



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

Support of the European Union to Fuel Cells and Hydrogen: stationary fuel cells focus

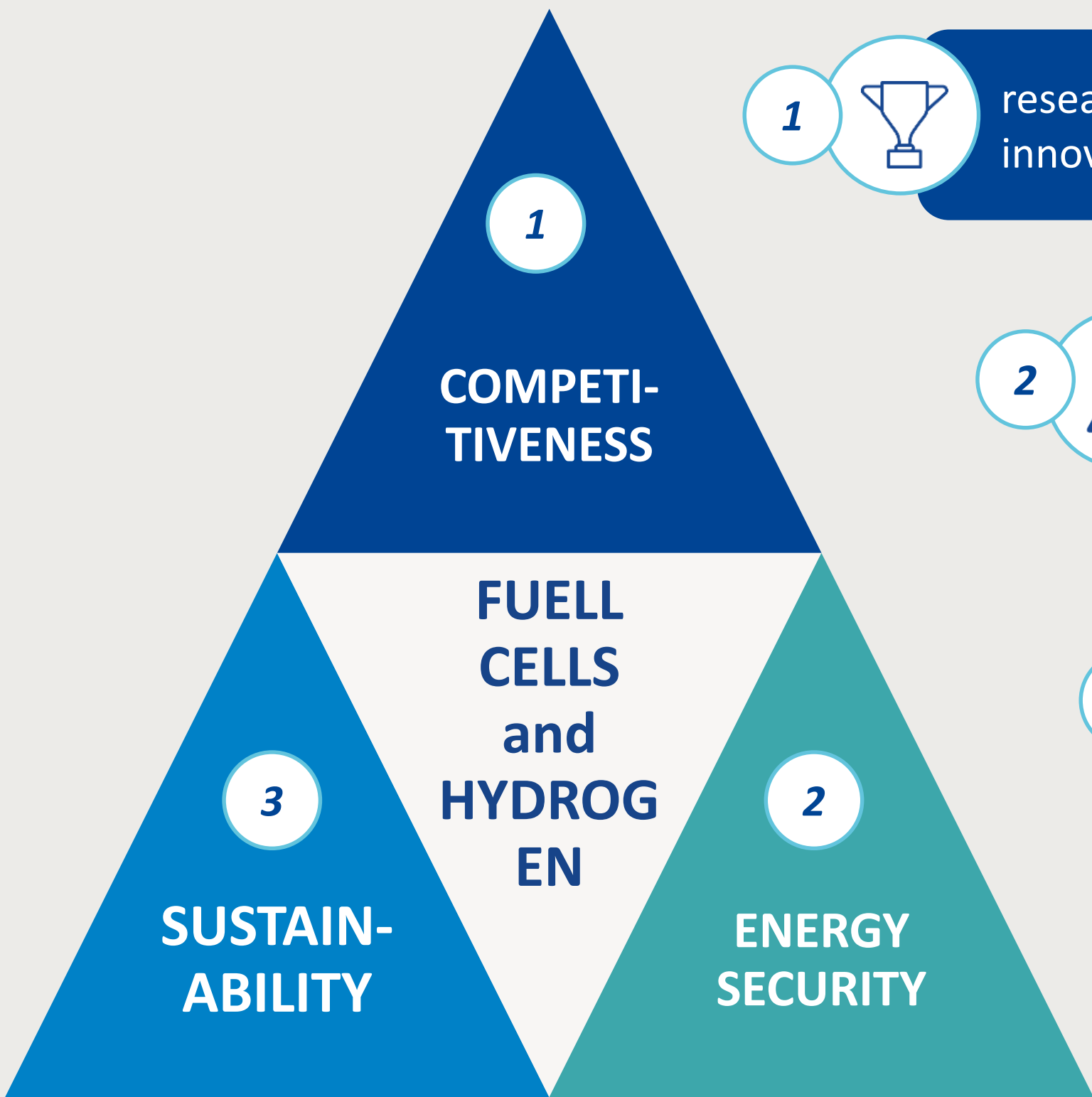
Antonio AGUILO – Project
Officer

**2nd International Hydrogen Energy and Fuel Cell
Technology and Product Expo**

7 November 2018, Foshan, Guangdong, China



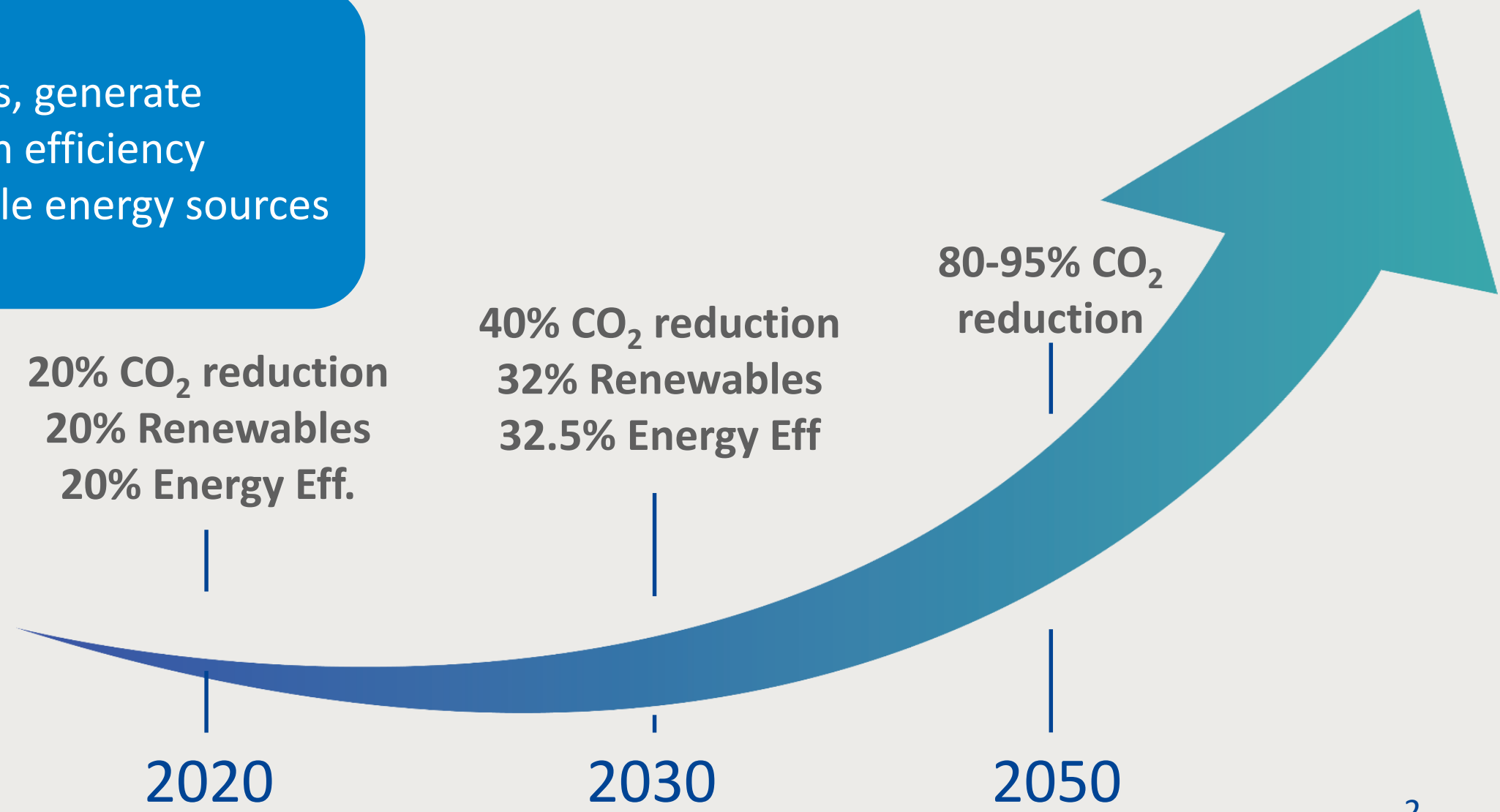
Fuel Cells & Hydrogen technologies in the context of the European Energy policy



1 research excellence leading to industry innovation and growth

2 Increase independence from unstable outside regions

- 3
- H2 is a clean energy carrier
 - Transport and Energy applications, generate electricity and heat with very high efficiency
 - Possibility for storage of renewable energy sources
 - Reduction of CO2 emissions



Strong public-private partnership with a focused objective

EU Institutional Public-Private Partnership (IPPP)



Fuel Cells & Hydrogen Joint Undertaking (FCH 2 JU)



Industry grouping
More than 130 members
50% SME



Research grouping
about 68 members

To implement an *optimal research and innovation programme* to bring FCH technologies to the point of market readiness by 2020



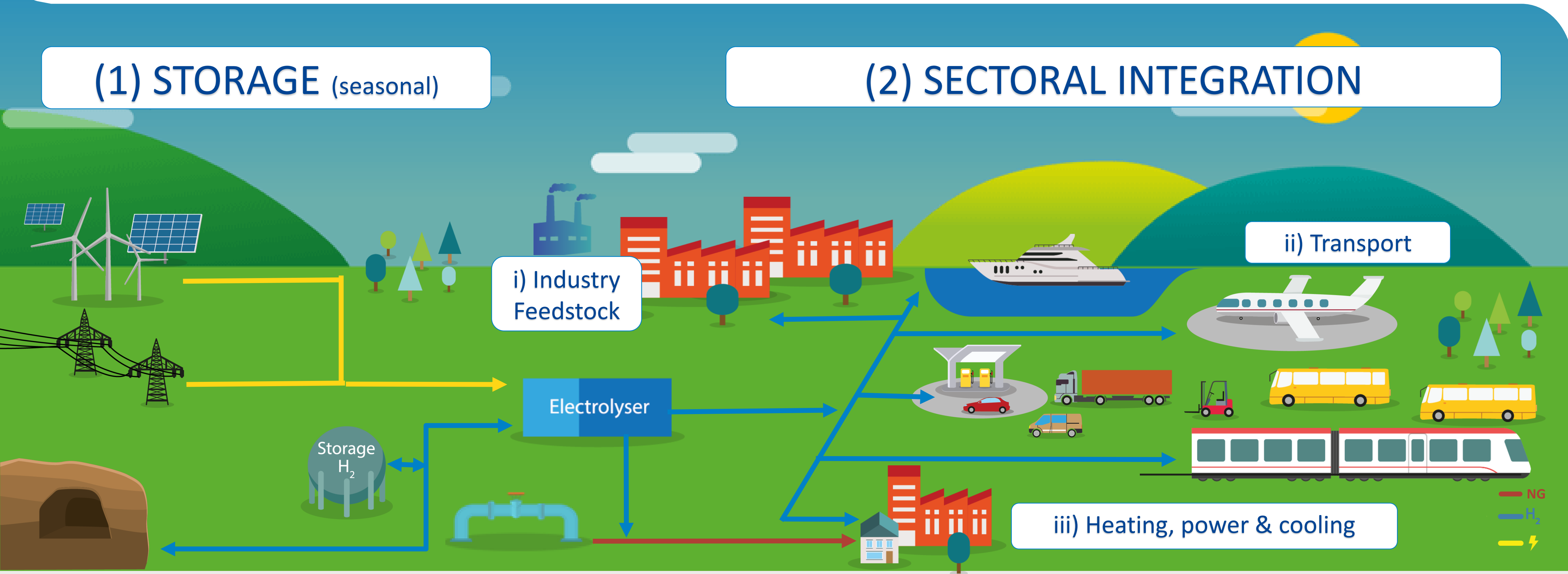
The role of hydrogen in our society & economy

Hydrogen allows more renewables in the energy system through storage and enables sectoral integration



(1) STORAGE (seasonal)

(2) SECTORAL INTEGRATION



FCH JU programme implementation



Energy

- Hydrogen production and distribution
- Hydrogen storage for renewable energy integration
- Fuel cells for power & combined heat & power generation



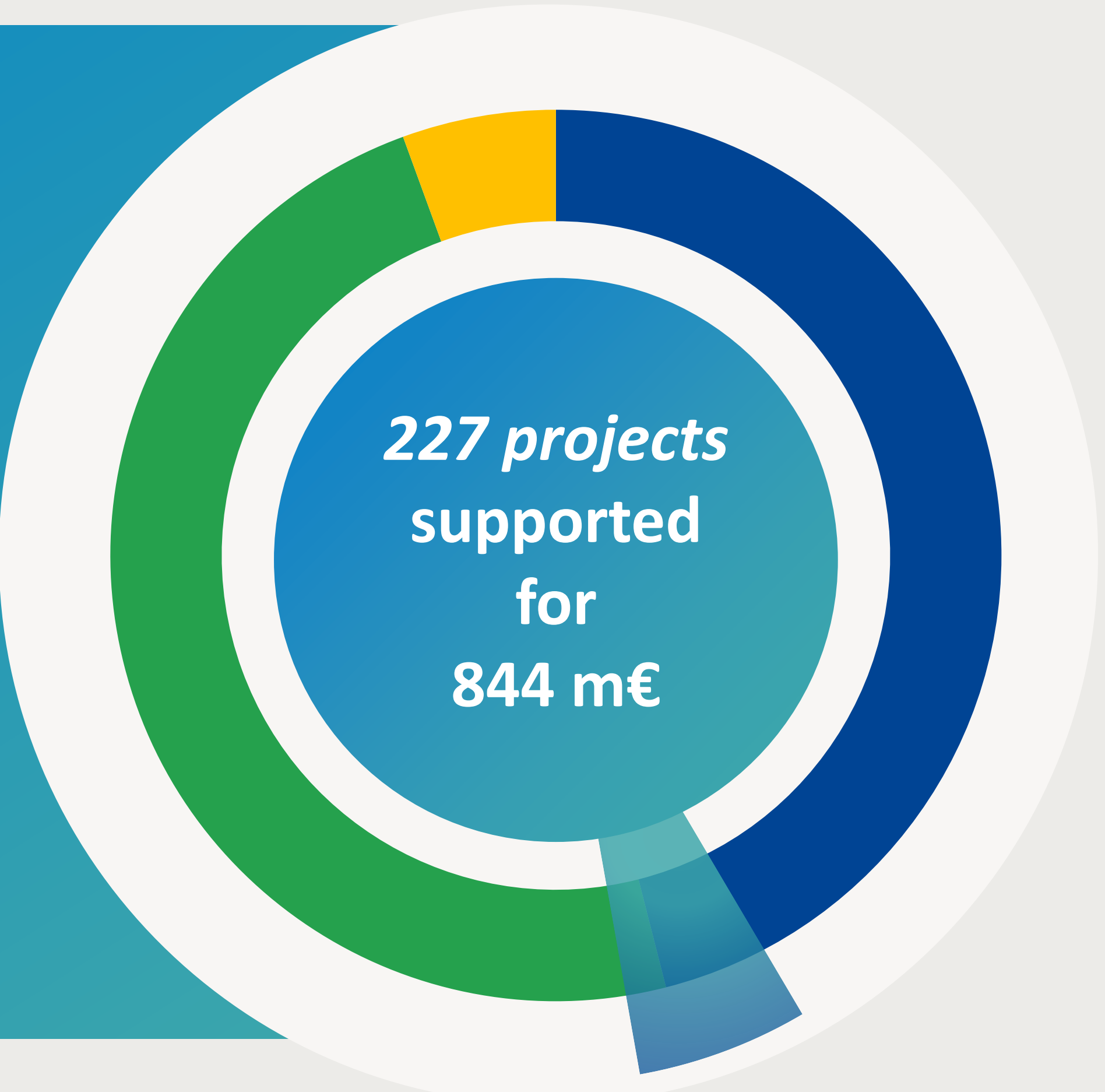
Transport

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



Cross-cutting

- E.g. standards, safety, education, consumer awareness ...



47.5%



401 million euros
128 projects

42%



353 million euros
59 projects

5.5%



47 million euros
37 projects



5%

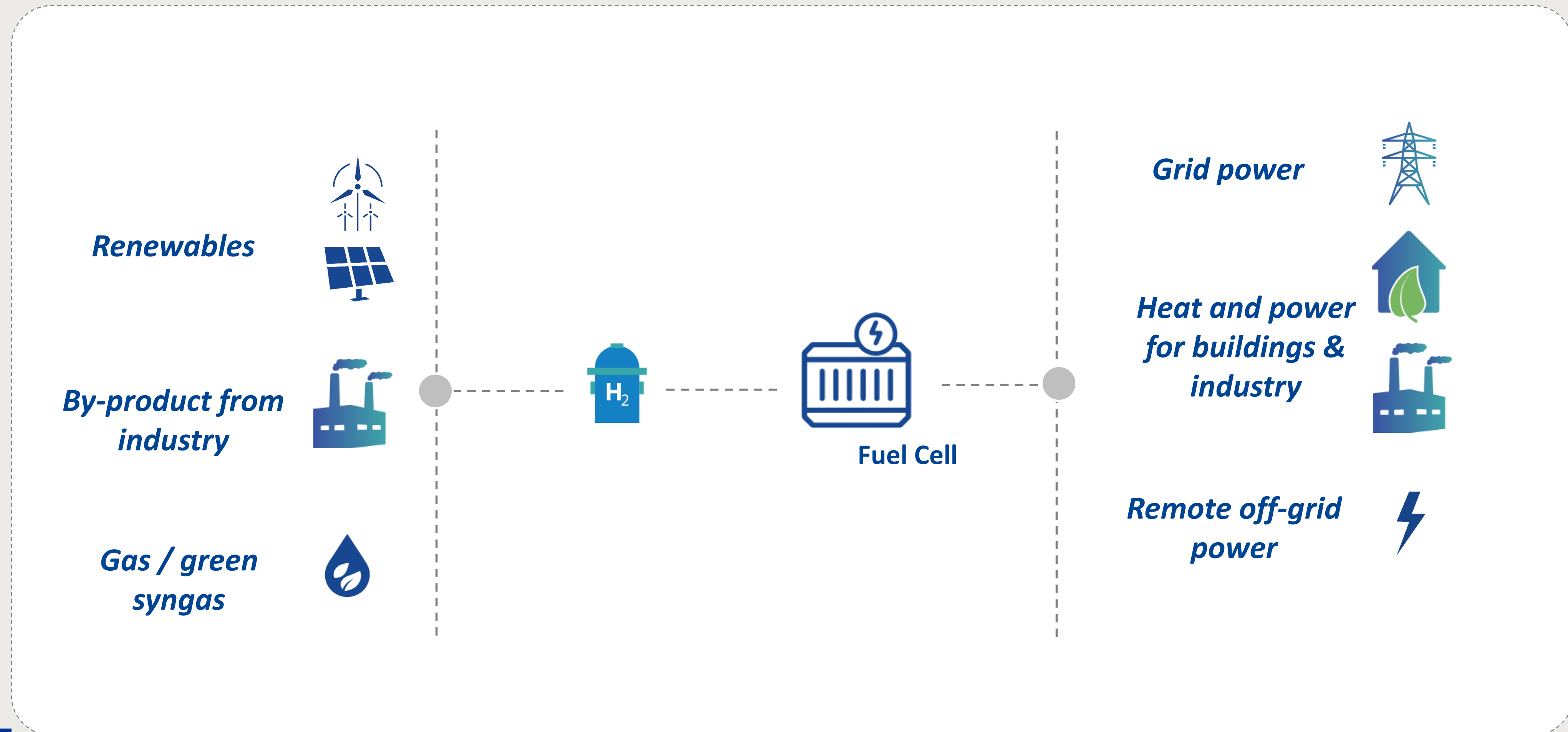
42 million euros
3 projects



Similar leverage of other sources of funding: 886 m€

Clean heat and power with fuel cells for buildings and industry

In support of European climate and energy objectives: highly efficient, clean and silent



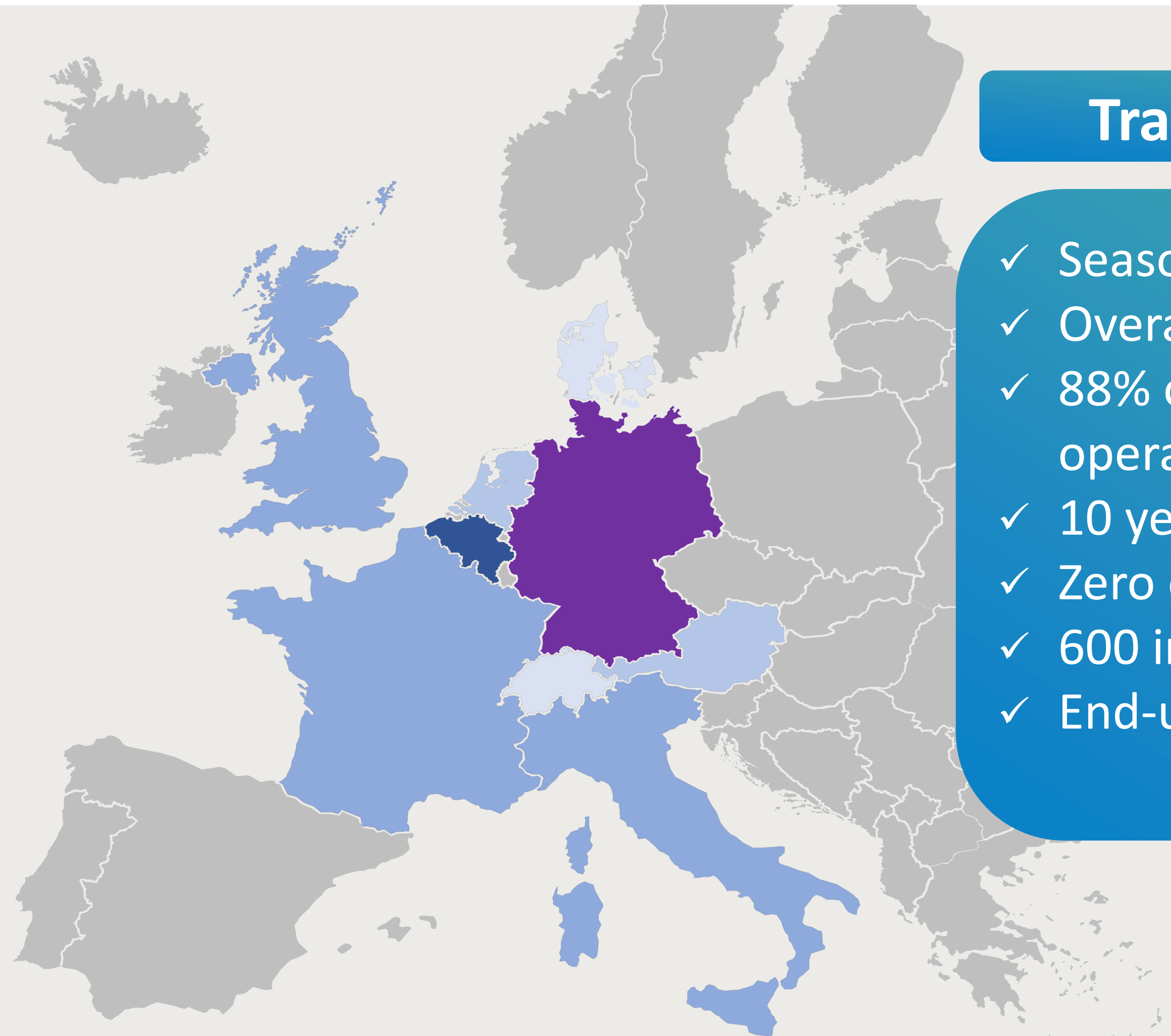
Clean heat and power solution for buildings

On the road to large scale deployment with a strong European industry



Track record of installations

- ✓ Seasonal elec. AC efficiencies up to 60%
- ✓ Overall efficiencies as high as 85-95%
- ✓ 88% of all systems during first year of operation achieved >98.2% availability
- ✓ 10 years product lifetime offered
- ✓ Zero or negligible emissions in local air
- ✓ 600 installers trained
- ✓ End-users satisfaction



Map with fuel cells mCHP installation in Europe. Source: FCH JU ©

1-70 71-200 201-400 401 - 1000 1001- 2000 2001- 3000 3001+
of units



Industrial applications...greening big industry by using waste hydrogen

Exporting EU technology abroad



2 MW_e Fuel Cell in a Chlor-alkali plant, China

- H₂ by-product as fuel
- Over 2 years operation
- ~50% elec. eff. recorded

Duration: 2015-2018

Budget: 10.5M€

Funding: 5.5M€



1 MWe Fuel Cell in a Refinery, Martinique

- Waste H₂ as fuel
- Driven by high power generation costs in the island
- To be commissioned Q2 2019

Duration: 2012-2020

Budget: 8.6M€

Funding: 4.6M€



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Successful European - Chinese Private/Public cooperation

What have we learnt



1 Technology works

2 Valorisation of industry by-product H₂

3 Ynnovate role as early adopter key to the project success

4 China is home to 50% of the chlor-alkali world production

5 Significant replication potential

6 Further research and demonstration needed



Strong partnership



Next generation of multi MW size Fuel Cell Power Plants

EU continues supporting the sector



Next generation multi-MW FCs

Builds on the DEMCOPEM learnings
Uses newly developed stacks, MEAs and BoP

Targets:

- FC elec. efficiency > 55%
- lifetime > 20,000 h
- Fast response, grid services capability
- CAPEX < 1500 EUR/kW_e at yearly production rate of 25 MW_e.

Advisory board participation

www.grasshopperproject.eu



Pilot plan to be built mid 2019

- 2018/2020
- 4.4M€ / 4.4M€



Opportunities and challenges

Continue working together



- 1 Use of heat to **improve business models**, e.g. district heating
- 2 **Re-electrification**: P2P with Renewables-> H2 storage -> fuel cells
- 3 Europe has **strong supply chain actors and systems integrators**
- 4 China has favorable **market conditions**
- 5 **Global deployment** by 2030 could be between 17-97 GW_e
- 5 We hope to continue **EU/China collaboration**

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FCH JU