

Introduction to European R&D activities in hydrogen technologies

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Hydrogen Europe

Who we are

Key numbers

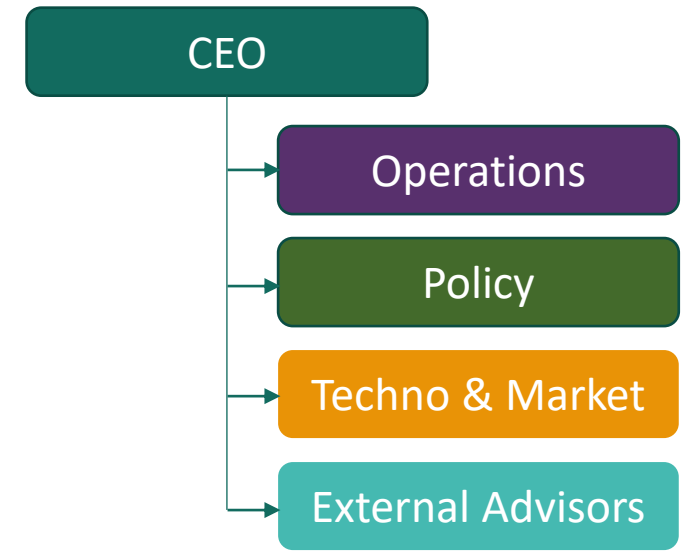
- 400+ members (including 25+ EU regions and 30+ national associations)
- c.50 staff
- 100,000+ followers on social medias

Our Vision

We are the European association representing the interest of the hydrogen industry and its stakeholders, promoting hydrogen as an enabler of a zero-emission society. Our vision is to propel global carbon neutrality by accelerating European hydrogen industry.

Our Mission

- Enable the adoption of clean hydrogen
- Bring together a very broad range of stakeholders as sole and united voice of the European hydrogen industry
- Promote and coordinate research, development and innovation of clean hydrogen technologies
- Be the driving force for the future direction of the hydrogen sector



Europe's accelerated hydrogen ambitions

EU Hydrogen Strategy (July 2020)

- Production Capacity in 2024:
 - 6 GW of electrolyzers equalling 1 million tonnes of hydrogen
- Production Capacity in 2030:
 - 40 GW of electrolyzers equalling 10 million tonnes of hydrogen

Fitfor55 (July 2021)

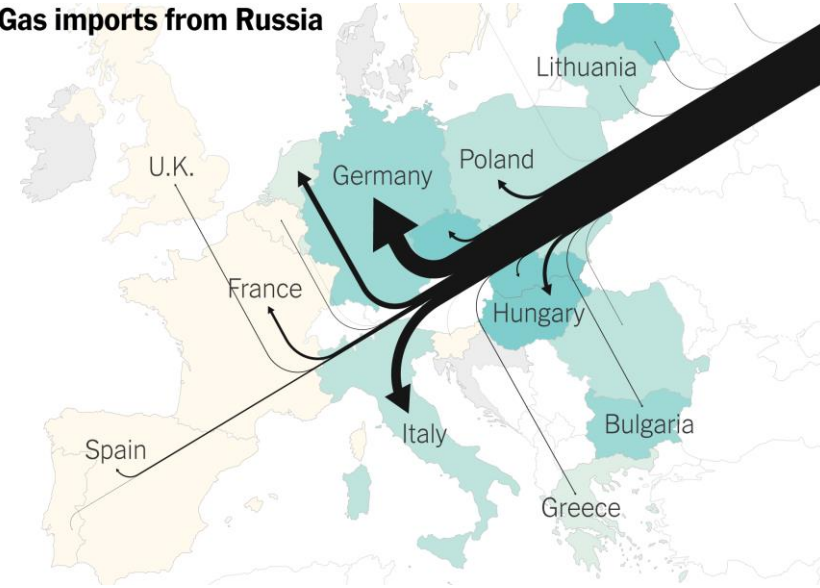
- 55% reduction in greenhouse gas emissions by 2030 and net-zero by 2050
- Revised Renewable Energy Directive (REDII)
- Alternative Fuel Infrastructure Regulation
- CO2 standards for cars and vans
- Hydrogen and decarbonised gas package

REPowerEU

A changed energy landscape

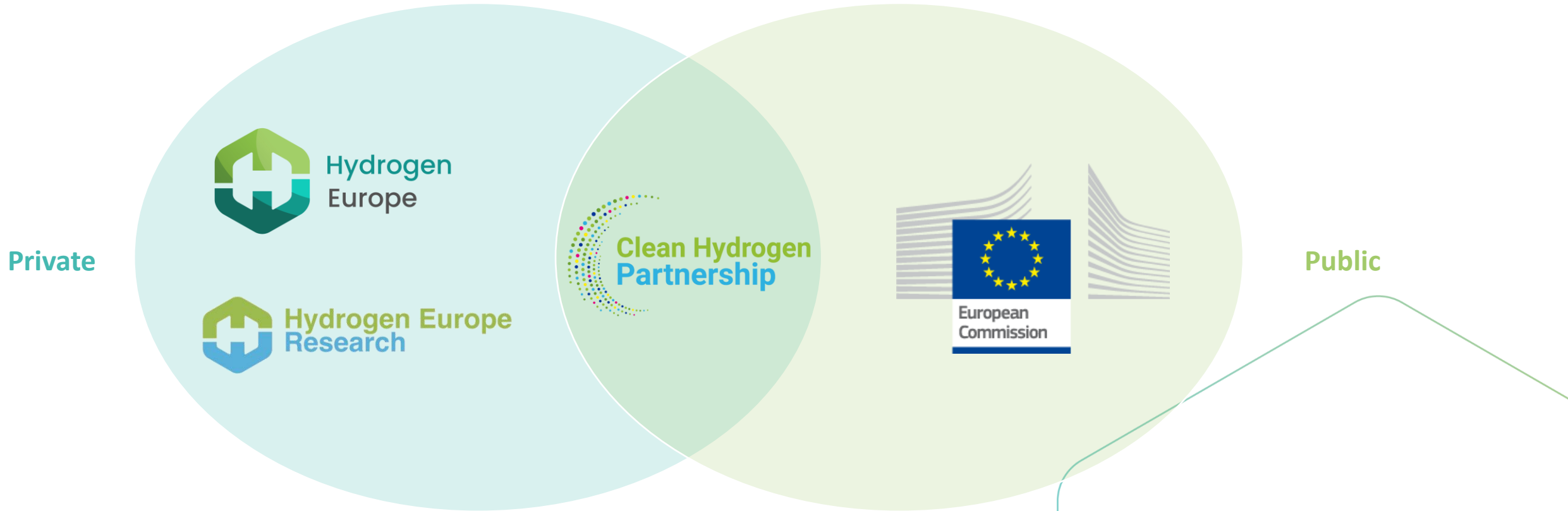
REPowerEU

Gas imports from Russia



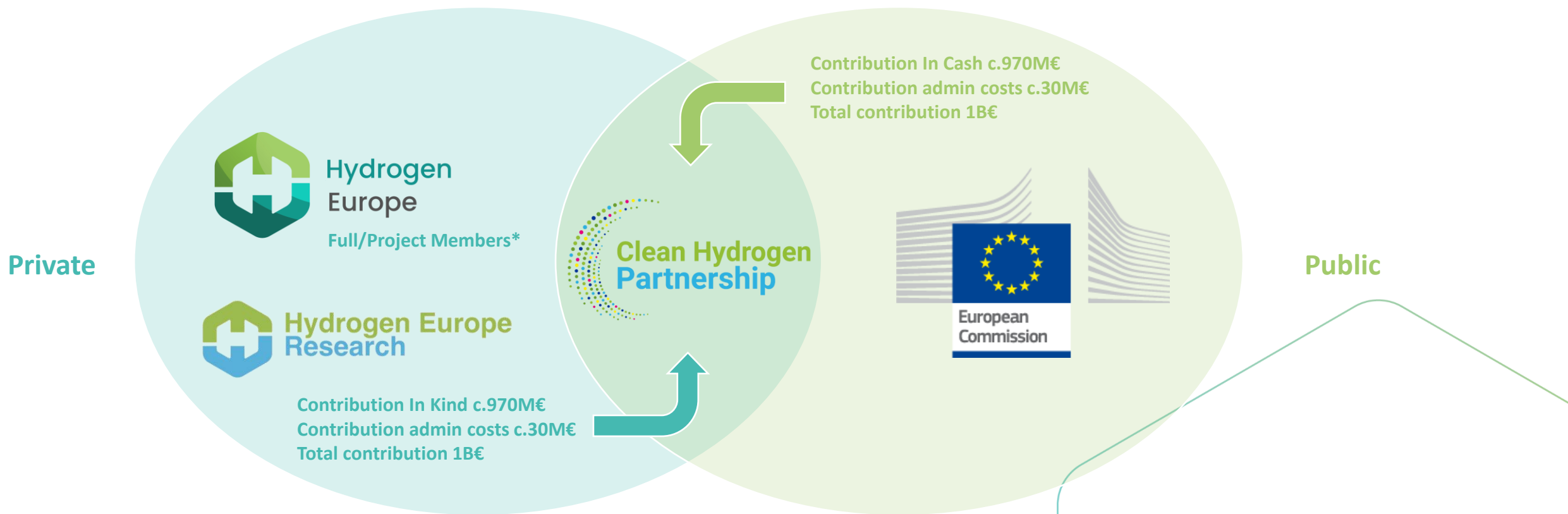
- **10 million tonnes of renewable hydrogen imports and**
- 10 million tonnes of domestic renewable hydrogen production by 2030, to replace natural gas, coal and oil in hard-to-decarbonise industries and transport sectors.
- € 200M funding to demonstrate diverse Hydrogen Valleys across Europe.
- Electrolyser Partnership to ramp up electrolyser manufacturing in Europe.
- Global European Hydrogen Facility (GEHF) for purchasing imported hydrogen.
- Hydrogen Bank to cover for Green Premium.

The Clean Hydrogen Partnership: Europe's hydrogen R&D vessel



To facilitate the transition to a greener EU society through the development of hydrogen technologies.

Clean Hydrogen Partnership budget and contributions

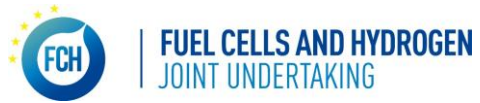


* Non-members should join Hydrogen Europe as full or project member in order to contribute to the success of the Partnership and the hydrogen eco-system as a whole



Co-funded by
the European Union

Legacy: FCH-JU & FCH2-JU



Energy

Hydrogen production and distribution
Hydrogen storage for renewable energy integration
Fuel cells for power & CHP



Mobility

Road vehicles & Non-road vehicles and machinery
Maritime rail and aviation applications
Refuelling infrastructure



Cross-cutting

Standards, safety
Education, Public awareness



Overarching

Hydrogen ecosystems
Valleys

Transport (42%)
443M€
77 projects

Cross-cutting (6%)
67M€
48 projects

Energy (45%)
481M€
153 projects

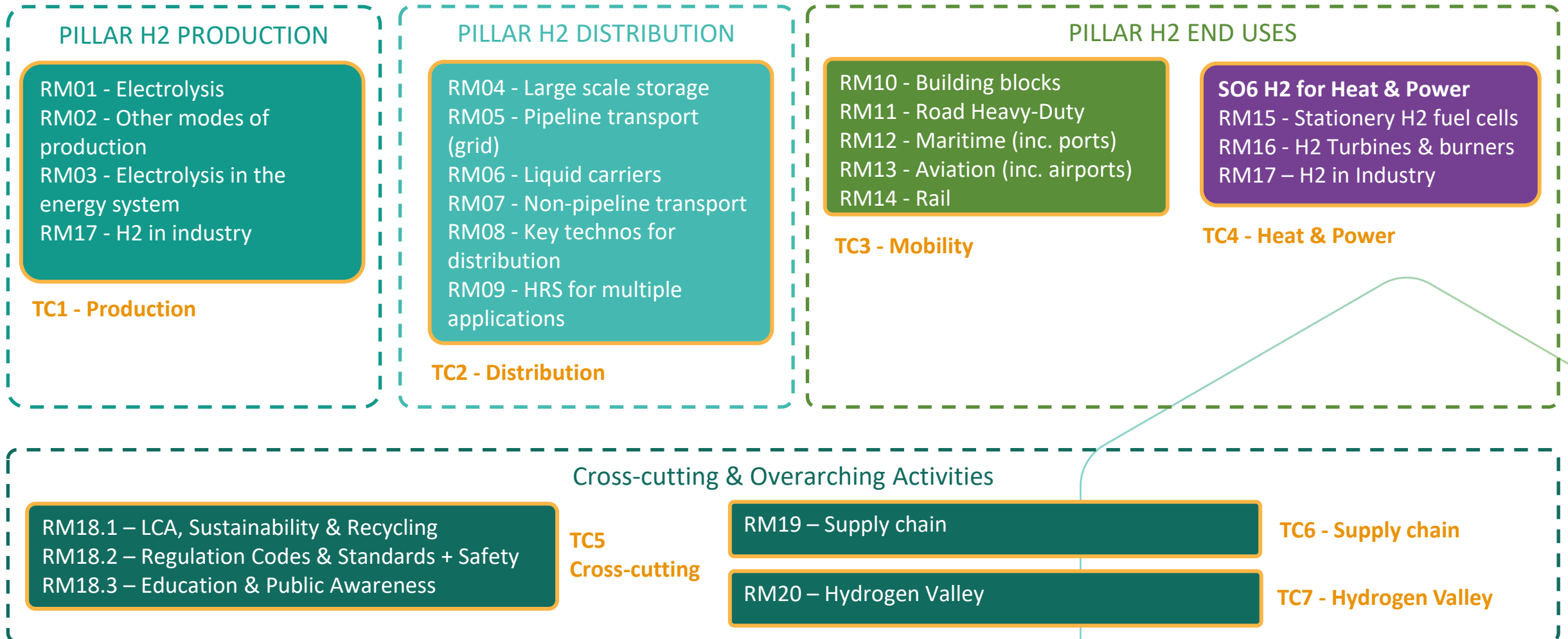
285 projects supported for 1.07 B€

Overarching (7%)
79M€
7 projects



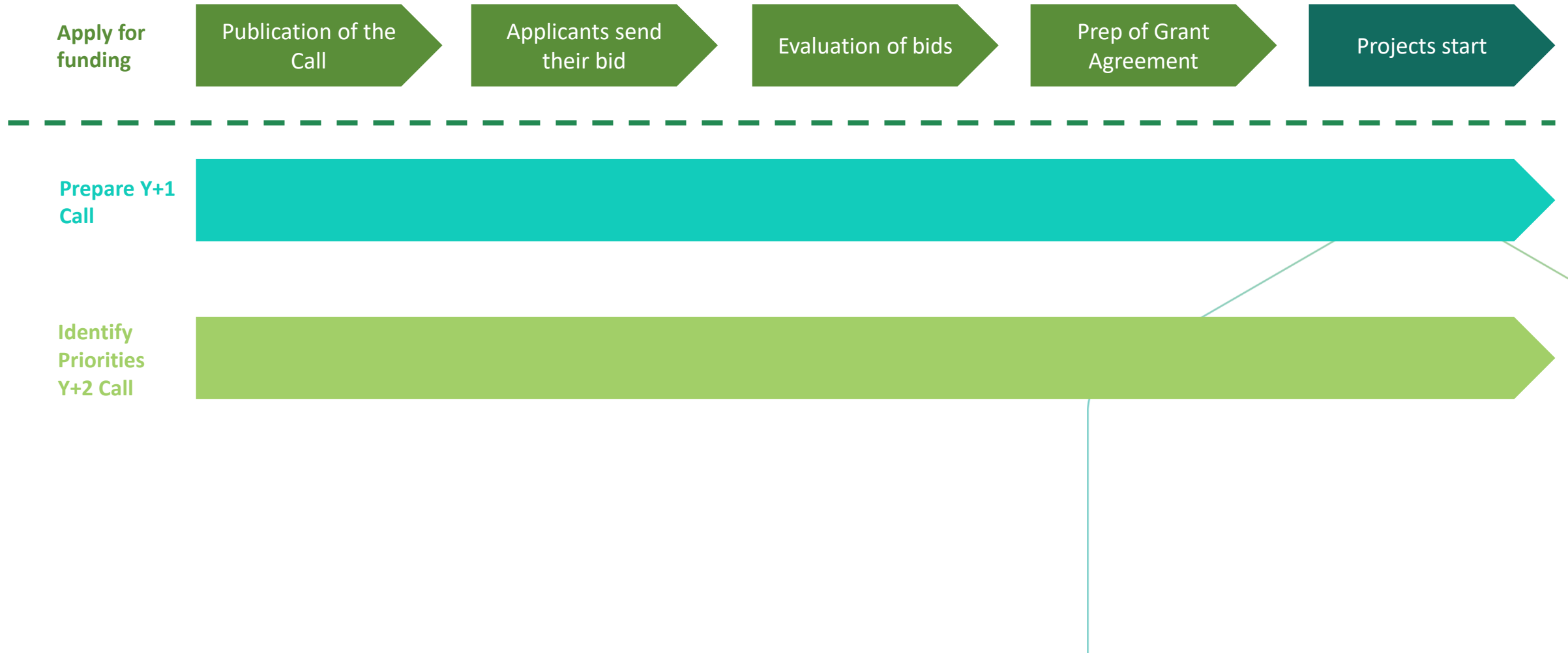
Co-funded by the European Union

Technical Committees & Roadmaps – General structure



From priorities to project: 3 main processes running in parallel

There are 3 processes running in parallel. We work on an annual basis.



The Strategic Research and Innovation Agenda

Electrolysis

- Technology development are covered for all type of electrolysis, provided the main input is water/steam and main output is hydrogen.

Other modes of production

- Several types of technologies can be covered, provided the input is renewable-based:
 - Biological production
 - Solar thermal
 - Hydrogen from waste/biomass gasification

Key KPIs

Electrolysis	2020	2030
CAPEX (€/kW)		
Alk	600	400
PEM	900	500
SO	2130	520
OPEX (€/(kg/d)/y)		
Alk	50	35
PEM	41	21
SO	410	45
Use of CRM (mg/W)		
Alk	0,6	0,0
PEM	2,5	0,25
SO	-	-

Note: Tables of KPIs available at the end of the SRIA

The Strategic Research and Innovation Agenda

Electrolysis – Objectives

- Reduce electrolyser CAPEX and OPEX
- Renewable H2 cost <3€/kg (@40€/MWh)
- Improve dynamic operation and efficiency, with high durability and reliability
- Reduce footprint (i.e. increase current density)
- Demonstrate ability of electrolysis to provide flexibility, allowing higher integration of renewables
- Ensure circularity by design for materials and for production processes
- Increase the scale of deployment
- Improve manufacturing capabilities

Other modes – Objectives

- Reduce CAPEX and OPEX
- Improve the efficiency of processes
- Increase carbon yield for processes based on biomass/raw biogas (kg hydrogen / kg carbon)
- Make technologies which can produce renewable, low cost (around 3 €/kg including feedstock cost) available by 2030
- Scale-up

Clean H2 Partnership – Call 2023

Call for proposals 2023 - Extract

Deadline	Name	Features	Budget
18/04/23	<u>Valorisation of by-product O2 and/or heat from electrolysis</u>	Pave the way for further large-scale integration of electrolyser systems into either industrial applications	€ 10M
	<u>Demonstration of high pressure (500-700 bar) supply chain</u>	The filling centre should fill trailers at high pressure with a H2 payload in the range of 1,000 to 1,500 kg.	€ 5M
	<u>Large-scale demonstration of underground hydrogen storage</u>	Demonstration of a large-scale underground hydrogen storage with a potential storage capacity of at least 1,000 tonnes H2.	€20M
	<u>Large-scale Hydrogen Valley</u>	Showcase the ability of H2 and its associated technologies to decarbonise different sectors in EU	€ 20M
	<u>Ultra-low NOx combustion system for aviation</u>	Development of a direct burn hydrogen combustion system with low NOx emissions compatible with aero engine specifications	€8M
	<u>Waste to Hydrogen demonstration plant</u>	Development of the technological process optimised for the conversion of the waste to Ren H2, with a >50% conversion efficiency	€ 10M
	<u>Hydrogen for heat production for hard-to-abate industries (e.g. retrofitted burners, furnaces)</u>	Development and validation of an integrated hydrogen burner system within heating furnaces in energy intensive industrial applications	€6M

➤ **The Call 2023 has 26 topics for a total budget of EUR 195M**

More information can be found on the website of the [Clean Hydrogen Partnership](#)



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Thank You



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