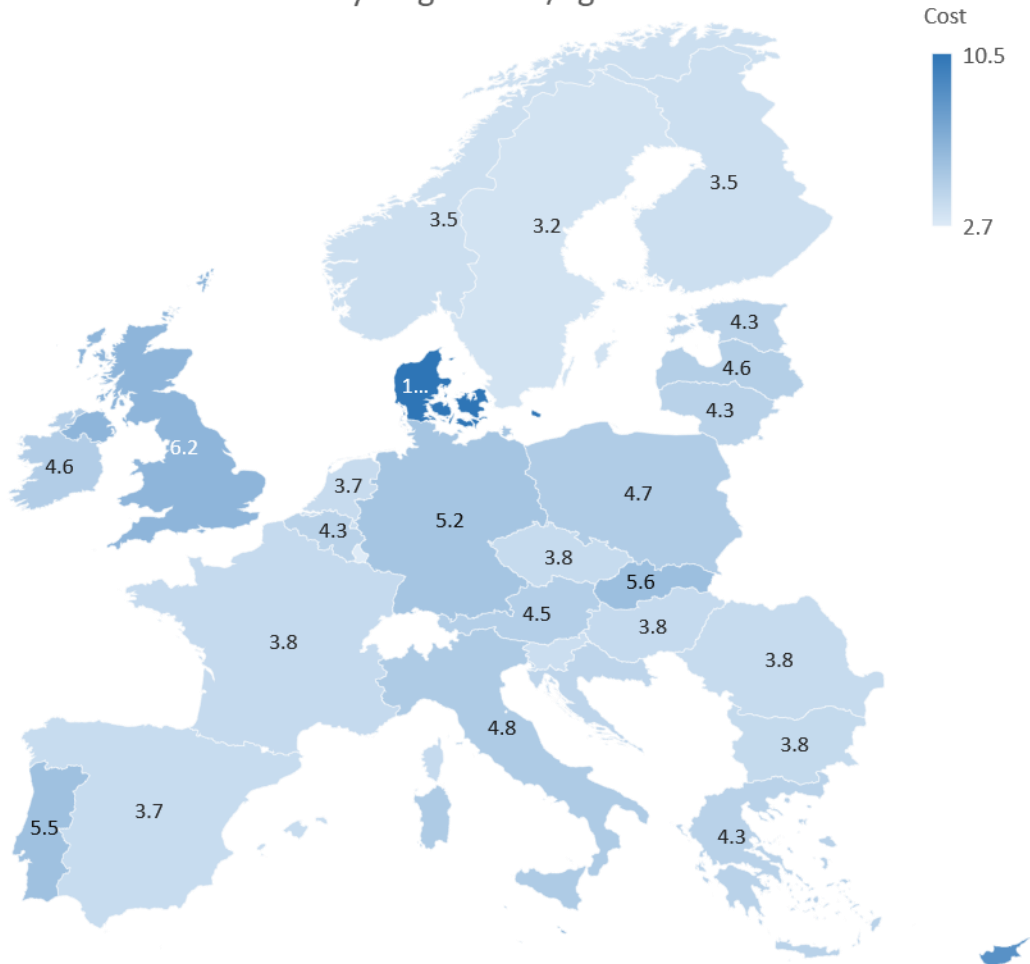


*“Spain **can** lead the development of hydrogen in Europe”*

Calculating levelized cost of hydrogen (LCOH)

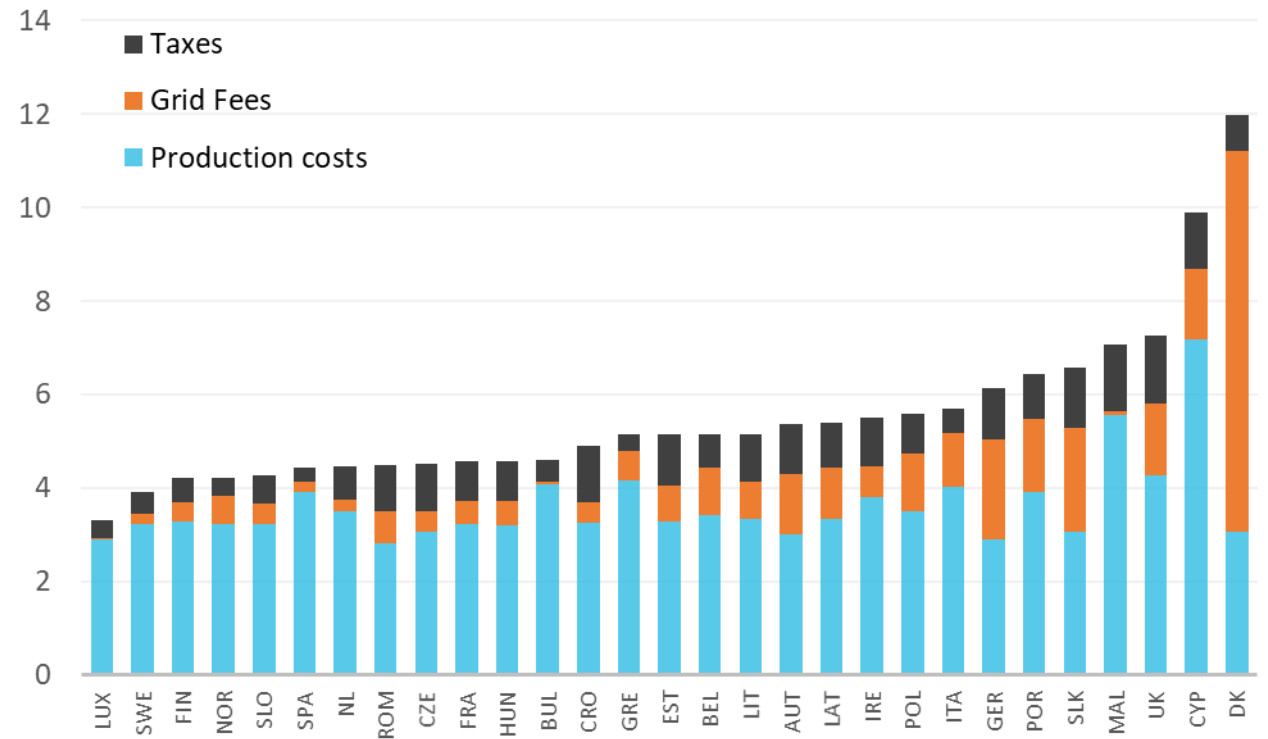
► Level 1: aggregated LCOH for EU countries

Levelized cost of hydrogen EUR/kg



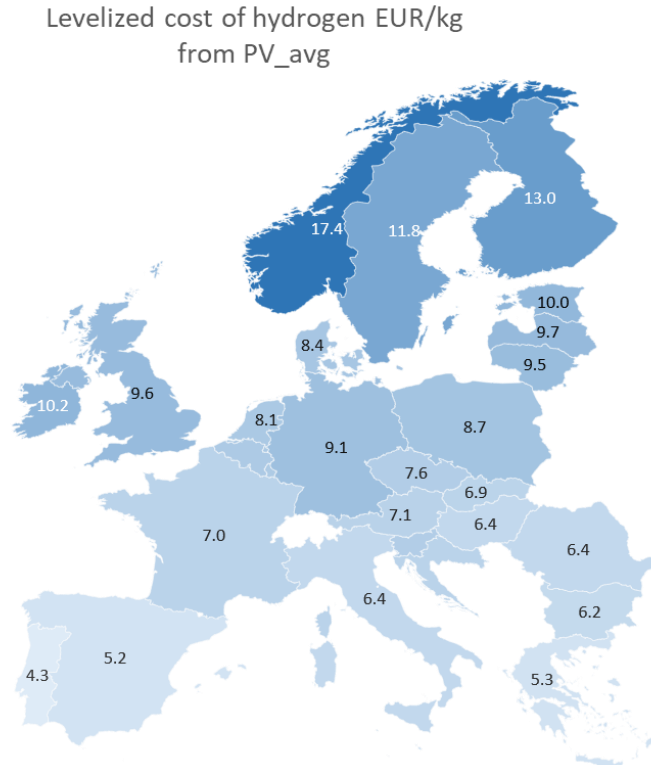
► Scenario 1: Grid connected electrolysis

Levelized cost of hydrogen EUR/kg



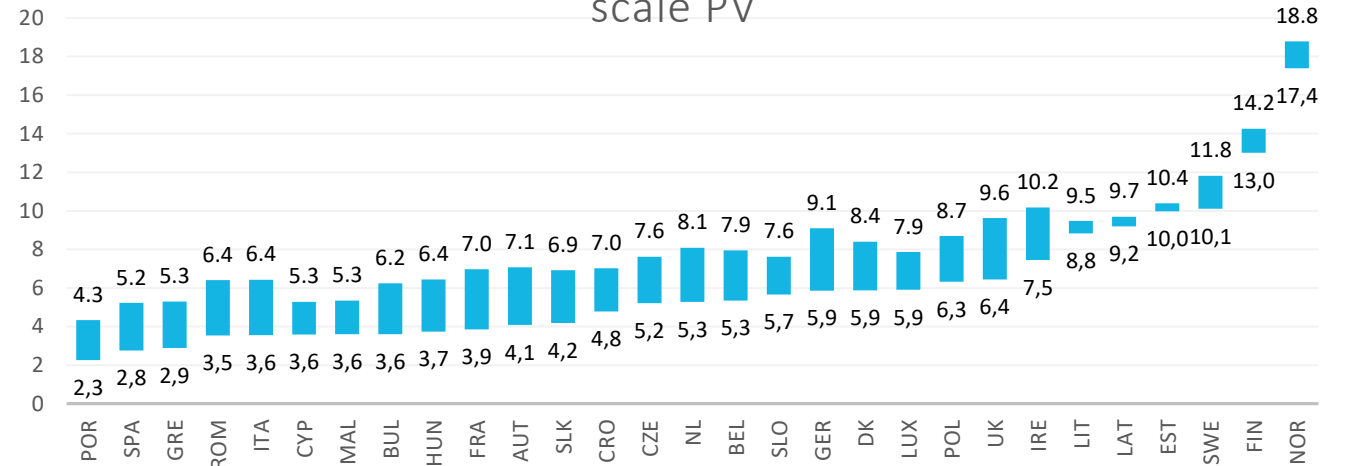
Calculating levelized cost of hydrogen (LCOH)

Scenario 2: Direct connection to a RES Outputs – aggregated

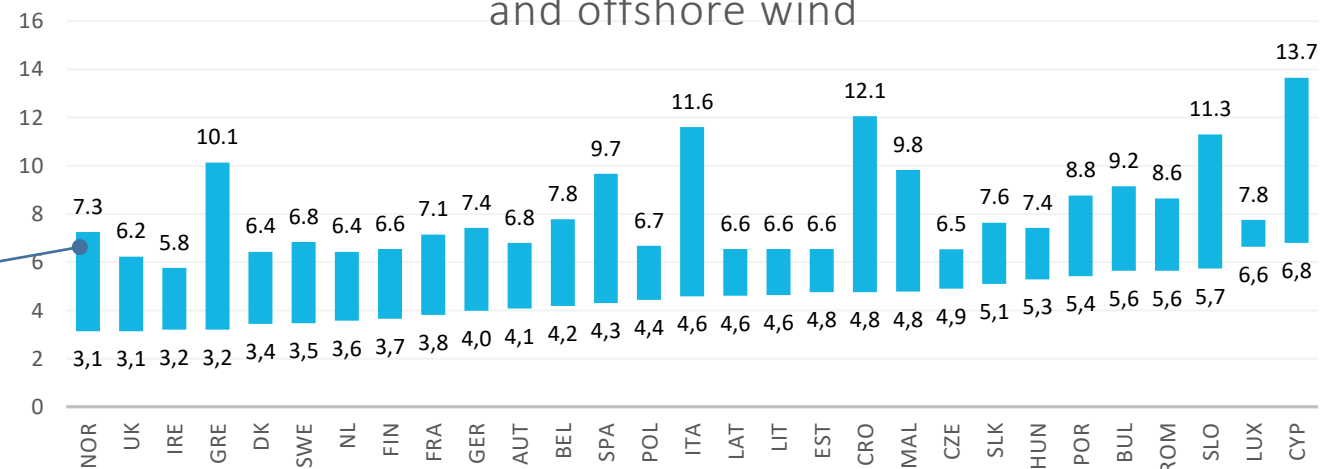


Range is defined by best wind/irradiation conditions in a given country to average conditions

Levelized cost of hydrogen (EUR/kg) from utility scale PV



Levelized cost of hydrogen (EUR/kg) from onshore and offshore wind





Hydrogen Europe

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