Next IPPP: Clean Hydrogen for Europe (CHE)

Consultation on the Strategic Research and Innovation agenda (SRIA)

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*

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

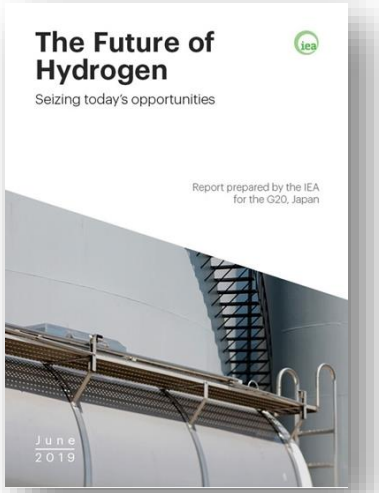
Executive Vice President of the European Commission

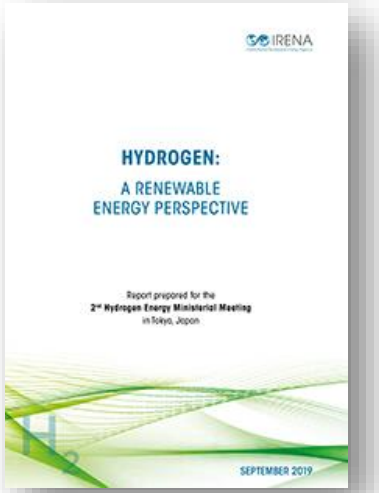
Responsible for Europe's Green Deal

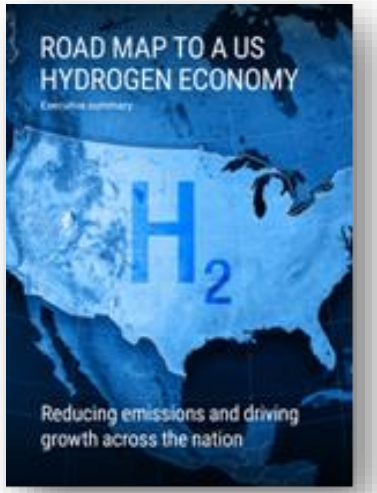
*"**Hydrogen** could be a huge opportunity for our economy"*

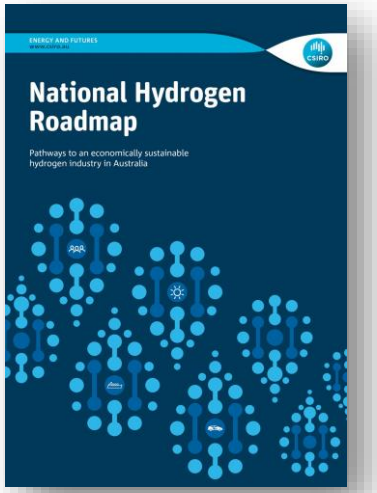
*"It is not that difficult to use gas infrastructure to import [green] **hydrogen** using gas infrastructure"*

*"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"*





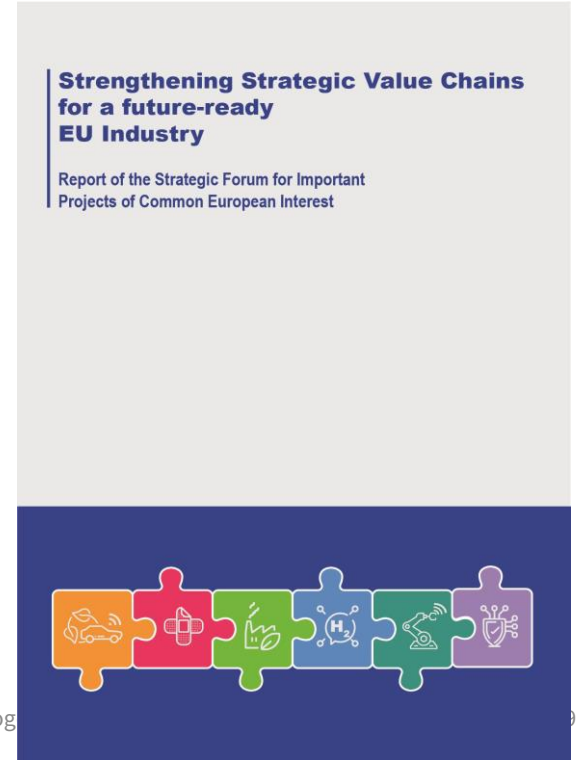




These convictions are now well-shared

- 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.

Clean Hydrogen for Europe

SOCIETAL IMPACT

1.Reduce and eliminate emissions in transport, industry and heating.

2.Integrate higher shares of variable **renewables** energy ensuring system efficiency.

3.Generate **economic benefits** for Europe.

GOAL

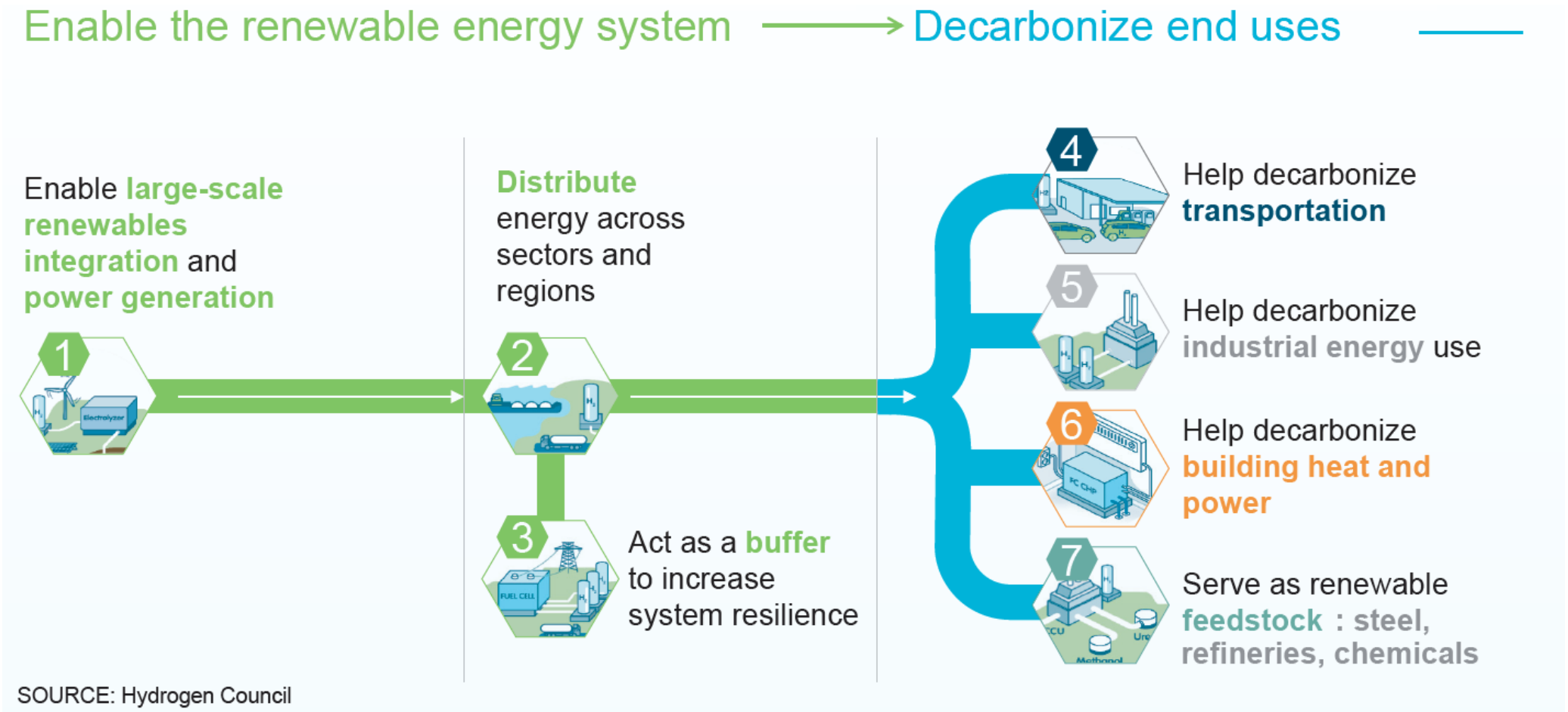
Demonstrate sectoral integration through hydrogen as a necessary element of a sustainable and decarbonized energy system**.**

GENERAL OBJECTIVES

1. **Accelerate the commercial maturity of individual hydrogen technologies** across transport, heating & power, and industry.
2. **Enable at scale and integrated deployment**
3. Ensure a **safe and frictionless deployment**

GO1: Accelerate the commercial readiness of H2 techno

Hydrogen enables the decarbonization of all major sectors in the economy



GO1: Accelerate the commercial readiness of H2 techno

SO1: Low carbon H2 production

SO2: Integration of renewables

SO3: H2 delivered at low cost

SO4: Refueling infrastructure

SO5: Transport vehicles

SO6: H2 for heat and power (in building and industry)

SO7: H2 decarbonises industry

GO1: Accelerate the commercial readiness of H2 techno

Hydrogen Europe

PILLAR H2 PRODUCTION	PILLAR H2 DISTRIBUTION	PILLAR H2 END USES
SO1: Low carbon H2 production	**SO3: H2 delivered at low cost**	**SO5: Transport vehicles**
SO2: Integration of renewables	**SO4: Refueling infrastructure**	**SO6: H2 for heat and power** (in building and industry)
		SO7: H2 decarbonises industry

GO1: Accelerate the commercial readiness of H2 techno

Hydrogen Europe

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 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

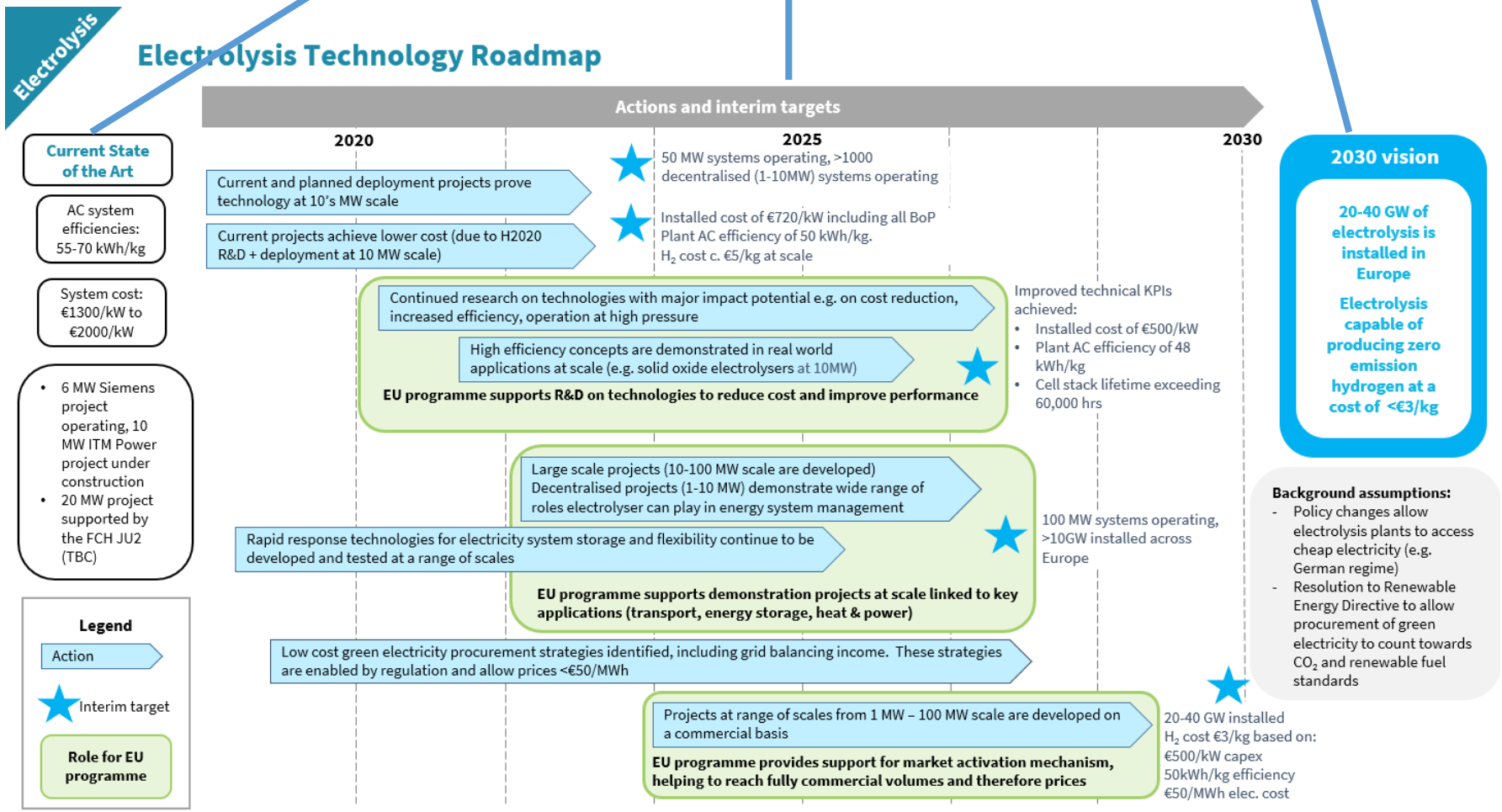
SO6: H2 for heat and power (in building and industry)
16. H2 Stationary FC
17. H2 Burners and turbines
- (also gas grid cf. distribution pillar)

SO7: H2 decarbonises industry
18. H2 in industry

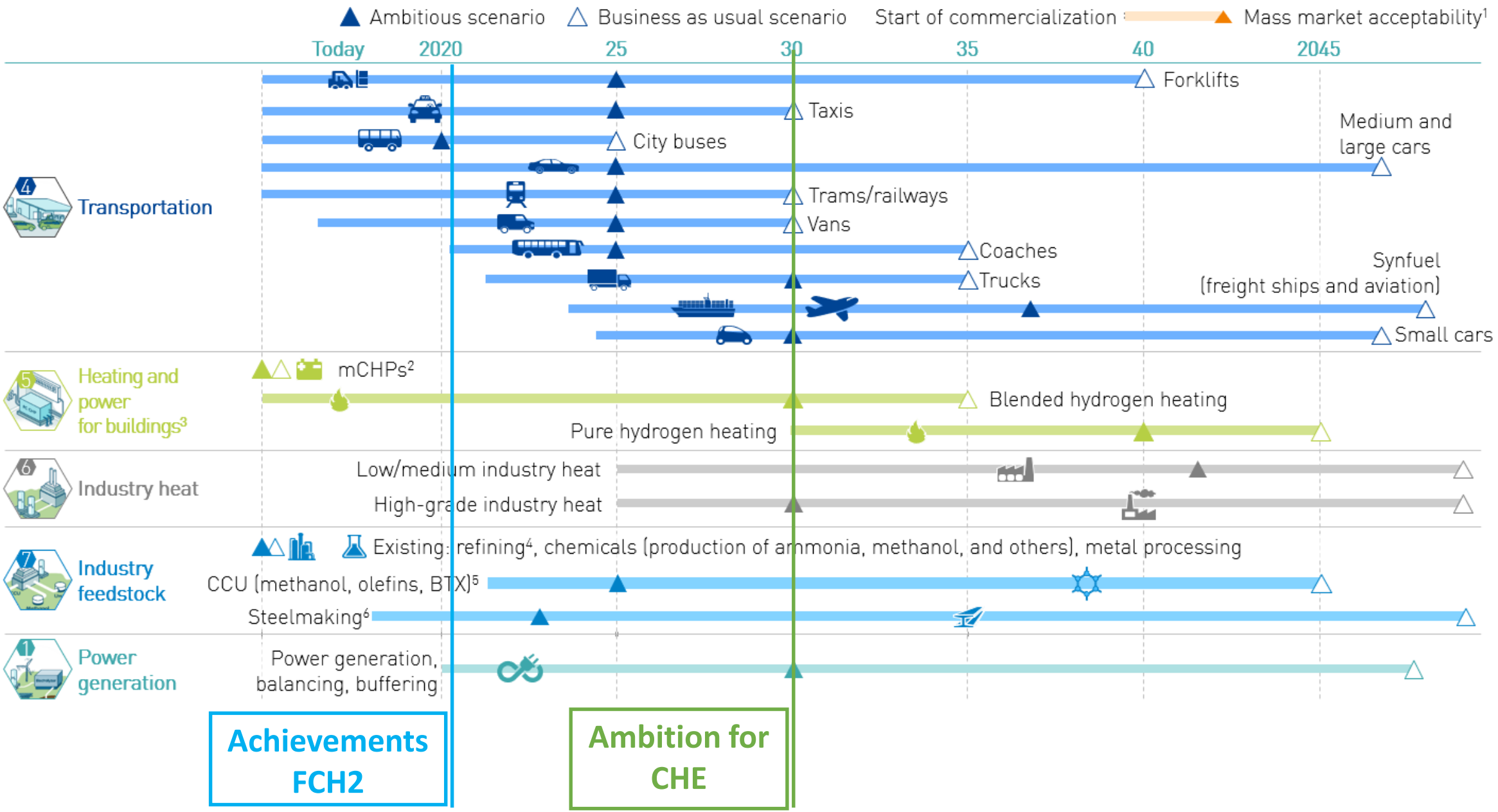
GO1: Accelerate the commercial readiness of H2 techno

Hydrogen Europe

Rationale for support → **State of the Art** → **Actions & Targets** → **Vision 2030**



GO1: Accelerate the commercial readiness of H2 techno



GO1: Accelerate the commercial readiness of H2 techno

- This GO1 is essentially implemented via grant funding.
- It is implemented via different funding instruments.

Type of project	TRL	Industry	Research
1. Strategic research challenges	TRL 2-3	100%	100%
2. Research Actions	TRL 3-6	70%	100%
3. Innovation Actions	TRL 5-8	50%	50%
4.1. Flagship project	TRL 7-8	30%	30%

GO2: Enable at scale deployment capacity
for key parts of the clean hydrogen value chain

Hydrogen Europe

PILLAR H2 PRODUCTION	PILLAR H2 DISTRIBUTION	PILLAR H2 END USES
SO1: Low carbon H2 production • Electrolysis • Other modes of production	**SO3: H2 delivered at low cost** • Large scale storage • H2 in the gas grid • Transport and storage in liquid carriers • Transport by road, ships, etc • Key techno for distribution	**SO5: Transport vehicles** <u>Priorities</u> • Technology building blocks • Truck and large vans (HD) • Maritime (Ships & Port) <u>Other new applications</u> • Aviation • Train • Coach
SO2: Integration of renewables • Role of electrolysis	**SO4: Refueling infrastructure** • HRS for multiple applications	**SO6: H2 for heat and power** (in building and industry) • H2 Stationary FC • H2 Burners and turbines • (also gas grid)
		SO7: H2 decarbonises industry • H2 in industry

SO9: SUPPLY CHAIN
Manufacturing & scale up

SO8: H2 VALLEYS
Integrated H2 ecosystems combining multiple applications (ports, industrial hubs, cities, etc.)

GO2: Enable at scale deployment capacity
for key parts of the clean hydrogen value chain

- This GO2 is essentially implemented via grant funding.
- It is implemented via 2 different funding instruments.

Type of project	TRL	Industry	Research
1. Strategic research challenges	TRL 2-3	100%	100%
2. Research Actions	TRL 3-6	70%	100%
3. Innovation Actions	TRL 5-8	50%	50%
4.1. Flagship project	TRL 7-8	30%	30%
4.2. Hydrogen Valley	TRL 7-8	30%	30%
5. Industrialization Action	TRL 5-8	30%	30%

GO3: Ensure a safe and frictionless deployment of Hydrogen techno

Hydrogen Europe

PILLAR H2 PRODUCTION

SO1: Low carbon H2 production
- Electrolysis
- Other modes of production

SO2: Integration of renewables
- Role of electrolysis

PILLAR H2 DISTRIBUTION

SO3: H2 delivered at low cost
- Large scale storage
- H2 in the gas grid
- Transport and storage in liquid carriers
- Transport by road, ships, etc
- Key techno for distribution

SO4: Transport infrastructure
- HRS for multiple applications

PILLAR H2 END USES

SO5: Transport vehicles

Priorities
- Technology building blocks
- Maritime (Ships & Ports)
- Truck and large vans (HD)

Other new applications
- Aviation
- Train
- Coach

SO6: H2 for heat and power (in building and industry)
- H2 Stationary FC
- H2 Burners and turbines
- (also gas grid)

SO7: H2 decarbonises industry
- H2 in industry

SO9: SUPPLY CHAIN
Manufacturing & scale up

SO8: H2 VALLEYS
Integrated H2 ecosystems combining multiple applications (ports, industrial hubs, cities, etc.)

SO10: Cross Cutting
Regulations, Codes, Standards, Training, Safety, social, etc.

Communication & dissemination Social acceptance

Knowledge Management

RCS coordination

Safety

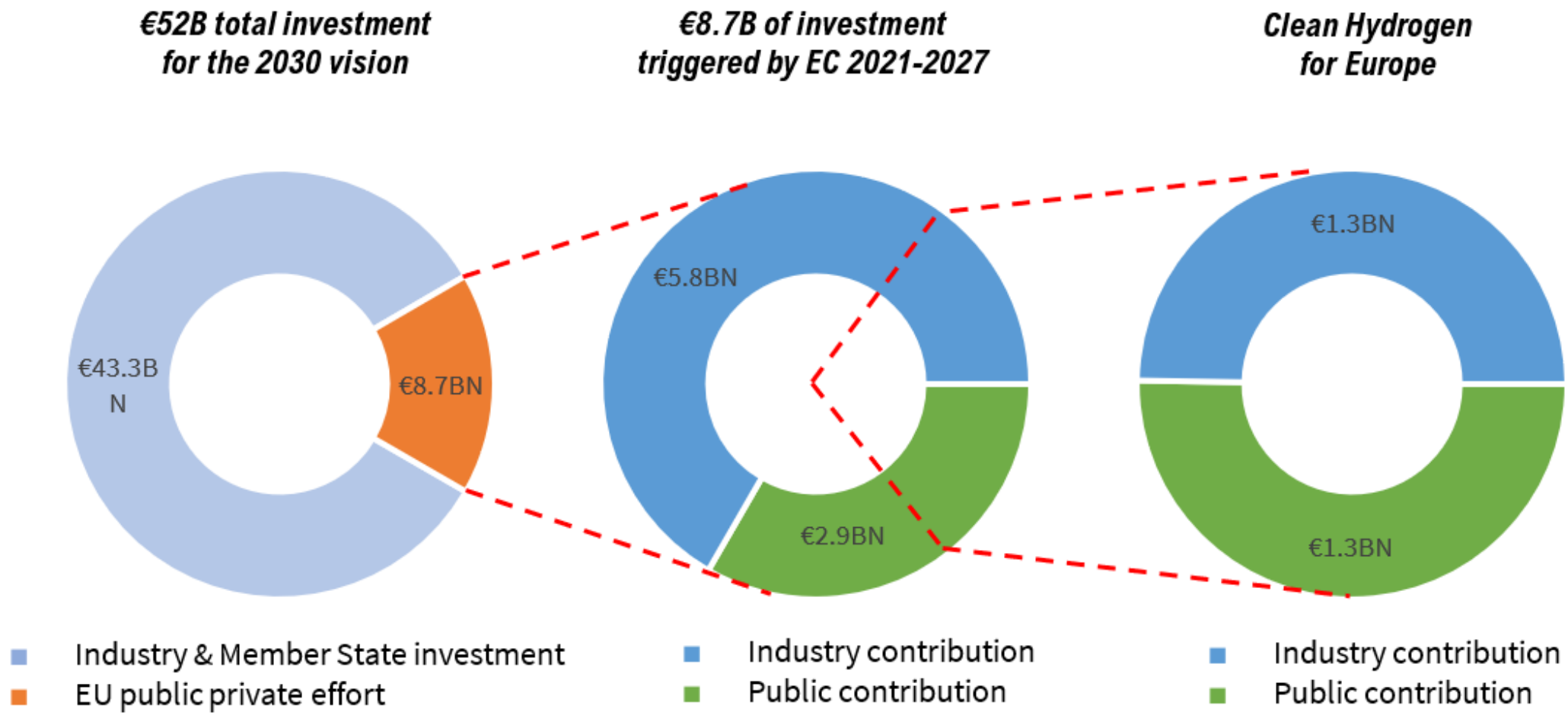
Regional & International Cooperation

GO3: Ensure a safe and frictionless deployment of Hydrogen techno

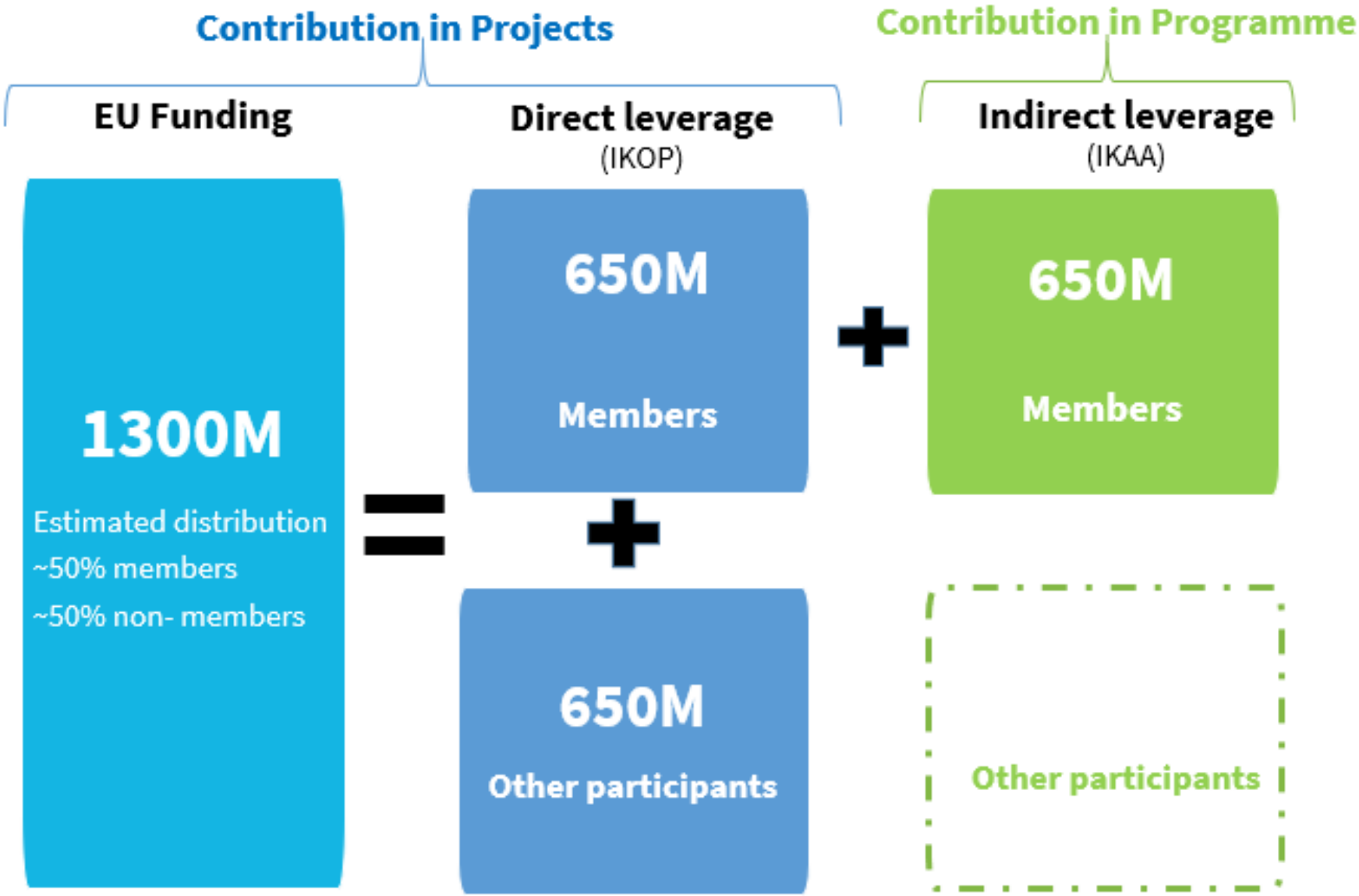
Type of project	TRL	Industry	Research
1. Strategic research challenges	TRL 2-3	100%	100%
2. Research Actions	TRL 3-6	70%	100%
3. Innovation Actions	TRL 5-8	50%	50%
4.1. Flagship project	TRL 7-8	30%	30%
4.2. Hydrogen Valley	TRL 7-8	30%	30%
5. Industrialization Action	TRL 5-8	30%	30%
6. Cross Cutting	n/a	100%	100%

- Procurement (studies) or grants in the form of coordinated and support action.
- But contrary to other general objectives, this GO is not exclusively implemented by grant funding but by diverse means
- Key differentiator of an IPPP

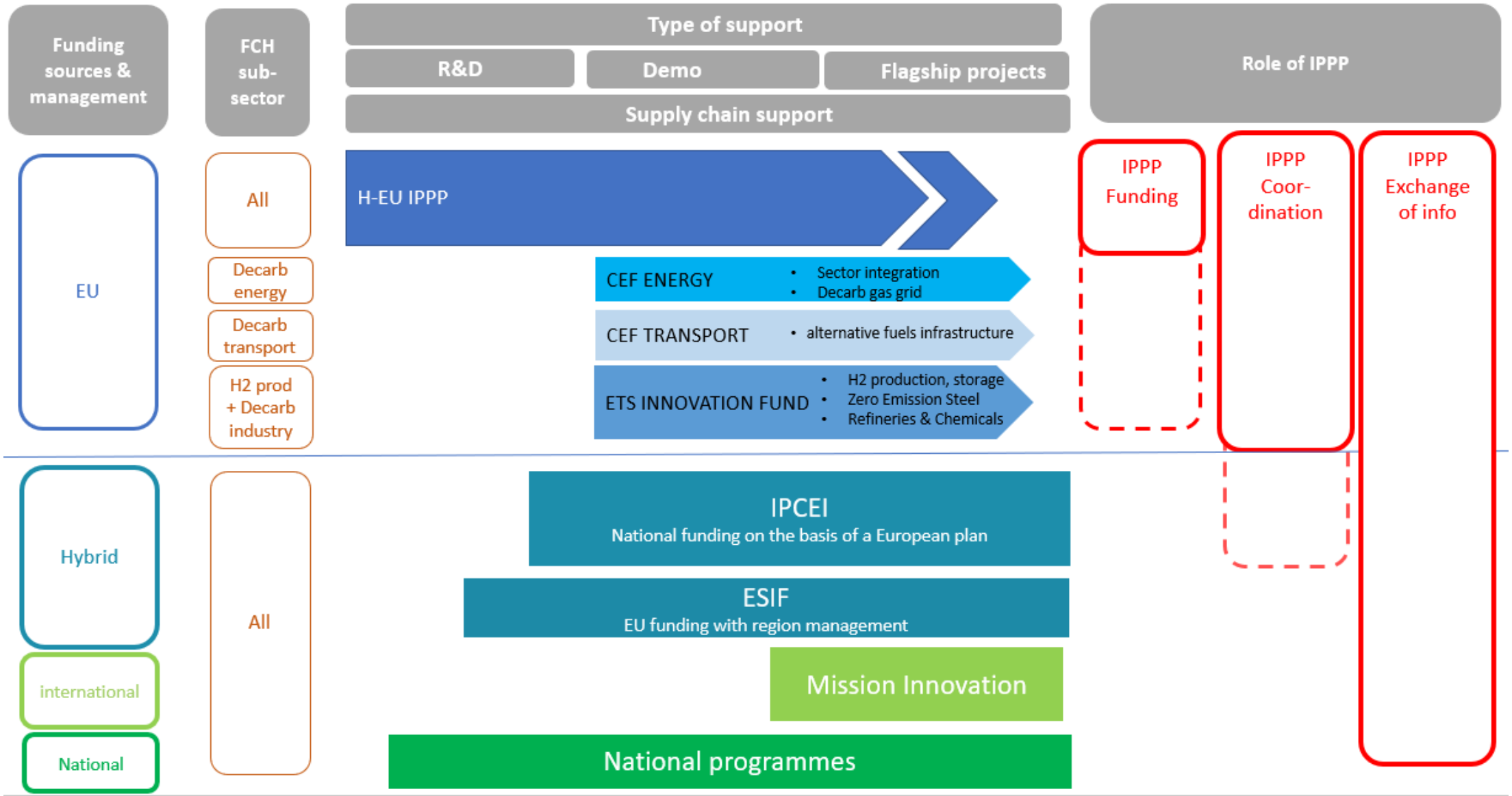
Budget, impact and private contribution



Budget, impact and private contribution



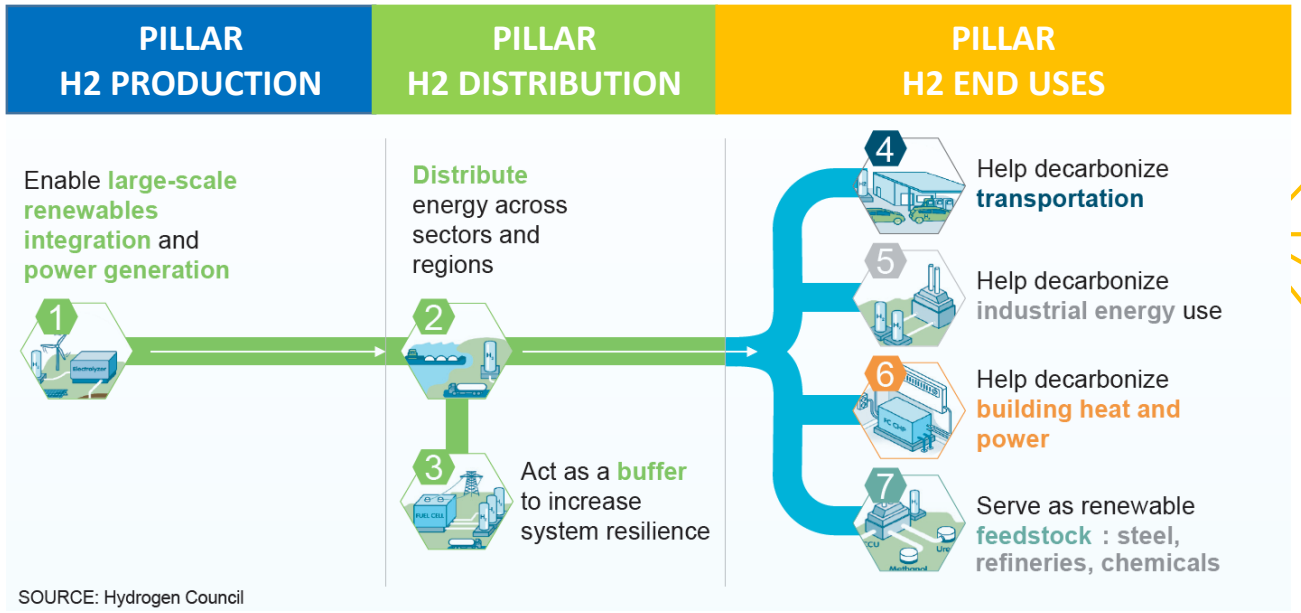
Coordination with other programmes



Consultation of other sectors & Complementarities with other partnerships.

Hydrogen Europe

RES & low carbon elec



Trucks (car, bus, coaches)

Ships and ports

Trains

Aircrafts, drones, aiport

Mosart (IPPP)

2ZERO (COP)

Batteries (COP)

Waterborne (?)

Transforming EU rail system (IPPP)

Clean Aviation (IPPP)

Built Environment (COP)

Clean & low carbon steel (COP)

Circular and Climate Neutral Industry (COP)

Circular and Climate Neutral Industry (COP)

Gas & elec grids

EU turbine

Batteries (cop)

Clean Energy Transition (COF)

EIT Climate

EIT Raw material

Legend

- Colored box = complementarity + wish of active coordination
- Colored frame= complementarity + exchange of information
- Colored disc= no PPP but wish of active coordination

A word on the process

EC preparation

1. Consultation of Member States (shadow strategic programme committee)
2. Public consultation (done)
3. Impact assessment and its 5 criteria + interviews of Stakeholders (on-going with Trinomics)

HE and HER preparation

1. IPPP request
2. SRIA: Strategic Research & Innovation Agenda
3. Consultation on SRIA
    1. **the stakeholders**
    2. related sectors & partnerships
    3. members states

506 replies of a total of
2205 for all IPPP,
nearly 25% of the total.
We are number one!

Give your opinion on the draft SRIA (by 20.12.2019)

www.cleanhydrogenforeurope.eu

Give your opinion on the draft SRIA by 20/12

SPECIFIC OBJECTIVE		ROADMAP	CHAPTER
1	Low carbon hydrogen production	Electrolysis	3.1.1
		Other modes of hydrogen production	3.1.2
2	Hydrogen production enables increased renewables	Role of electrolysis in energy system	3.2.1
3	Hydrogen is delivered at low cost	Large scale storage of hydrogen	4.1.1
		Hydrogen in the gas grid	4.1.2
		Transport and storage in liquid carriers	4.1.3
		Transport of hydrogen by road, ship etc	4.1.4
		Key technologies for distribution	4.1.5
4	Affordable hydrogen is dispensed to transport applications	Hydrogen refuelling stations	4.2.1
5	Fuel cell vehicles (road, rail, ship) are competitively priced	Technology Building Blocks	5.1.1
		Buses & coaches	5.1.2
		Trucks	5.1.3
		Rail	5.1.4
		Maritime	5.1.5
		Aviation	5.1.6
6	Hydrogen meets demands for heat and power	Stationary fuel cells	5.2.1
		Hydrogen burners and turbines	5.2.2
7	Hydrogen decarbonises industry	Hydrogen in industry	5.3.1
8	Creation of hydrogen ecosystems	Hydrogen valleys	6.1
9	Manufacturing and scale-up	Supply chain development	6.2
10	Regulations, codes, standards, training, safety, etc.	Cross cutting issues	6.3

Contacts

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