Accelerating the energy transition
EU perspective

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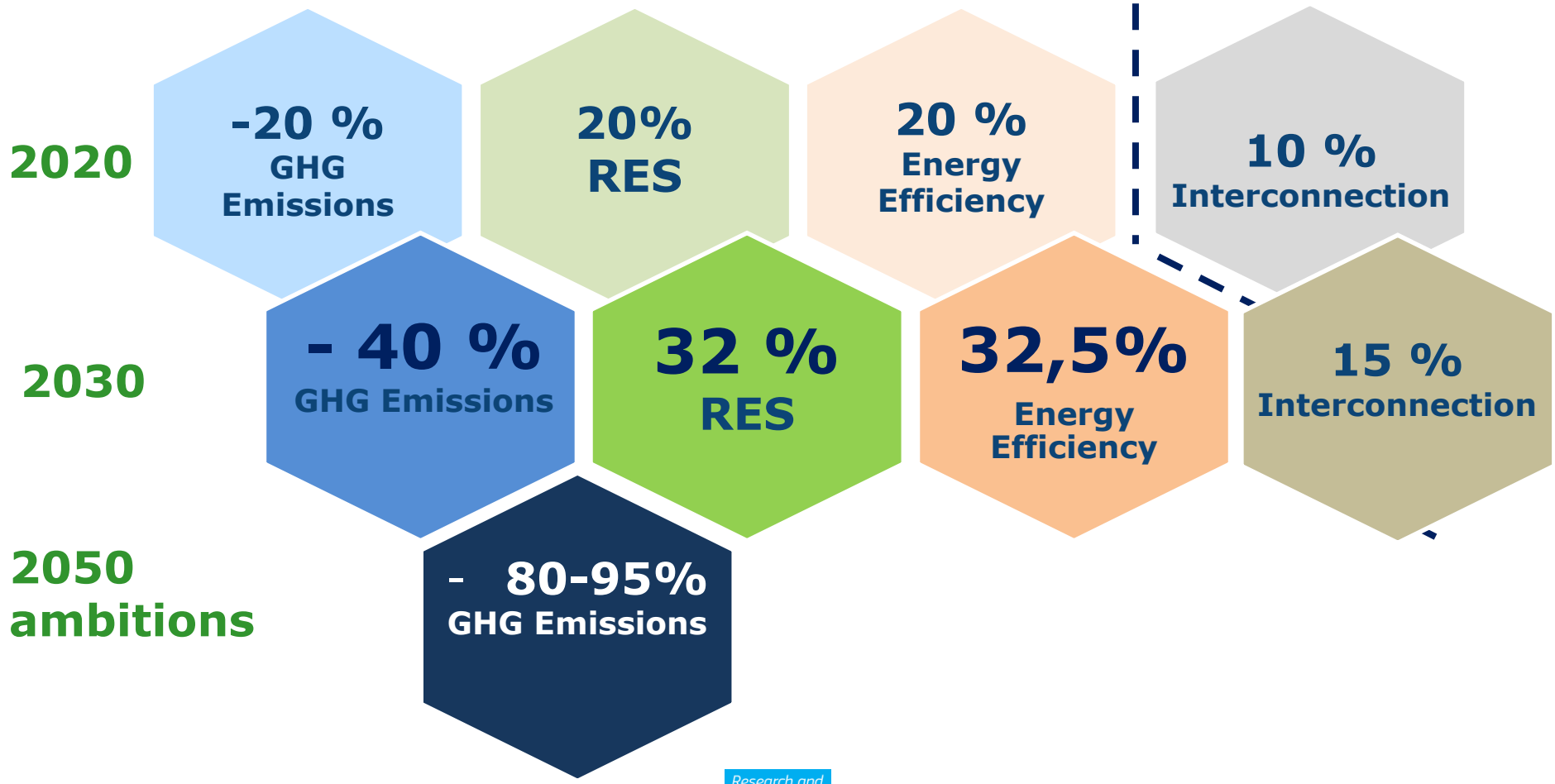
Research and Innovation

European Commission

European Climate & Energy Targets



The EU energy system in transition

- The EU's goal is 80-95% decarbonisation by 2050…
- …and should even reach 100% by 2050 to stay within 1,5°C
- This means 'renewables first', with remaining fossil fuel and carbon intensive industries fully decarbonised through CCUS
- Remaining fossil fuel power plants must be highly flexible to back-up and balance these fluctuating renewables
- A 'systems approach' addressing electricity, heating, smart grids, transport and energy-intensive industry
- Deep electrification of transport and industry requires sector coupling

Hydrogen is a key part of the energy transition

We need smart solutions for:

- **Renewable hydrogen**
- **Low carbon hydrogen from natural gas with CCS**
- **Hydrogen in an integrated energy system (power, heat and transportation)**
- **Hydrogen in CO2-intensive industry processes (e.g. steel)**
- **Power-to-X (gas, liquids, chemicals)**
- **Utilisation of captured CO2 (CCU)**
- **Hydrogen as a long-term, large-scale energy storage**

Research & Innovation is key

- We need to accelerate the energy transition
- Horizon 2020 addresses all enabling technologies for deep decarbonisation
- Horizon Europe will strengthen this through a stronger cross-sectoral design and approach
- Preparations for Horizon Europe are ongoing

R&I Initiatives relevant for H2 & Fuel Cells:

- **FCH 2 JU** (665 M€ ring-fenced budget for 2014-2020)
- **Energy Union Research, Innovation & Competitiveness Strategy** (December 2016)
- **Strategic Energy Technology Plan**
  - *Implementation Plan CCUS:* R&I activity on the Feasibility for a European hydrogen infrastructure
- **Mission Innovation**
  - **Renewable and Clean Hydrogen Innovation Challenge**
  - **Carbon Capture Innovation Challenge**

MISSION INNOVATION
Accelerating the Clean Energy Revolution

IC#8
Renewable and Clean Hydrogen Challenge

Objective
To accelerate the development of a global hydrogen market by identifying and overcoming key technology barriers to the production, distribution, storage, and use of hydrogen at gigawatt scale.

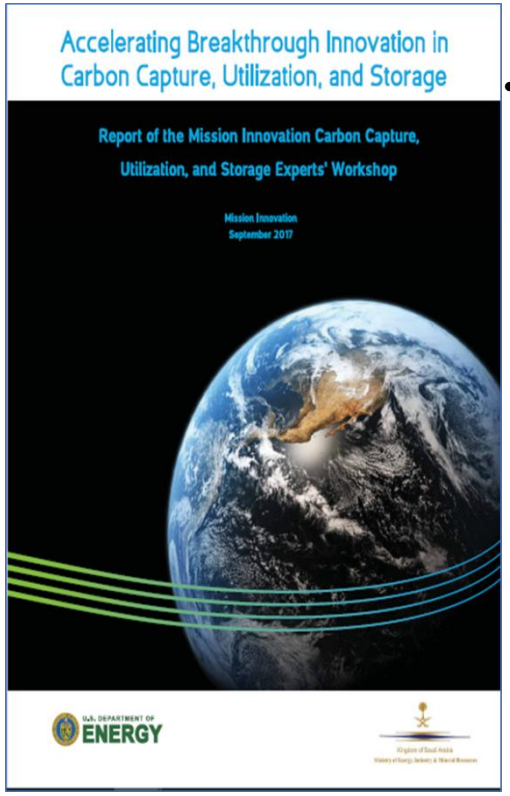
•Launched in May 2018
•14 countries

The challenge will focus **multinational research and large scale demonstration efforts** from both public and private sectors on industry-directed breakthroughs which have a realistic prospect of underpinning commercial renewable and clean hydrogen industries.

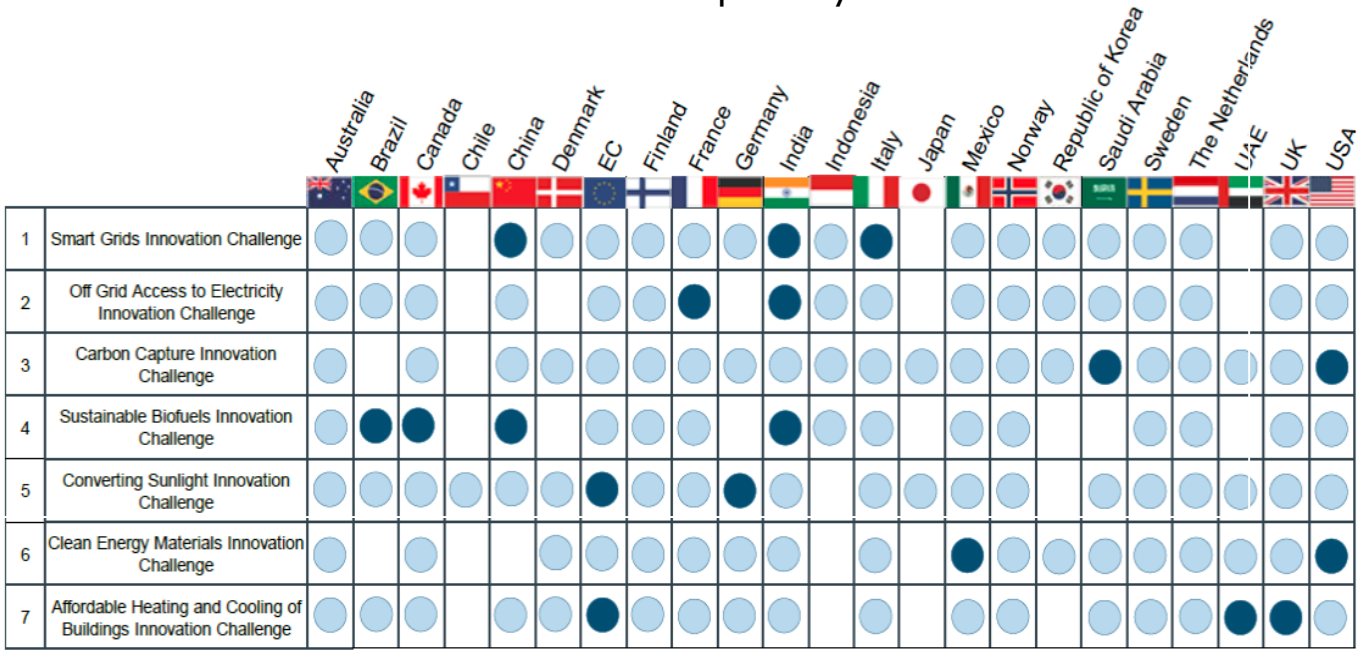
Co-lead: Australia, European Commission, Germany

Mission Innovation Challenge # 3: CCUS

- 20 active countries
- Co-leads: UK, Mexico, Saudi-Arabia



- The Report puts the production of low carbon hydrogen from Fossil Fuels with CCS as a research priority



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Fuel Cells & Hydrogen Joint Undertaking (FCH2 JU)

Hydrogen Europe

Industry Grouping
Over 100 members
~ 50% SME

European Commission

Hydrogen Europe Research

Research Grouping
Over 60 members

The Joint Undertaking is managed by a Governing Board composed of representatives of all three partners and lead by Industry.

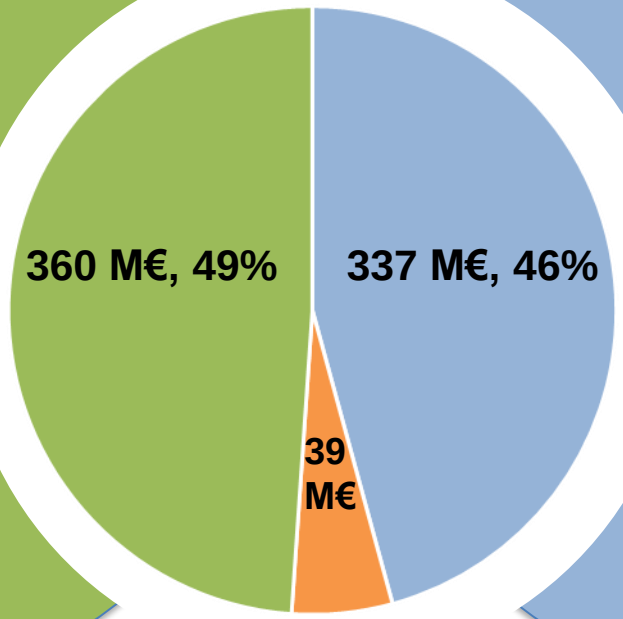
To implement an optimal research and innovation programme to bring FCH technologies to the point of market readiness by 2020

EC contribution: 665M€

FCH JU's project portfolio:

ENERGY
117 projects

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



TRANSPORT
53 projects

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

Cross-cutting, 34 projects

(e.g. standards, safety, education, consumer awareness, …)

Relevant H2020 topics

European Commission

LC-SC3-NZE-5-2019-202

Low carbon industrial production using CCUS

- Includes industrial sectors, steel, iron and cement, oil refining, gas processing, **hydrogen production**, biofuel production and waste incineration plants.
- Innovation Action, Funding 70 %
- Budget 33 Mio € in 2019, (15 Mio € in 2020)
- Proposals expected to request 10-12 Mio €
- TRL 6 – 7
- Opening 7 May 2019, Deadline 27 August 2019

Relevant H2020 topics

European Commission

LC-SC3-NZE-3-2018: Strategic planning for CCUS development

- Elaborate detailed plans for European CO2 gathering networks and industrial clusters linked to CO2 storage sites via hubs, pipeline networks and shipping routes.
- Industrial clusters may include power producers, cement and steel factories, chemical plants, refineries and **hydrogen production facilities**
- Expected EC contribution EUR 2-3 million per project; CSA
- Topic budget EUR 3 million
- Call opened on 15 May 2018 and closed on 6 September 2018

Horizon Europe

is the Commission proposal for a **€ 100 billion** research and innovation funding programme for seven years (2021-2027)

to strengthen the EU's scientific and technological bases

to boost Europe's innovation capacity, competitiveness and jobs

to deliver on citizens' priorities and sustain our socio-economic model and values

Additional **€ 4.1 billion** are proposed to be allocated for defence research, in a separate proposal for a European Defence Fund

Horizon Europe: evolution not revolution

Pillar 1
Open Science

- European Research Council
- Marie Skłodowska-Curie Actions
- Research Infrastructures

Pillar 2
Global Challenges and Industrial Competitiveness

Clusters

- Health
- Inclusive and Secure Society
- Digital and Industry
- Climate, Energy and Mobility
- Food and natural resources

Joint Research Centre

Pillar 3
Open Innovation

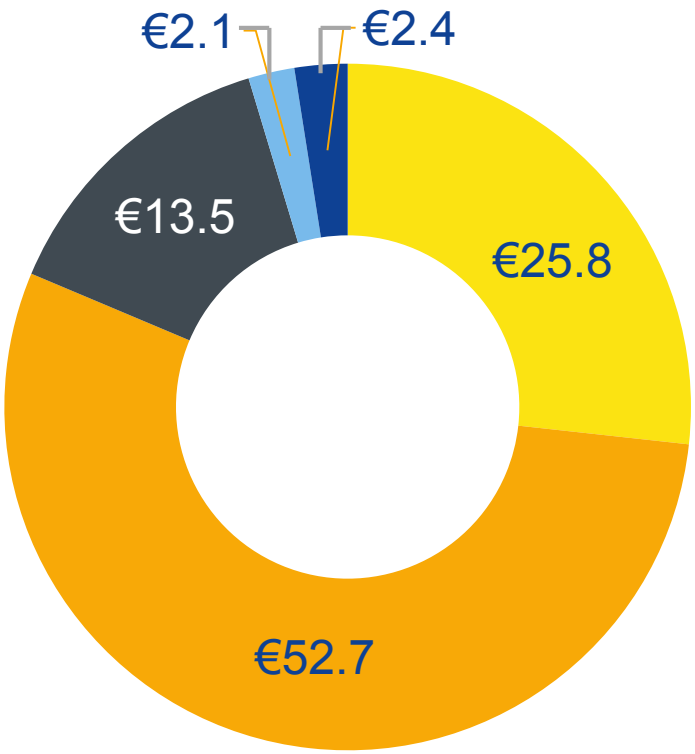
- European Innovation Council
- European innovation ecosystems
- European Institute of Innovation and Technology

Strengthening the European Research Area

- Sharing excellence
- Reforming and Enhancing the European R&I system

European Commission

Budget: €100 billion* (2021-2027)



€ billion
In current prices

- Open Science
- Global Challenges & Ind. Competitiveness
- Open Innovation
- Strengthening ERA
- Euratom

* This envelope includes EUR 3.5 billion allocated under the InvestEU Fund.

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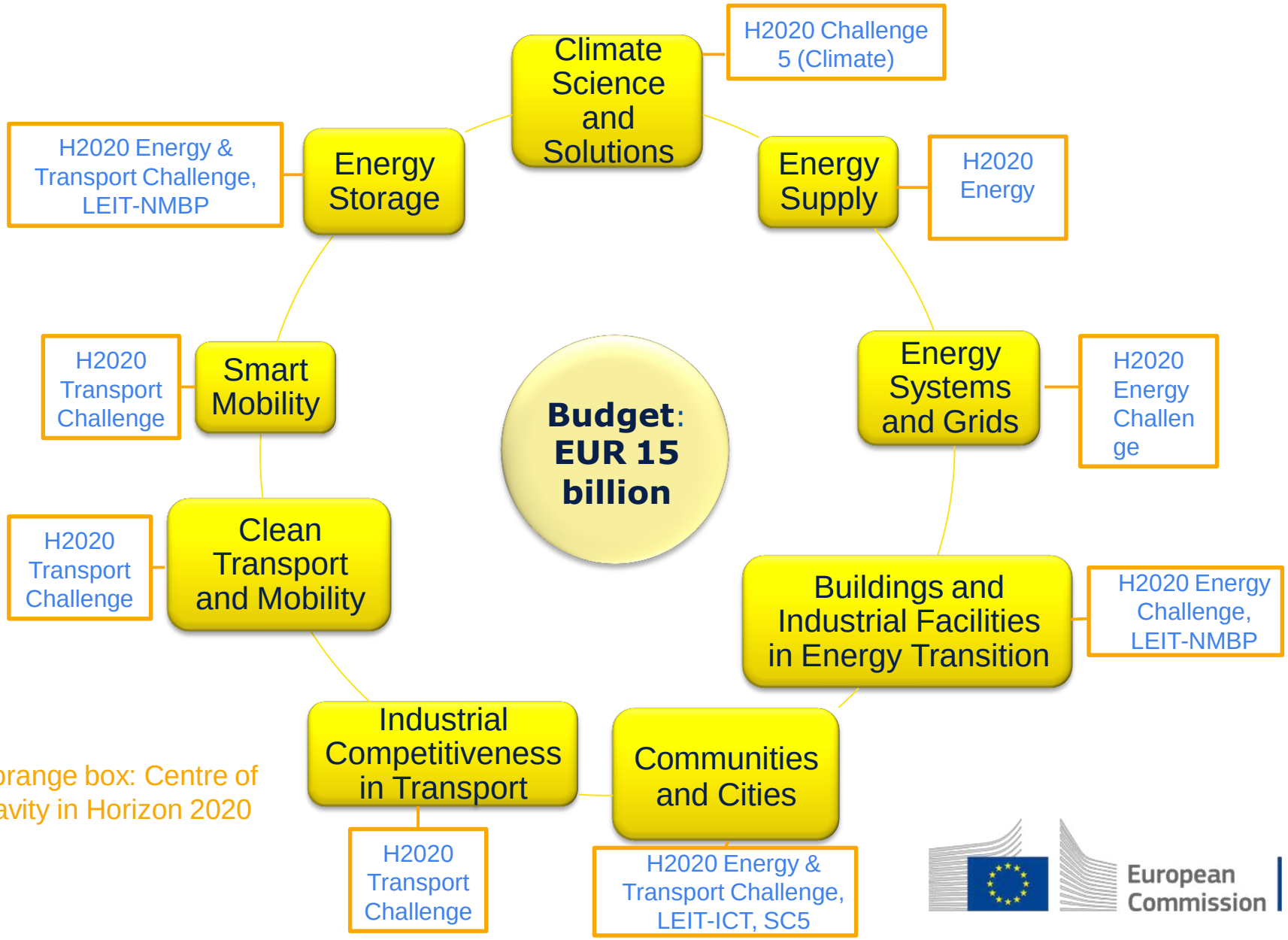
Pillar 2

Global Challenges & Industrial Competitiveness:

boosting key technologies and solutions underpinning EU policies & Sustainable Development Goals

Clusters implemented through usual calls, **missions & partnerships**	Budget (€ billion)
Health	*€ 7.7*
Inclusive and Secure Societies	*€ 2.8*
Digital and Industry	*€ 15*
Climate, Energy and Mobility	*€ 15*
Food and Natural Resources	*€ 10*
Joint Research Centre supports European policies with independent scientific evidence & technical support throughout the policy cycle	€ 2.2

Cluster ‘Climate, Energy and Mobility’ - Scope



In orange box: Centre of gravity in Horizon 2020

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Area “Energy Supply”

Main activities:

- ✓ **Renewable energy technologies and solutions for power generation, heating and cooling, sustainable transport fuels and intermediate carriers**
- ✓ **Disruptive renewable energy technologies**
- ✓ **Reduction of GHG-emissions from fossil fuel-based power generation via CO2 capture, utilisation and storage (CCUS).**

Area “Energy Storage”

Main activities:

✓**Broad portfolio of storage technologies for daily to seasonal energy needs**

✓**Batteries and the EU value chain, including design, large-scale battery cell production technologies, reuse and recycling methods**

✓**Near zero-carbon hydrogen including fuel cells, and the EU value chain from design to end use.**

Thank you!

#HorizonEU

http://ec.europa.eu/horizon-europe