EU R&I priorities for renewable fuels

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Clean Energy Transition
DG Research & Innovation
EUROPEAN COMMISSION

IEA EGRD Green fuels Workshop , Paris,,21 October 2019

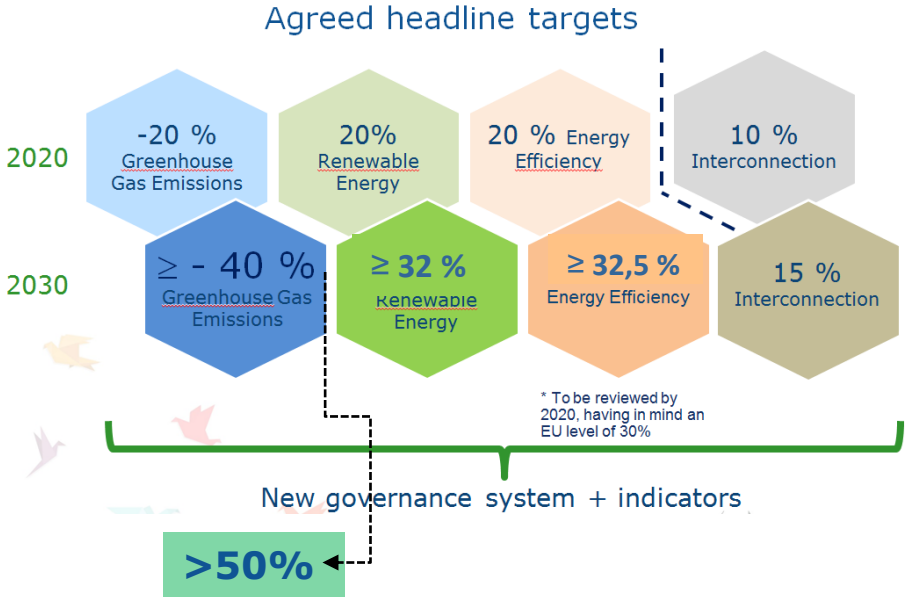
Outline

- Energy Policy
- R&I Policy - SET Plan - Horizon 2020
- Renewable fuels
- Future Support - Horizon Europe

"European Green Deal"



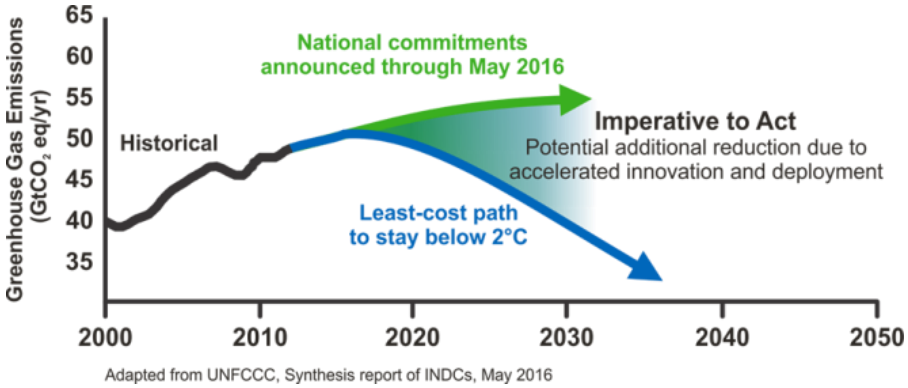
"Clean Energy for all Europeans"



Paris Agreement

*Holding global average temperature to **well below 2°C** and limit its increase to **1.5°C***

*Accelerating, encouraging and enabling **innovation** is crucial...*



Other EU policy priorities

- Digital Single Market
- Jobs, Growth and Investments
- EU as a strong global actor
- Sustainable Development
- …

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*I want the **European Green Deal** to become Europe's hallmark. At the heart of it is our commitment to becoming the world's first **climate-neutral continent**. It is also a long-term **economic imperative**: those who act first and fastest will be the ones who grasp the opportunities from the ecological transition. I want Europe to be the **front-runner**. I want Europe to be the exporter of **knowledge, technologies and best practice***

President-elect Ursula von der Leyen announces distribution of portfolios

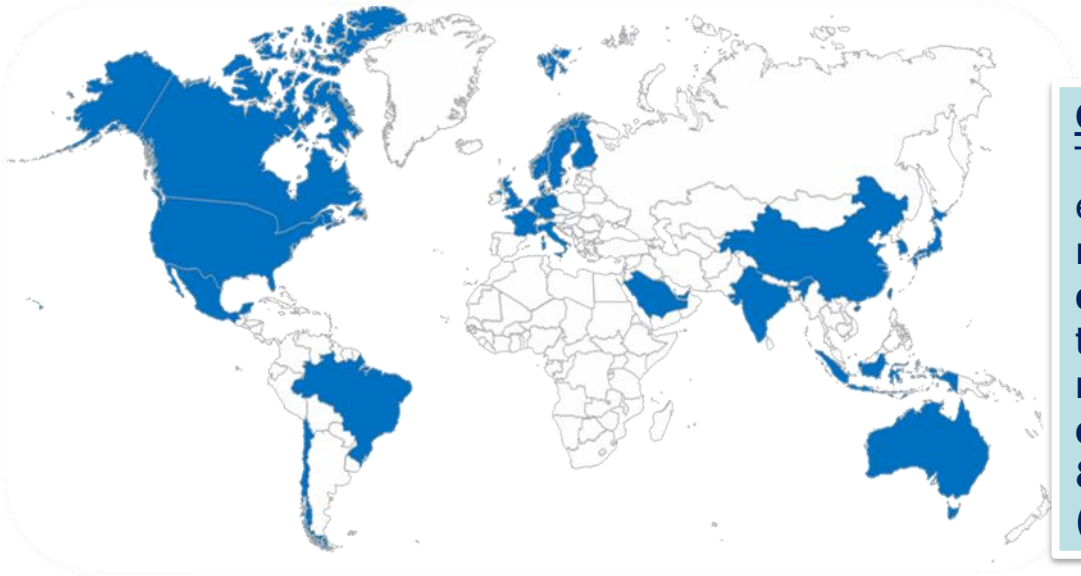


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Mission Innovation

COP21

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE



Overall objective:
To reinvigorate global efforts in clean energy innovation, Mission Innovation members share a common goal to **develop and scale** breakthrough technologies and substantial **cost reductions**. MI members aim to seek to **double public clean energy research & development investment** over 5 yrs (2015-2020)

24 Members worldwide - 8 Innovation Challenges

- ✓ EC and 10 EU MS
- ✓ smart grids, off-grid access to electricity, CCS, biofuels, converting solar, clean energy materials, H&C buildings, H2
- ✓ EU engaged in all the ICs, co-leads IC5, IC7 and IC8

Tangible results in the near future (end 2020)

- ✓ Public sector support for clean energy R&I
- ✓ Private sector engagement
- ✓ International collaboration
- ✓ EU invests 150 Million € on MI-relevant calls by 2020

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European Commission

The Strategic Energy Technology Plan (SET Plan) - *coordinating research and innovation across Europe*



Overall objective: Accelerating the development and deployment of low-carbon technologies through cooperation among EU countries, companies, research institutions, and the EU itself, based on **common priorities, targets and actions**.

Defining priorities •SET-Plan Communication 2015

Setting targets •Declaration of Intents

Implementation Plans (IP) •Temporary Working Groups

Execution of IPs

Priority Actions:

1&2. Improving performance and reducing cost of renewable energy
3. Smart solutions for consumers
4. Smart Resilience and Secure Energy System
5. Energy Efficiency in Buildings
6. Energy Efficiency in Industry
7. Batteries and e-Mobility
8. Renewable Fuels and Bioenergy
9. Carbon Capture Utilisation and Storage
10. Nuclear Safety

European Commission

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The Implementation Plans by country



SUSTAIN TECHNOLOGICAL LEADERSHIP IN RENEWABLES (1 AND 2)

- Solar Photovoltaics (PV) IP
- Concentrated Solar Power / Solar Thermal Electricity (CSP/STE) IP
- Offshore Wind Energy IP
- Deep Geothermal Energy IP
- Ocean Energy IP

A SMART CONSUMER-CENTRIC ENERGY SYSTEM

- Smart Solutions for Energy Consumers IP (3.1)
- Towards Positive Energy Districts for Sustainable Urbanisation IP (3.2)
- Energy Systems IP (4)

DEVELOP AND STRENGTHEN ENERGY EFFICIENT SYSTEMS

- Energy Efficiency in Buildings IP (5)
- Energy Efficiency in Industry IP (6)

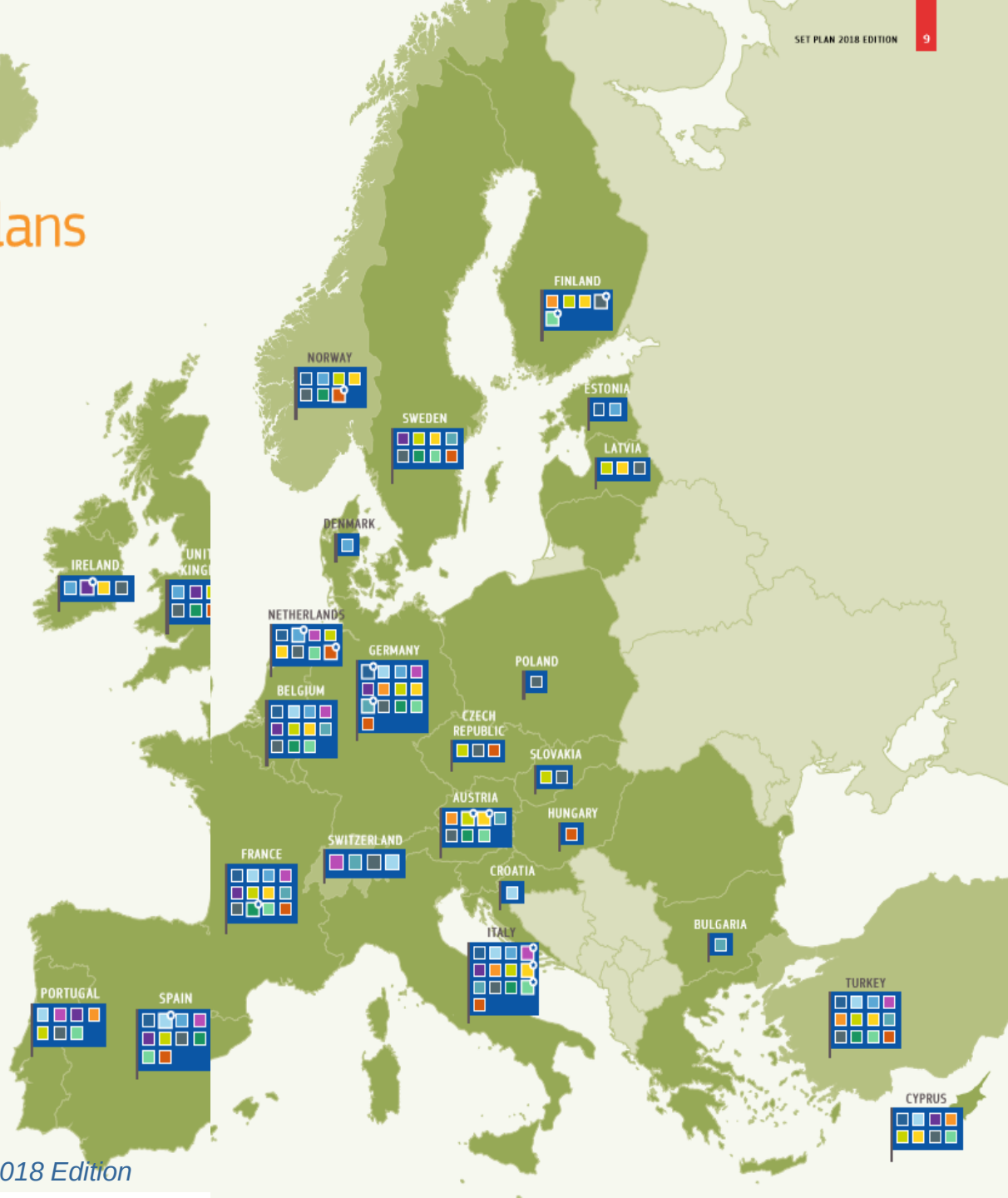
ENERGY OPTIONS FOR SUSTAINABLE TRANSPORT SYSTEMS

- Batteries for E-Mobility and Stationary Storage IP (7)
- Renewable Fuels and Bioenergy IP (8)

CCUS

- Carbon Capture Utilisation and Storage IP (9)

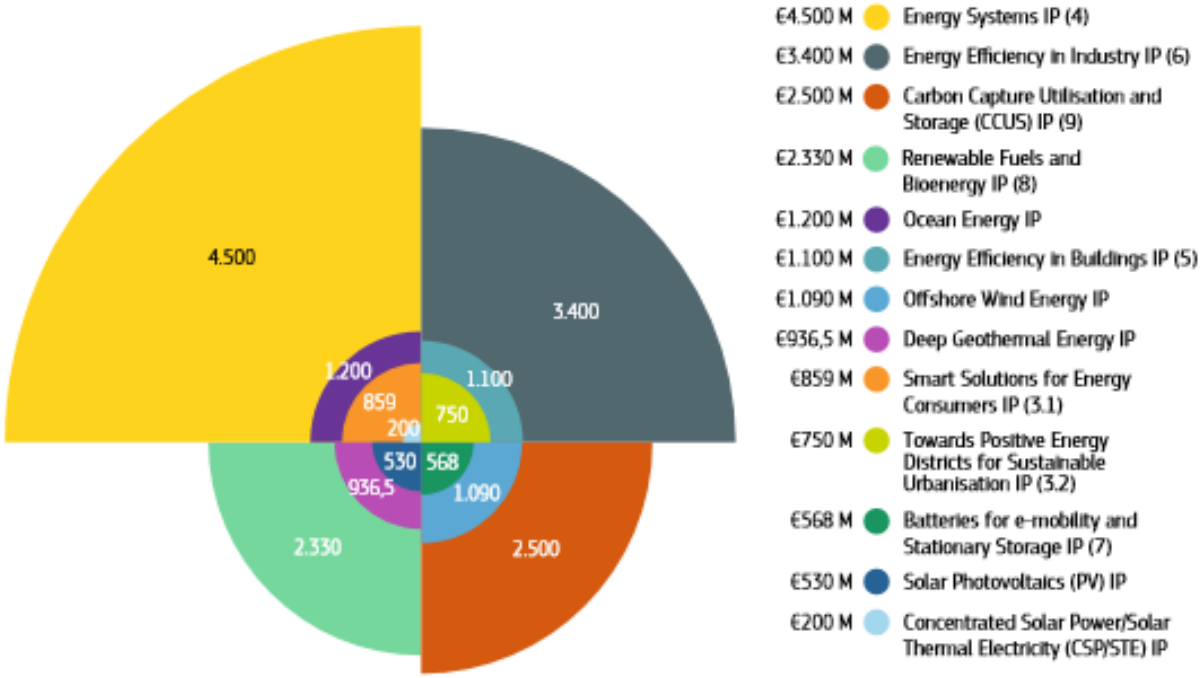
★ Chair



SET Plan delivering results, SET Plan 2018 Edition

SET Plan Investments

EXPECTED VOLUME OF INVESTMENTS IN R&I ACTIVITIES AS IDENTIFIED IN THE IMPLEMENTATION PLANS (EUR MILLION)



- In 2030, aggregated investments in R&I > EUR 20 billion
- Part of wider effort to decarbonize EU energy system

SET Plan delivering results, SET Plan 2018 Edition

Action 8 - Renewable Fuels and Bioenergy

- ✓ Targets in Declaration of Intend – November 2016
- ✓ Implementation Plan with 12 Member States – June 2018
- ✓ R&I activities:
  1. Advanced liquid and gaseous biofuels
  2. Other renewable liquid and gaseous fuels
  3. Renewable hydrogen
  4. High efficiency large scale biomass CHP
  5. Solid, liquid and gaseous intermediate bioenergy carriers

Action 8: Bioenergy and Renewable Fuels for Sustainable Transport

Table 1: Total investment for R&I activities

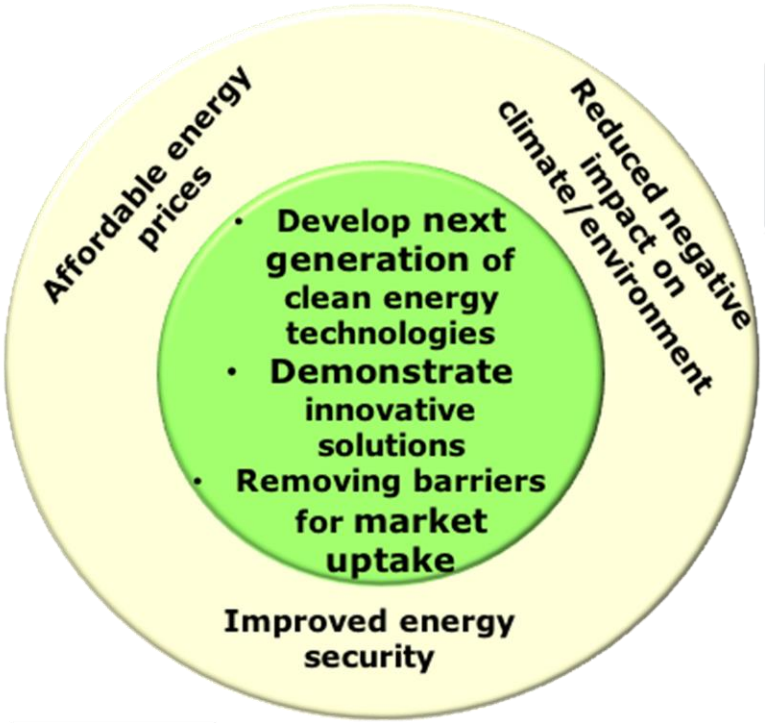
Billions €		Industry		MS Funding		EU	
Total Bioenergy and Renewable Fuels for Sustainable Transport	**106,61**	**77,74**	***73%***	**22,23**	***21%***	**6,64**	**6%**
Renewable Fuels for Sustainable Transport	**84,81**	**62,34**	***74%***	**17,48**	***21%***	**4,99**	**6%**
Advanced Biofuels	**73,00**	**53,75**	***74%***	**15,00**	***21%***	**4,25**	**6%**
#1 Development	1,00	0,25	*25%*	0,50	*50%*	0,25	25%
#2 Demonstration	2,00	1,00	*50%*	0,50	*25%*	0,50	25%
#3 Scale-Up	70,00	52,50	*75%*	14,00	*20%*	3,50	5%
Other renewable liquid and gaseous fuels	**11,40**	**8,35**	***73%***	**2,36**	***21%***	**0,69**	**6%**
#4 Development	0,20	0,05	*25%*	0,10	*50%*	0,05	25%
#5 Demonstration	0,40	0,20	*50%*	0,10	*25%*	0,10	25%
#6 Scale-Up	10,80	8,10	*75%*	2,16	*20%*	0,54	5%
#7 Renewable Hydrogen	**0,41**	**0,24**	***59%***	**0,12**	***28%***	**0,05**	**13%**
TRL 2-6 (Development)	0,10	0,03	*25%*	0,05	*50%*	0,03	25%
TRL 7-8 (Demonstration)	0,06	0,03	*50%*	0,02	*25%*	0,02	25%
TRL 9 (Scale-Up)	0,25	0,19	*75%*	0,05	*20%*	0,01	5%
Bioenergy	**11,30**	**8,03**	***71%***	**2,45**	***22%***	**0,83**	**7%**
#8 Development	0,50	0,13	*25%*	0,25	*50%*	0,13	25%
#9 Demonstration	0,80	0,40	*50%*	0,20	*25%*	0,20	25%
#10 Scale-Up	10,00	7,50	*75%*	2,00	*20%*	0,50	5%
Intermediate Bioenergy Carriers	**10,50**	**7,38**	***70%***	**2,30**	***22%***	**0,83**	**8%**
#11 Development	0,50	0,13	*25%*	0,25	*50%*	0,13	25%
#12 Demonstration	1,00	0,50	*50%*	0,25	*25%*	0,25	25%
#13 Scale-Up	9,00	6,75	*75%*	1,80	*20%*	0,45	5%

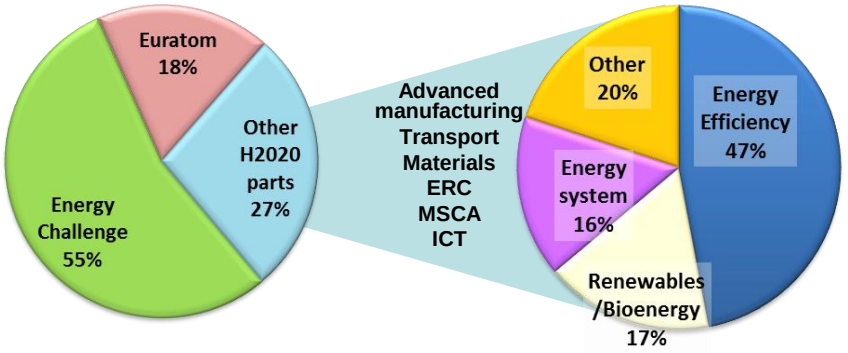
Research & Innovation

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Research Policy Framework
Horizon 2020 (2014-2020) €70,2 billion

H2020 ENERGY Challenge





✓ H2020-Energy Challenge budget **EUR 5,7 billion**

✓ Additional energy-related spending in H2020 outside Energy Challenge: ~ **50% of the Energy Challenge budget**

✓ H2020 total Energy budget **~ EUR 8.5 billion, 11,4%**

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European Commission

Advanced Bioenergy, Biofuels and Renewable Fuels

Opportunities & Challenges

- Essential for both energy storage and use
- Growing market for advanced biofuels
- Biofuels deployable solution for aviation, shipping and heavy road
- Reaching competitiveness via R&I to improve cost, performance, sustainability
- EU Leadership, little deployment

R&I Strategy

- Technology improvement and diversification
- Feedstock diversification
- Market up-take and on particular transport needs
- Coordinated R&I funding and risk-funding needed for market-uptake
- Breakthrough research and market-creating innovation
- International cooperation to tackle global societal challenges

❖ *Creation of positive social and economic impact !*

Horizon 2020 topics
"Secure Clean and Efficient Energy"

48 topics 2014 to 2020

- **20** RIAs,
- **11** IAs
- **7** MuM
- **10** Strategic Actions

68 projects 2014 to 2018

- Next generation technologies for biofuels and sustainable alternative fuels
- Demonstrating advanced biofuel technologies
- Next generation technologies for renewable electricity and heating/cooling
- Renewable energy solutions for energy system implementation
- Market Uptake Support
- Supporting the development of a European research area in the field of energy

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Horizon 2020 thematic areas "Secure Clean and Efficient Energy"

Feedstock

- lignocellulosic biomass residues
- organic fraction of municipal and industrial wastes
- phototrophic algae and bacteria
- macro-algae
- industrial waste flue gases
- CO2, water and renewable energy
- biogas

Process

- Chemical, bio-chemical, biological conversion
- pyrolysis, hydrothermal liquefaction, biomass gasification
- indirect and direct artificial photo-synthesis with chemical, bio-chemical and biological systems
- chemo and photo autotrophic micro-organisms

Product

- paraffinic biofuels and higher alcohols
- middle distillate range biofuels e.g., diesel and jet fuel
- drop-in biofuels, e.g., liquid diesel- and gasoline-like
- biofuels for shipping
- renewable alternative and synthetic fuels from CO2
- intermediate bioenergy carriers

Horizon 2020 thematic areas "Secure Clean and Efficient Energy"

Market up-take

- supply chains
- sustainability, standards
- public acceptance
- communication, training
- biogas and bio-methane barriers
- supply and market barriers, logistics and trade centres for intermediates
- marginal lands
- stakeholders awareness and capacity building

Overarching

- market creating innovation
- pre-commercial production of advanced aviation biofuel
- retrofitting of existing industrial installations
- international cooperation

Horizon 2020 funded projects "Secure Clean and Efficient Energy"

Signed Grants by type of Action

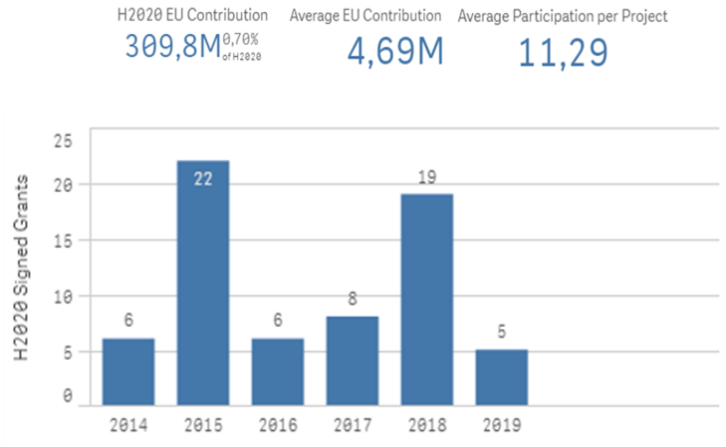
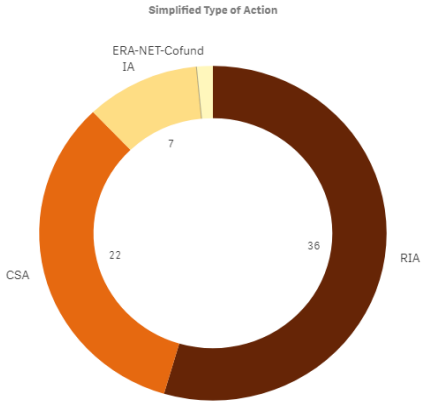


Fig. 1 Signed Grants per year



Participant EU contribution by Country

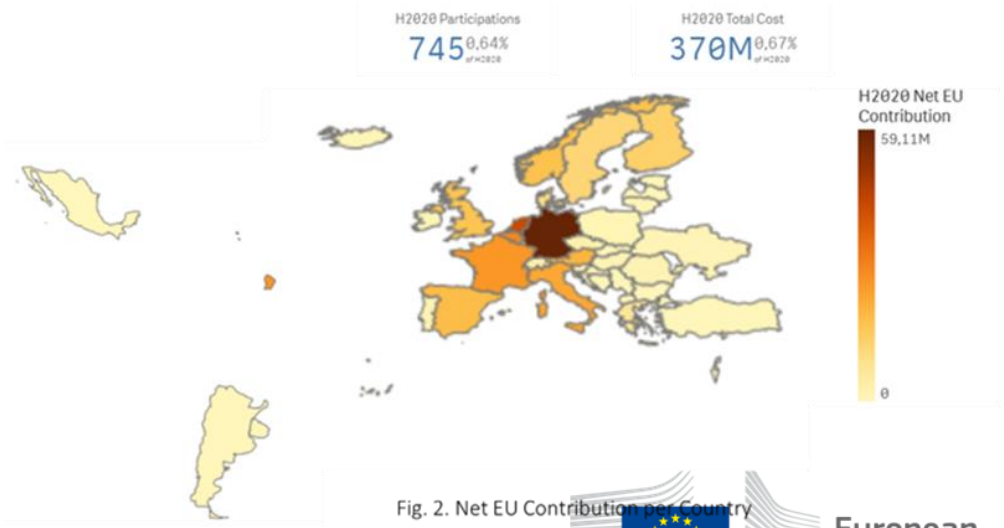


Fig. 2. Net EU Contribution per Country

H2020 open calls

LC-SC3-RES-1-2019-2020
Developing the next generation of renewable energy technologies - Sustainable Fuels RIA TRL to 3-4

LC-SC3-RES-3-2020
International Cooperation with USA and/or China on alternative renewable fuels from sunlight for energy, transport and chemical storage RIA TRL to 3-4

LC-SC3-RES-25-2020
International cooperation for Research and Innovation on advanced biofuels and alternative renewable fuels –Japan RIA TRL to 3

LC-SC3-RES-26-2020
Development of next generation renewable fuel technologies from CO2 and renewable energy (Power and Energy to Renewable Fuels) RIA TRL 3-4 to 4-5

LC-SC3-RES-36-2020
International cooperation with Canada on advanced biofuels and bioenergy RIA TRL 3 to 5

LC-SC3-RES-37-2020
Combined clean biofuel production and phytoremediation solutions from contaminated lands worldwide RIA TRL 3-4 to 4-5

LC-SC3-RES-27-2020
Demonstration of advanced biofuels production from aquatic biomass IA

LC-SC3-RES-28-2018-2019-2020

Market Uptake support Bioenergy specific CSA TRL 5 to 6-7

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H2020 - Prize



Inducement Prize
Artificial Photosynthesis: Fuel from the Sun
Launched on 12th December 2017

Aim:
Develop the ***best fully functional prototype*** producing a sustainable fuel by combining sunlight, water and carbon via an artificial photosynthesis process.

Deadline ➔ 3rd Feburary 2021

*Award will be given after a **grand final** of the ten best prototype in which **real life operation** will be done*

Who ➔ Anybody that can develop, build and run such a device

Reward ➔ 5M€

ec-fuelfromsun-eic-prize@ec.europa.eu

The way forward

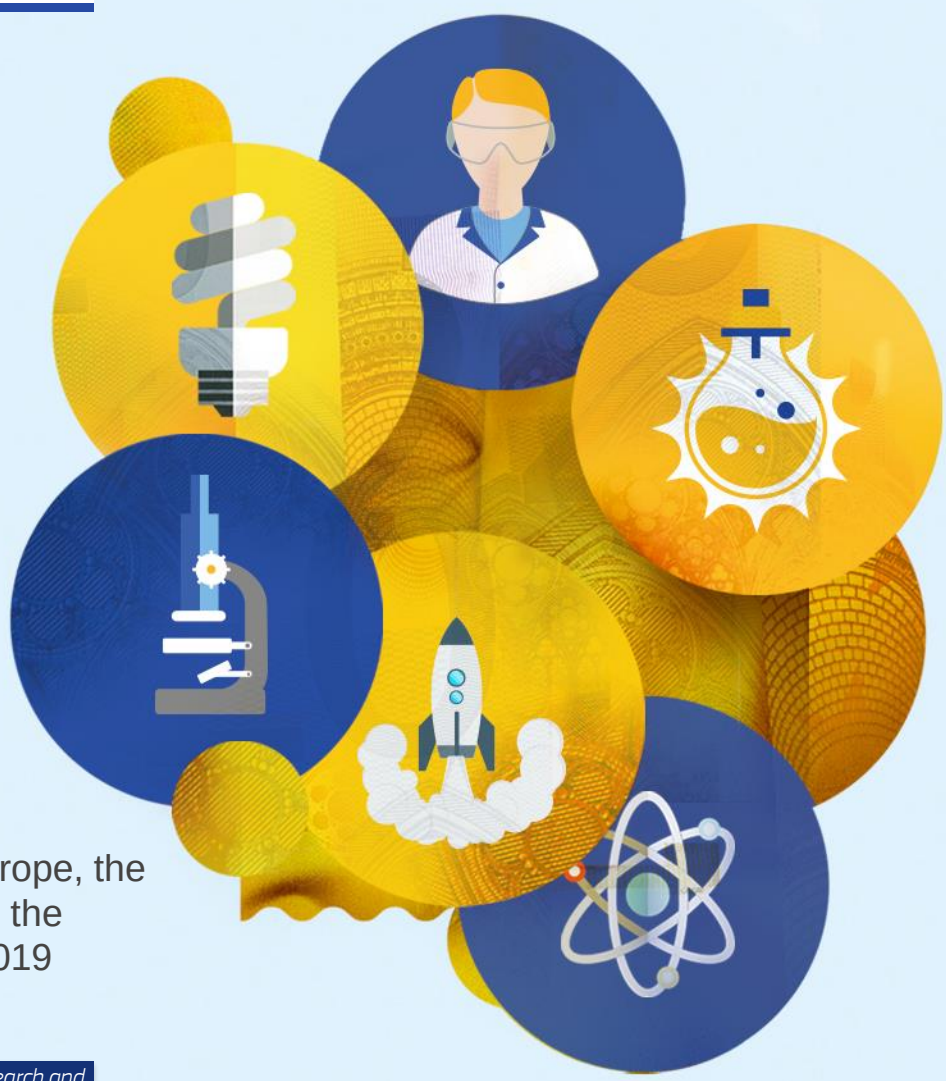
- A vast portfolio of technologies and value chains
- Support at all TRL & value chains including new
- Flexibility of installations
- Collaboration across EU and internationally
- Understanding early innovation potential
- Ensuring financing at later stages
- Regional approach and clustering of market players
- System integration
- Public acceptance
- Integrated approach

European Commission

Horizon Europe

THE NEXT EU RESEARCH & INNOVATION INVESTMENT PROGRAMME (2021 – 2027)

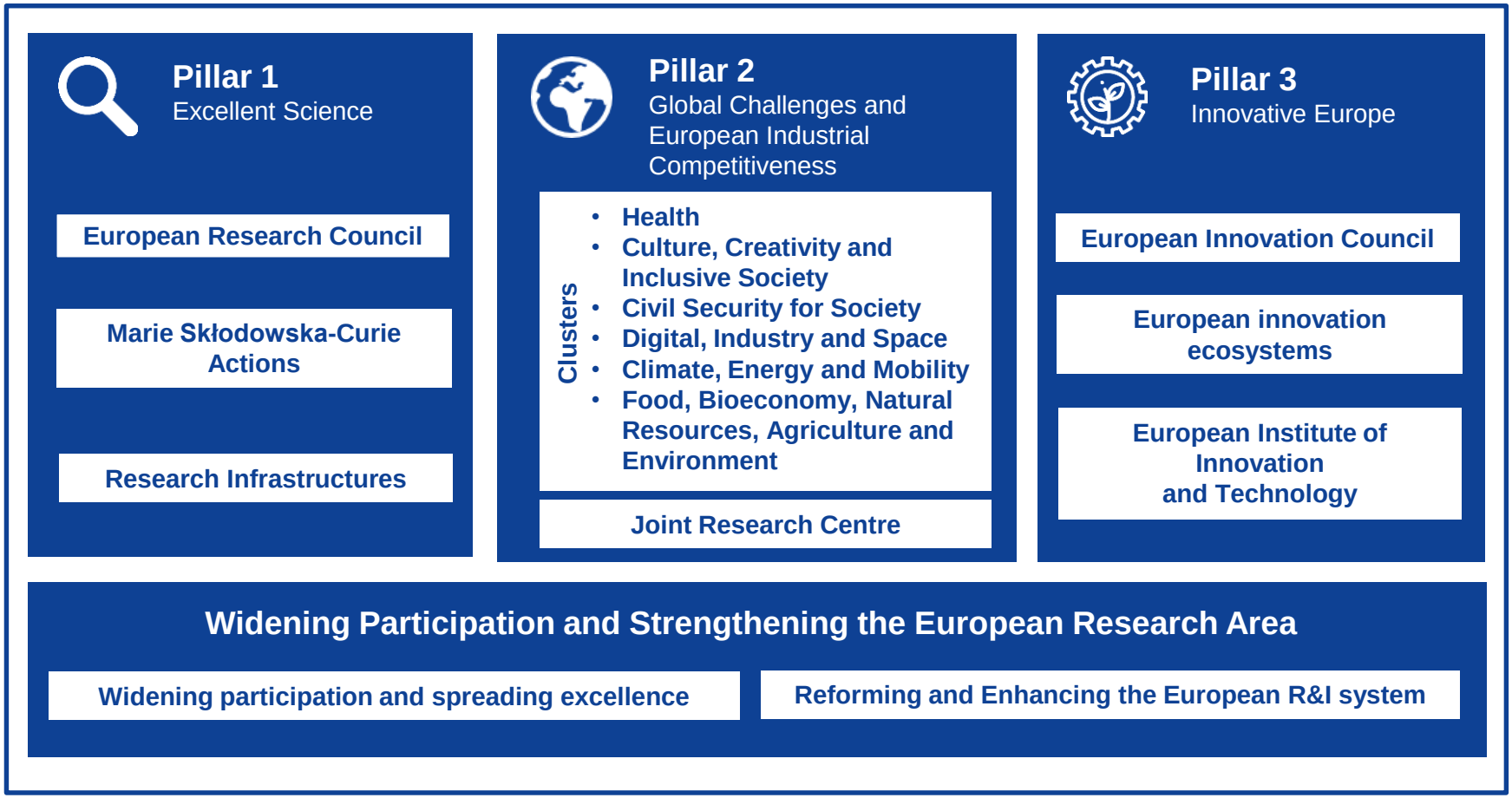
#HorizonEU



Based on the Commission Proposal for Horizon Europe, the common understanding between co-legislators and the Partial General Approach, both approved in April 2019

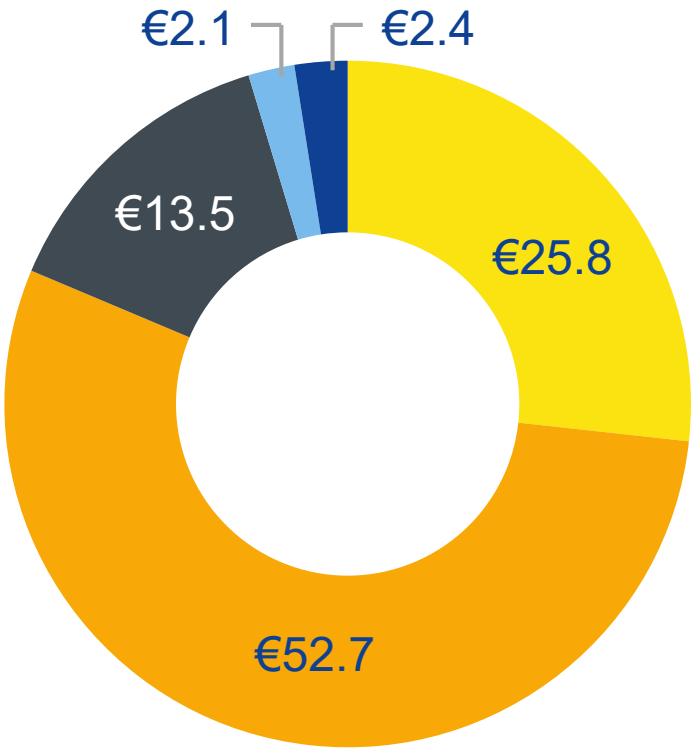
Research and Innovation

Horizon Europe: Preliminary structure



European Commission

Commission proposal for budget: €100 billion* (2021-2027)



€ billion
In current prices

- Excellent Science
- Global Challenges & European Ind. Comp.
- Innovative Europe
- Widening Part. & ERA
- Euratom

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

European Commission

Clusters in 'Global Challenges and Industrial Competitiveness'

Clusters	Areas of intervention	
Health	• Health throughout the life course • Non-communicable and rare diseases • Tools, technologies and digital solutions for health and care, including personalised medicine	• Environmental and social health determinants • Infectious diseases, including poverty-related and neglected disease • Health care systems
Culture, creativity and inclusive society	• Democracy and Governance • Social and economic transformations	• Culture, cultural heritage and creativity
Civil security for society	• Disaster-resilient societies • Protection and Security	• Cybersecurity
Digital, Industry and space	• Manufacturing technologies • Advanced materials • Next generation internet • Circular industries • Space, including Earth Observation • Emerging enabling technologies	• Key digital technologies, including quantum technologies • Artificial Intelligence and robotics • Advanced computing and Big Data • Low-carbon and clean industry • Emerging enabling technologies
Climate, Energy and Mobility	• Climate science and solutions • Energy systems and grids • Communities and cities • Industrial competitiveness in transport • Smart mobility	• Energy supply • Buildings and industrial facilities in energy transition • Clean, safe and accessible transport and mobility • Energy storage
Food, bioeconomy, natural resources, agriculture and environment	• Environmental observation • Agriculture, forestry and rural areas • Circular systems • Food systems	• Biodiversity and natural resources • Seas, oceans and inland waters • Bio-based innovation systems in the EU Bioeconomy

European Commission

Adaptation to climate change, including societal transformation



Healthy oceans, seas, coastal and inland waters



Mission areas



Cancer

Climate-neutral and smart cities





Soil health and food

European Commission

Areas for possible Institutionalised European partnerships (based on Article 185/7 TFEU)

- Health innovations
- Key digital and enabling technologies
- Metrology
- EU air traffic, aviation and rail
- Sustainable bio-based solutions
- Hydrogen and sustainable energy storage
- Clean, connected mobility
- Innovative SMEs

European Commission

Steps towards the first Horizon Europe work programme



Summer 2019

Early involvement and exchanges with Member States, consultation with stakeholders and the public at large
Establishment of Mission Boards

Autumn-winter 2019/2020

Co-creation at Research & Innovation Days 24 – 26 September.
Extensive exchanges with the new European Parliament.
Establishment of new Commission - envisaged endorsement of Strategic Plan

2020

Drafting of first Horizon Europe Work Programme on the basis of the Strategic Plan

2021

Start of Horizon Europe

European Commission

Energy Financing in the Energy Union

- Investment Plan for Europe
- European Structural & Investment Funds
- Horizon 2020
- Horizon Europe
- Digital Europe Programme
- Innovation Fund
- EU Finance for Innovators
- Just Transition Fund

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Thank you for your attention!

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