EU R&I Policies for Bioenergy

Dr Maria GEORGIADOU
Renewable Energy Sources
DG Research & Innovation
EUROPEAN COMMISSION

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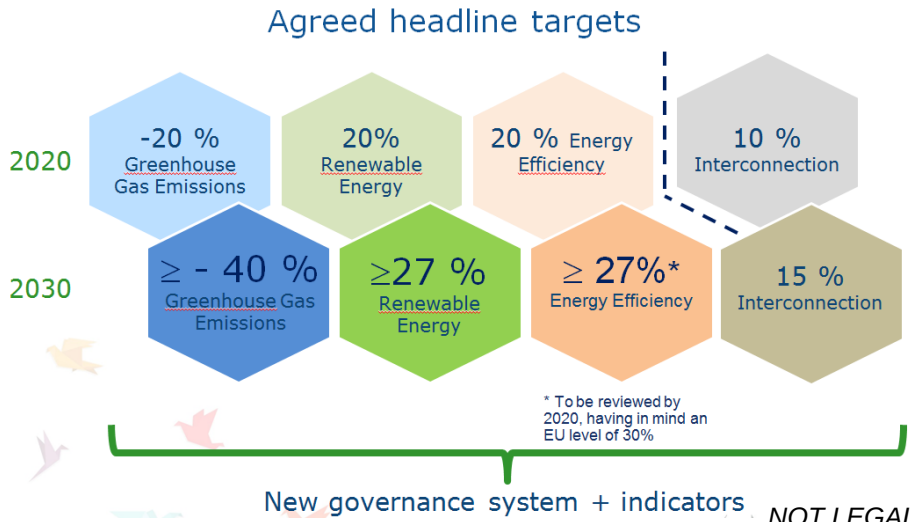
Outline

- Policy
- Horizon 2020 R&I Framework Programme
- Advanced Biofuels and Bioenergy
- Calls for proposals
- Horizon Europe next Framework Programme

Policy Framework

"Clean Energy for all Europeans"

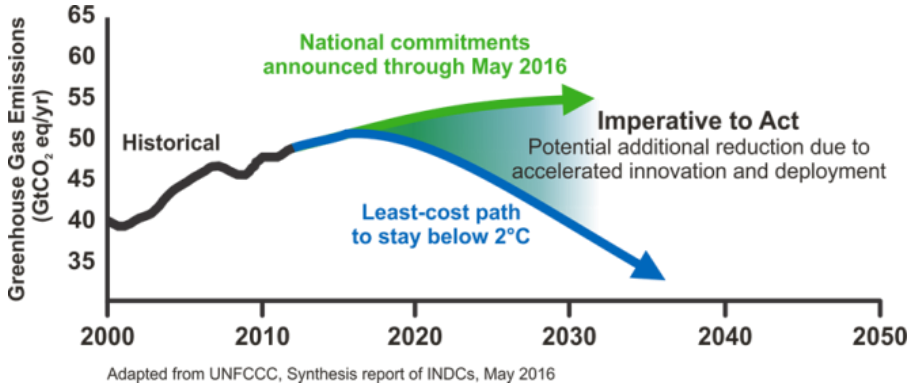
- *Putting energy efficiency first*
- *Demonstrating global leadership in renewables*
- *Delivering a fair deal for consumers*



Paris Agreement

*Holding the increase in the global average temperature to **well below 2°C** above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels*

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



Adapted from UNFCCC, Synthesis report of INDCs, May 2016

Other EU policy priorities

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

NOT LEGALLY BINDING

European Commission

We need to strengthen the share of renewable energies on our continent. This is not only a matter of a responsible climate change policy. It is, at the same time, an industrial policy imperative if we still want to have affordable energy at our disposal in the medium term. ***I therefore want Europe's Energy Union to become the world number one in renewable energies.*** *COM(2016) 110 Resilient Energy Union with a forward-looking climate change policy*

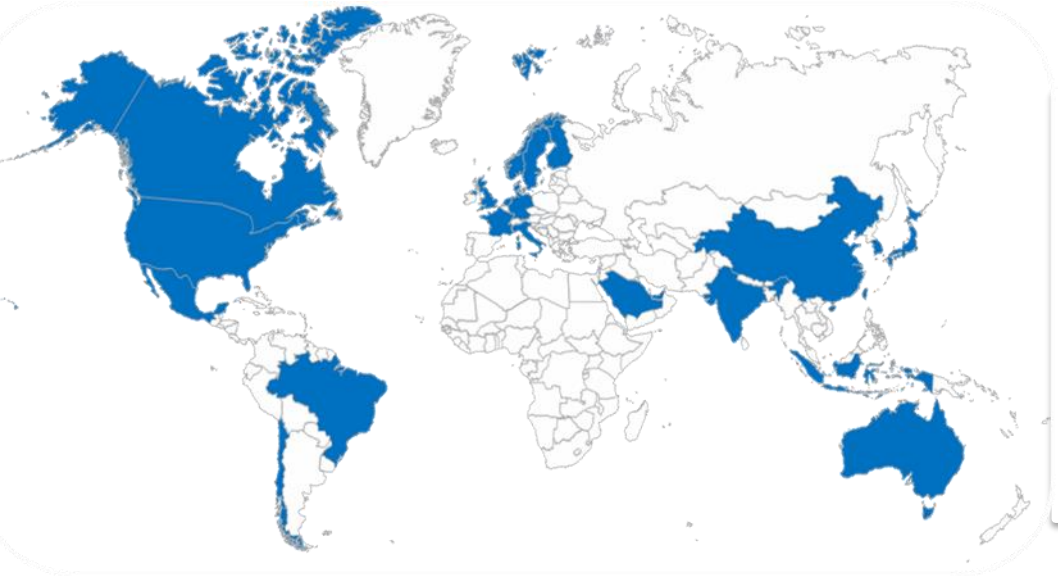
EU Regulatory Framework & updates

1. Renewable Energy Directive *RED 2009/28/EC*
2. The Fuel Quality Directive regulates with RED sustainability *2009/30/EC*
3. *Directive to reduce indirect land use change for biofuels and bioliquids (EU)2015/1513*
4. New Renewable Energy Directive *RED II* and Bioenergy sustainability legislation *COM(2016) 767*
5. New Electricity Market Design Legislation *COM(2016)861 862 864*
6. Revised Emissions Trading Directive ETS *COM(2015)337*
7. Revised Effort Sharing Decision and LULUCF *COM(2016) 482*
8. Strategy for Low-emission Mobility *COM(2016) 501*
9. *Revised Directives on Energy Efficiency, Buildings, Energy Labeling, Security of electricity supply COM(2016) 761 765 773 EU(2017)2196*
10. Accelerating Clean Energy Innovation ACEI *COM(2016)763*

Mission Innovation

COP21

COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE



<u>Overall objective</u>:
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

23 Members worldwide

Tangible results in the near future (end 2020)

- ✓ encourage public sector support for clean energy R&I
- ✓ Promote private sector engagement
- ✓ Boost international collaboration
- ✓ Engage MI members and the broader international community

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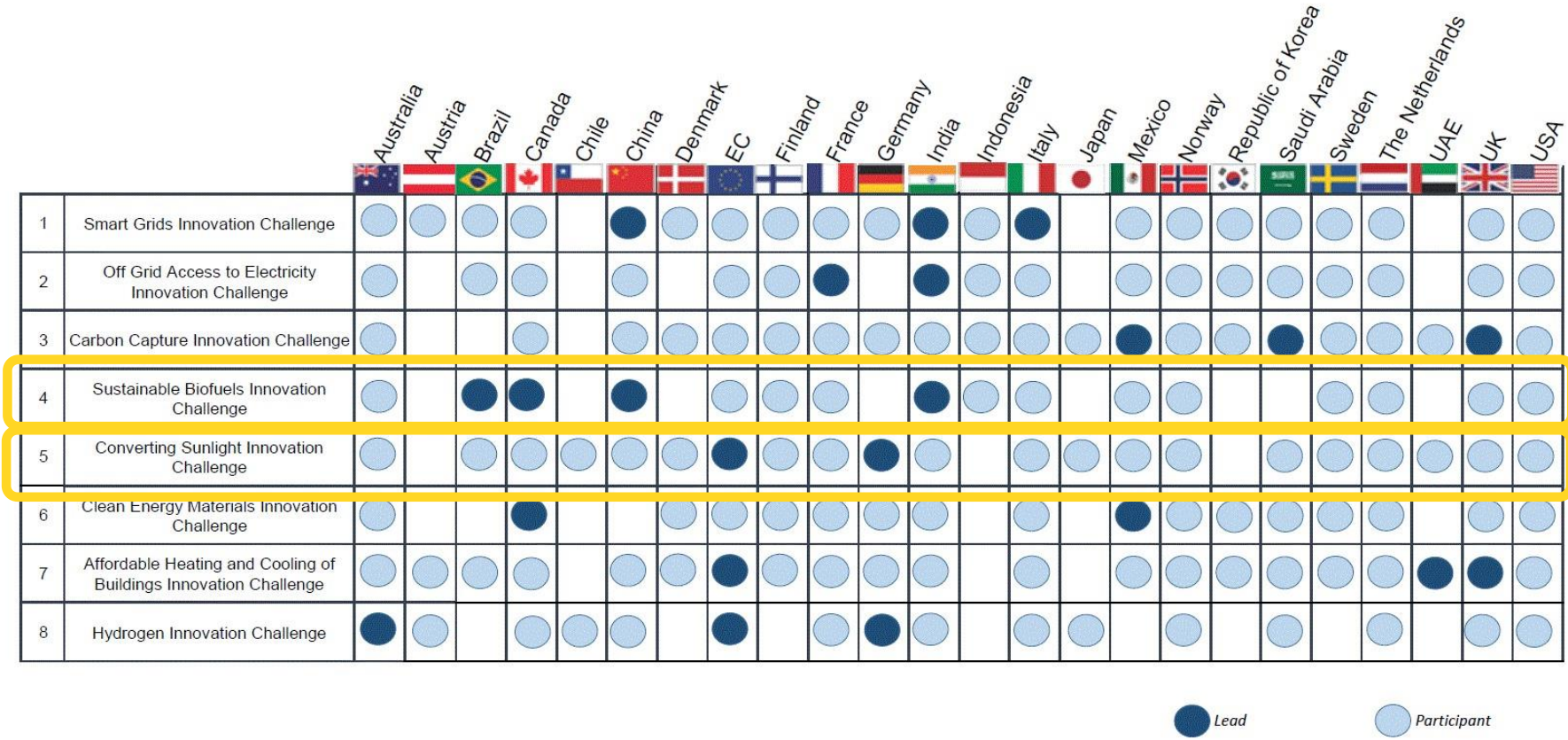
Innovation Challenges

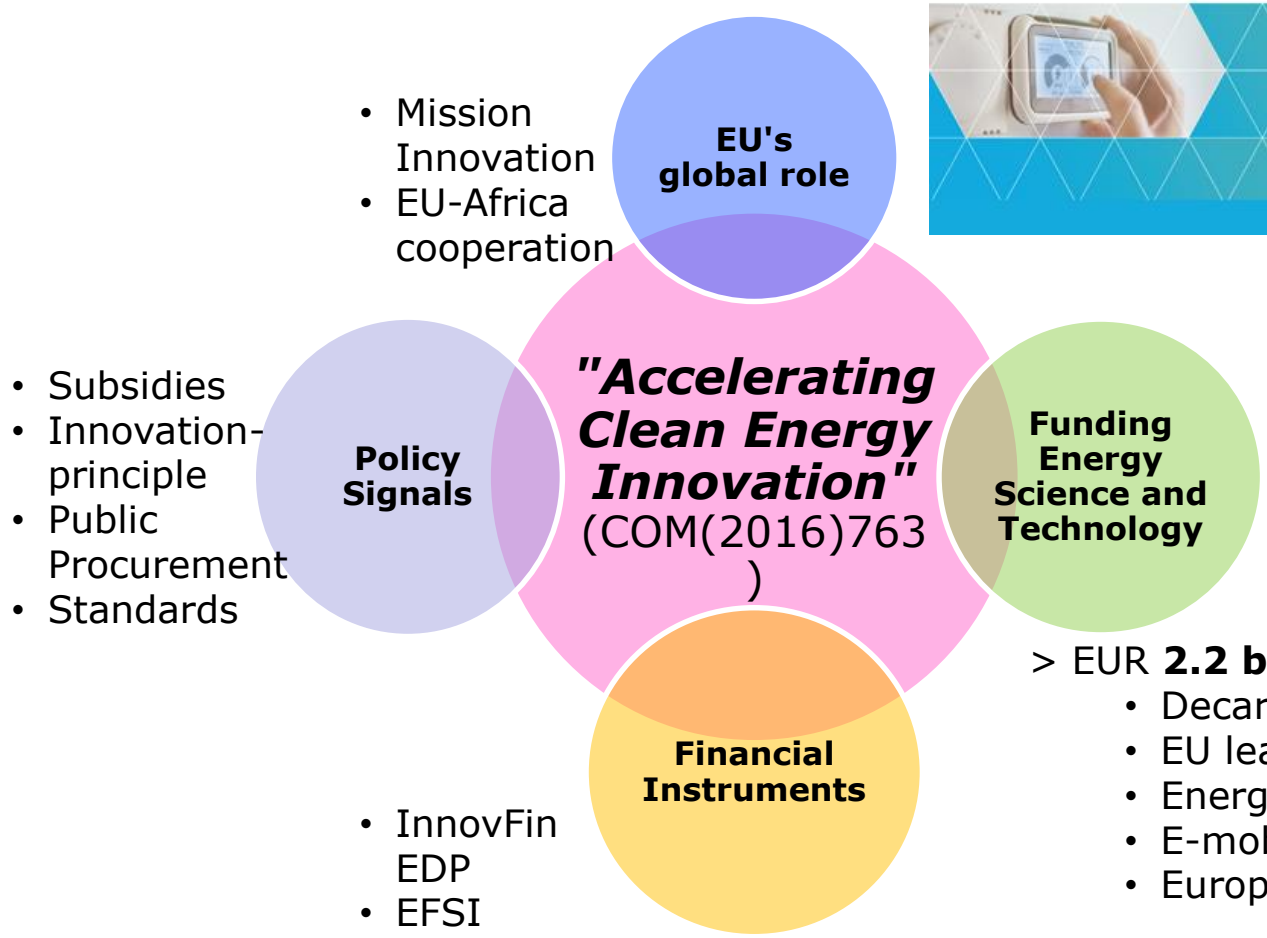


EC

- ✓ engaged in all the ICs, including latest on Hydrogen
- ✓ co-leads Solar Fuels and H&C buildings,
- ✓ invests 150 Million € on MI-relevant calls by 2020

Accelerating Clean Energy Innovation

Centered on Research & Innovation



- Mission Innovation
- EU-Africa cooperation

- Subsidies
- Innovation-principle
- Public Procurement
- Standards

- InnovFin EDP
- EFSI

> EUR **2.2 billion** in H2020 2018-2020

- Decarbonising EU building
- EU leadership in renewables
- Energy storage
- E-mobility
- European Innovation Council

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

NOT LEGALLY BINDING

European Commission

Action 8 - Renewable Fuels and Bioenergy

- ✓ Targets in Declaration of Intend – November 2016
- ✓ Implementation Plan with 12 MS – 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

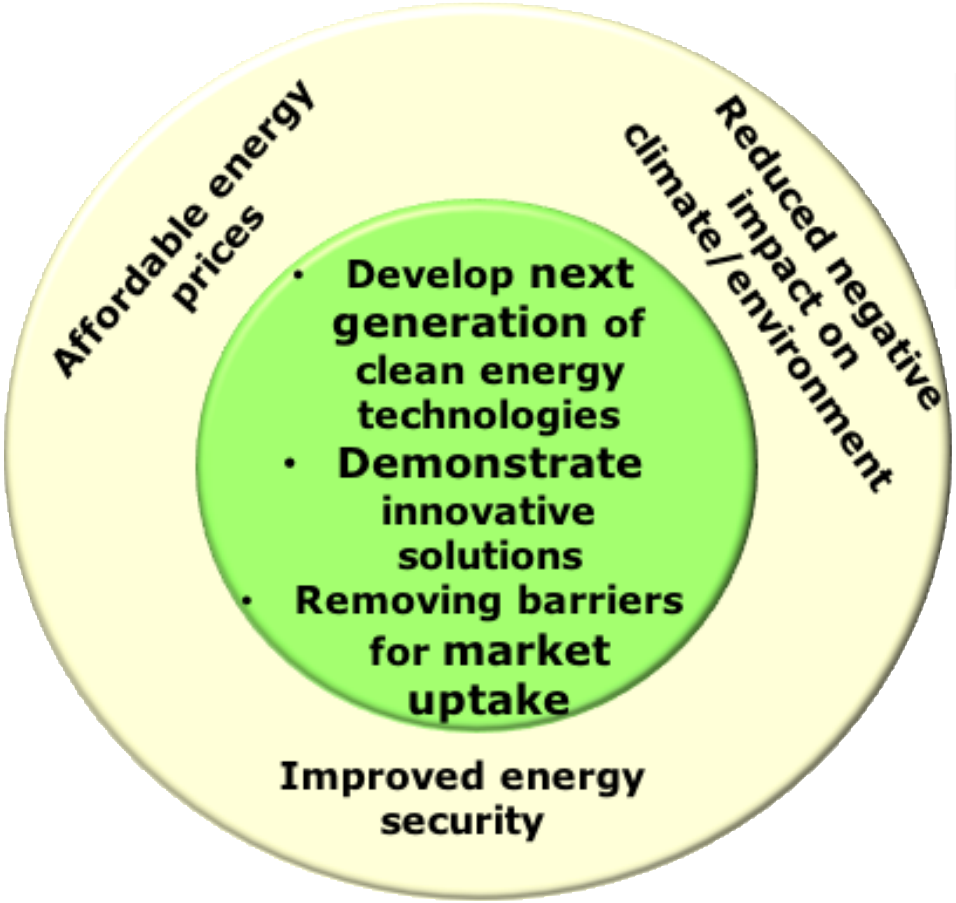
Billions €		Industry		MS Funding		EU	
Total Bioenergy and Renewable Fuels for Sustainable Transport	**106,61**	**77,74**	***73%***	**22,23**	***21%***	**6,64**	**6%**
Renewable Fuels for Sustainable Transport	**84,81**	**62,34**	***74%***	**17,48**	***21%***	**4,99**	**6%**
Advanced Biofuels	**73,00**	**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%

Energy Financing in the Energy Union

1. The Juncker Investment Plan and the European Structural and Investment Funds
2. **The EU Horizon 2020 research and innovation framework programme 2014-2020** with more than 30 billion euros climate related budget and the SMEs instrument
3. The **Innovfin EDP** facility for loans, guarantees or equity type investments to risky first-of-a-kind commercial scale energy demonstration projects
4. The **NER** Innovation Fund for first-of-a-kind investments in RES, CCS and low-carbon innovation in energy intensive industry with about 400 million allowances from 2021

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

H2020 ENERGY Challenge



FP7 Energy (2007-2013) EUR 3.25 bn

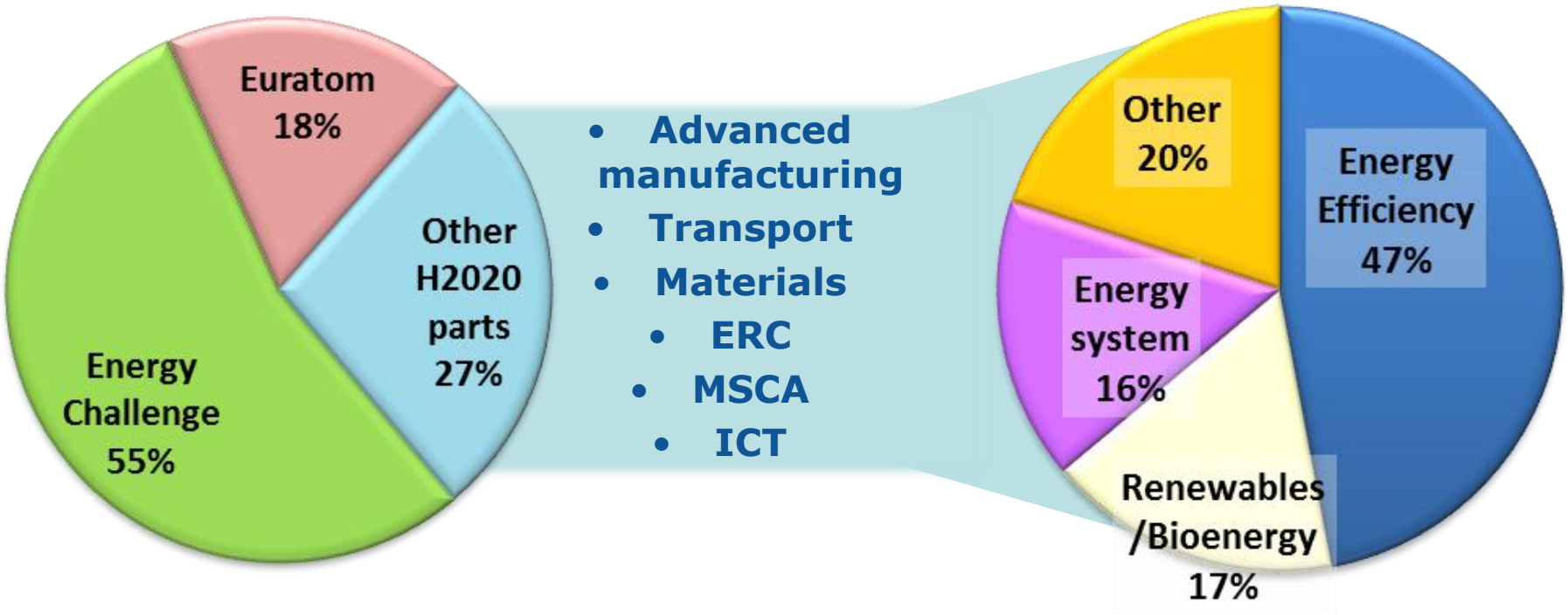
Intelligent Energy for Europe (IEE) (2007-2013) EUR 0.73 bn

H2020 – Energy Challenge

Budget (2014-2020): EUR 5.7 billion (as of 2015)

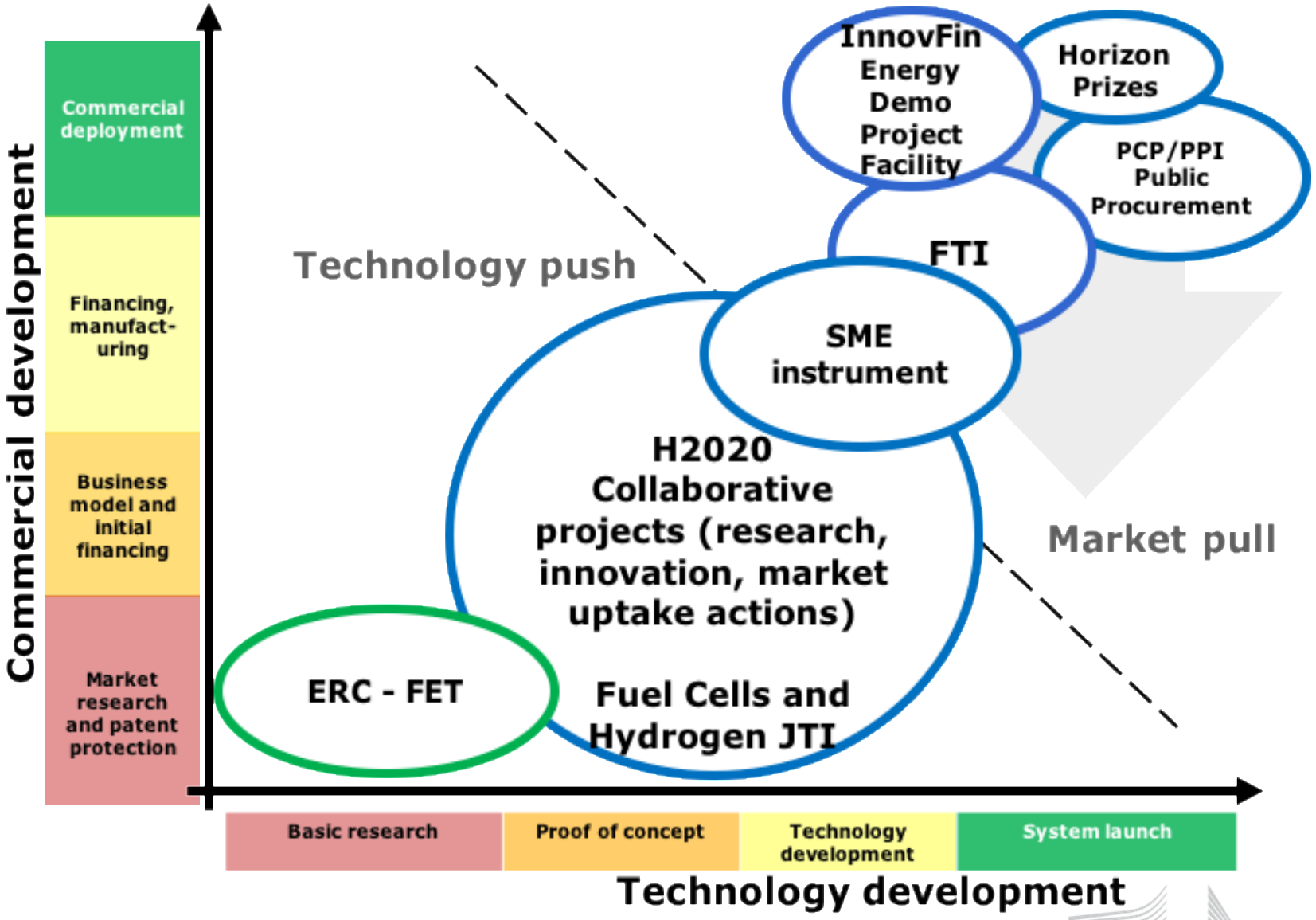
Total budget for energy in H2020: ~ EUR 8.5 billion

Energy in other parts of Horizon 2020



- ✓ Additional energy-related spending in H2020 outside Energy Challenge: ~ **50% of the Energy Challenge budget**
- ✓ Total budget for energy **11.4%** of the total H2020 budget

Research Financing Instruments



InnovFin EDP Facility

InnovFin Energy Demo Projects

Basic features

- Risk-finance instrument (loans/loan guarantees) - Pilot launched in June 2015 focused on renewable energy but scope is now enlarged
- Implemented by the EIB
- Budget up to € 700 million
- Single proponents are the norm
- Criteria are Innovativeness, Replicability, Bankability during operations (revenue stream), Commitment by promoters

How it works

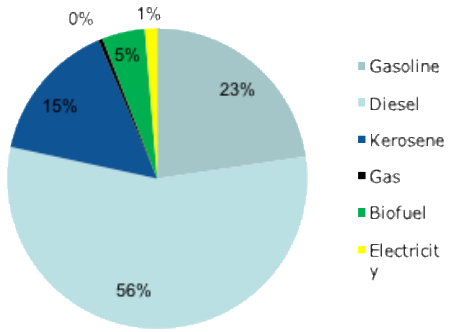
- Projects apply to the EIB http://www.eib.org/products/blending/innovfin/products/energy-demo-projects.htm
- EIB process: Eligibility (EC confirmation) ➔ due diligence ➔ approval
- EIB provides loans with max 15 years & covering up to 50% of project costs
- EC (via Horizon 2020) provides guarantee on loan covering riskiest phase of the project

Opportunities and Challenges for Advanced Biofuels, Bioenergy & Renewable Fuels

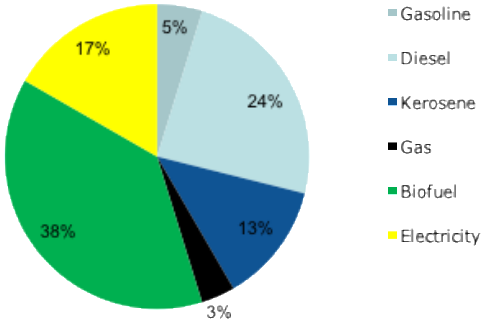
- Advanced biofuels and bioenergy intermediates essential for both **energy storage and use** (grid balancing, use in electricity, heat and transport)
- Growing market for advanced biofuels
- Biofuels are the medium term solution for road & maritime and the **long-term** solution for air transport
- Reaching **competitiveness** by lowering production costs of advanced biofuels and addressing feedstock constraints
- European leadership in advanced biofuels technologies but little deployment in Europe
- **R&I** needed to improve cost, performance and sustainability
- Coordinated R&I funding and risk-funding availability needed for **market-uptake**
- R&I needed for **renewable fuels** that **outperform** fossil fuels

Share of Fuels in EU transport sector

Current share



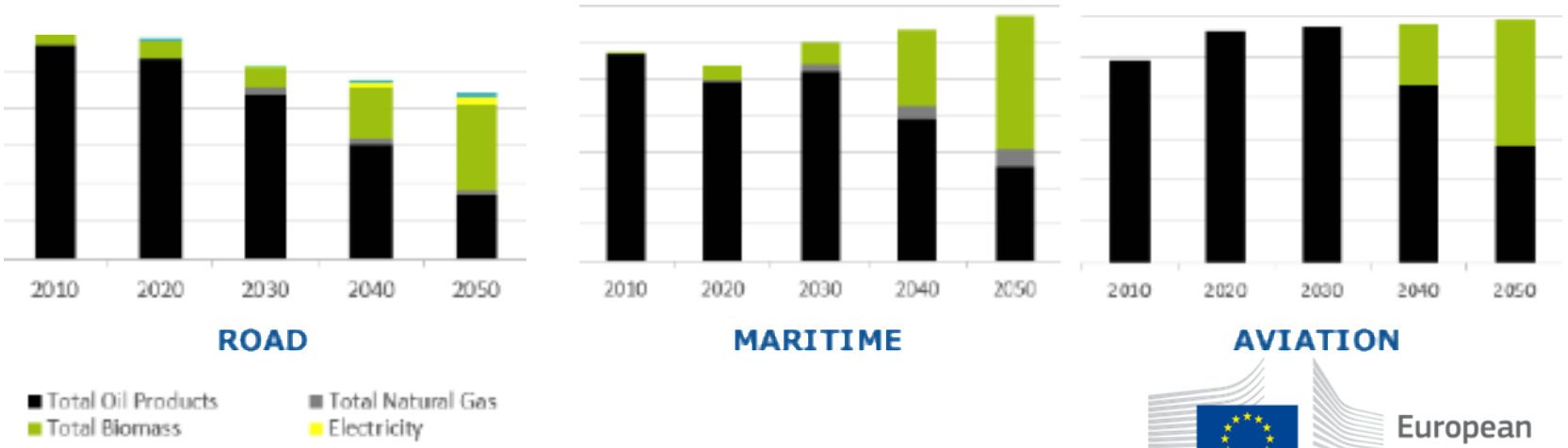
Projected share of transport fuels in 2050 (compatible with decarbonisation objectives)



Advanced biofuels dominate maritime and aviation in the long term. In 2050, cars run on batteries and fuels, ships on LNG and fuels but planes only on Advanced Biofuels

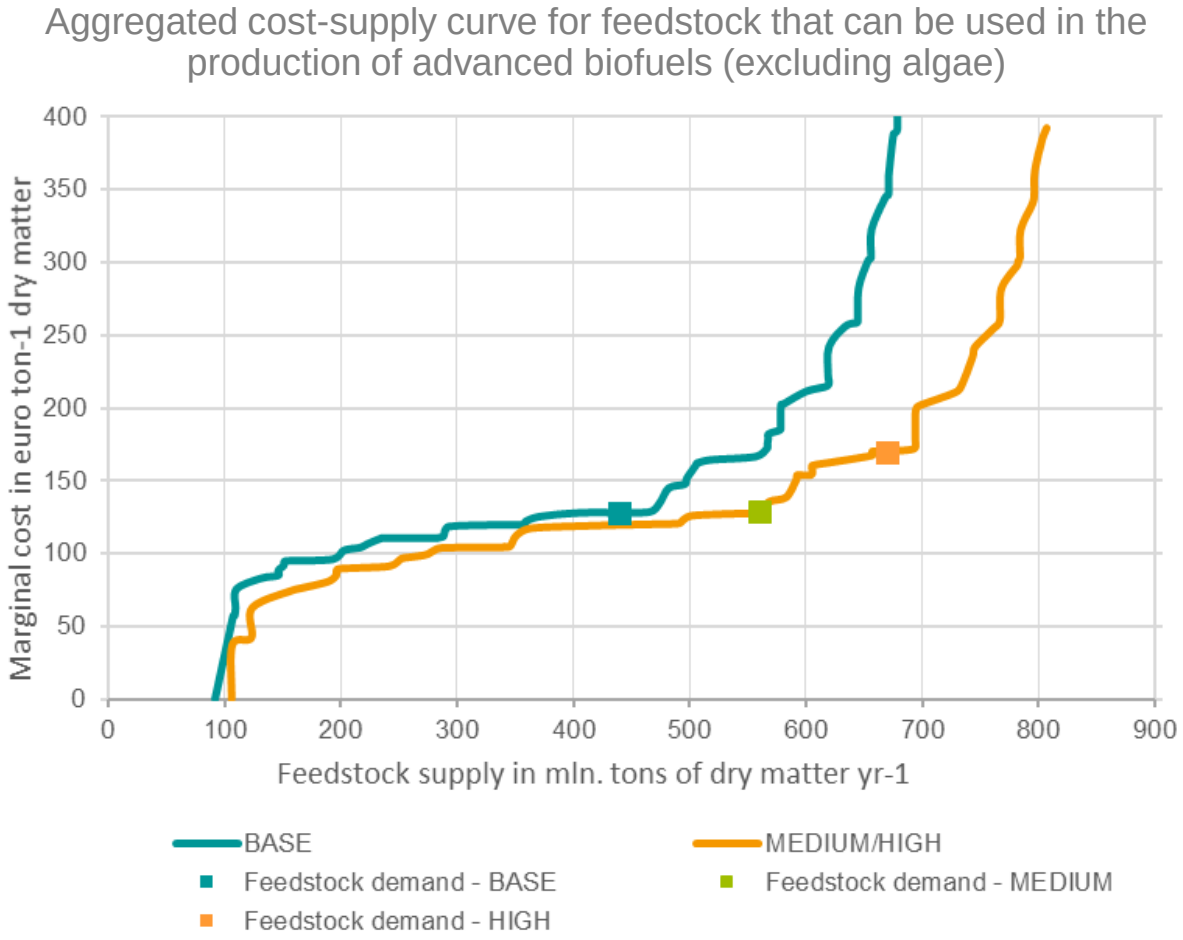
ECORYS

Study on Research and Innovation Perspective of the mid-and-long-term Potential for Advanced Biofuels in EU



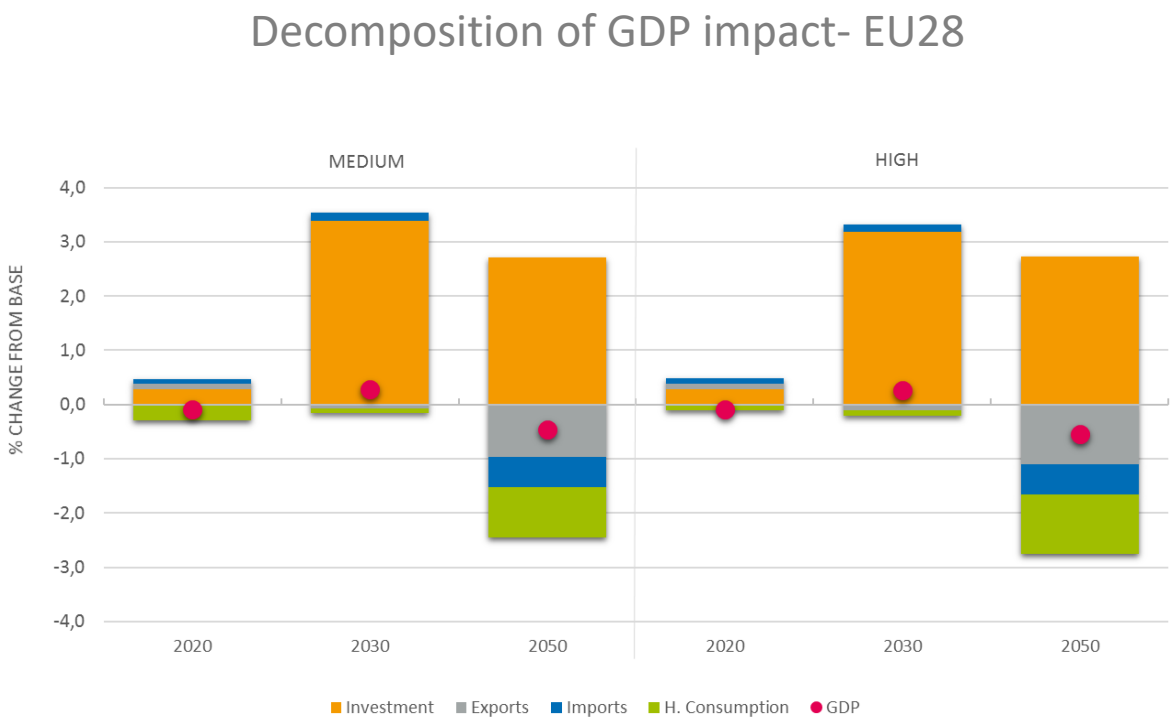
European Commission

For every level of feedstock demand, R&I significantly decreases the cost of biomass

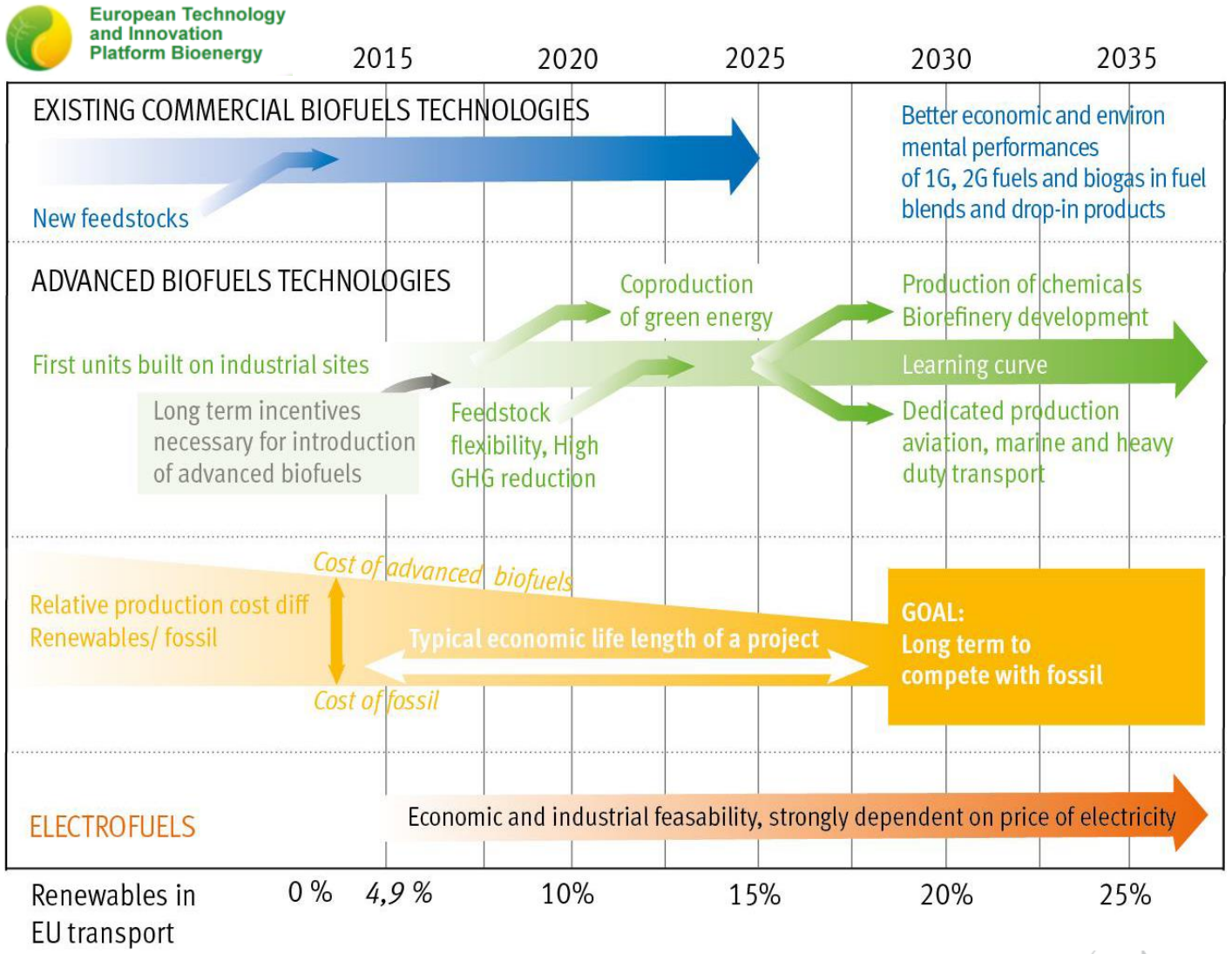


European Commission

Decarbonizing the energy system using advanced biofuels is achievable without a negative impact on GDP



Industrial Biofuel Deployment in EU



Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 (1)

- Bottom-up approach to long-term research and technology development
- Advance and demonstrate the technology, reduce its costs, improve its performance and prove its reliability
- Technology-specific demonstration activities
- Support mechanisms for first-of-a-kind plants with a higher leverage than 'standard grants' (e.g. through the Innovfin EDP facility)
- Market up-take measures
- Breakthrough market-creating innovation
- EU contribution under ENERGY calls ~ €350 Mio

Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 (2)

Overall strategy is to target the following sector challenges

- Technology and cost competitiveness
- Feedstock availability
- Market up-take
- Sectorial transport particular needs
- Complete fossil fuel replacement
- Global societal challenges through international cooperation

Advanced Biofuels in Horizon 2020 (3)

Expected impacts of the projects funded

- Advance technologies for production of sustainable biofuels with reduced costs and favourable GHG balance
- Enlargement of feedstock basis
- Positive social and economic impact by targeting Europe's competitiveness and energy security
- Successful upscaling of technology for future commercialization

Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 (3)

Next renewable energy solutions

- **LC-SC3-RES-1-2019-2020**: sustainable renewable fuels
  TRL 3 to 4, RIA, € 2 to 5 million, budget € 20 million
- LC-SC3-RES-2-2018: the Bionic leaf technology

Market Uptake Support

- **LC-SC3-RES-28-2018-2019-2020**: bioenergy specific
  CSA, € 1 to 3 million, budget € 15 million

Renewable energy solutions for energy system implementation

- LC-SC3-RES-11-2018: small/medium scale CHP
- LC-SC3-RES-12-2018: large scale CHP
- **LC-SC3-RES-16-2019**: bioenergy intermediate carriers
  TRL 3-4 to 4-5, RIA, € 3 to 5 million, budget € 15 million
- **LC-SC3-RES-17-2019**: bioenergy intermediate carriers
  TRL 5 to 7, IA, € 8 to 10 million, budget € 40 million

Advanced Bioenergy, Biofuels and Renewable Fuels in Horizon 2020 (4)

Renewable Fuels for transports

- LC-SC3-RES-21-2018: road transport
- LC-SC3-RES-22-2018: retrofitted industrial installations
- **LC-SC3-RES-23-2019**: aviation and shipping
  TRL 3-4 to 5, RIA, € 3 to 5 million, budget € 20 million
- **LC-SC3-RES-24-2019**: pre-commercial production of advanced aviation biofuels TRL 5 to 7, IA, € 8 to 10, budget € 20 million

International cooperation

- LCE-22 WP2016: EU - Brazil on advanced biofuels

Joint actions and Cross-cutting issues

- LC-SC3-JA-1-2018: ERANET Cofund
- **LC-SC3-JA-2-2018-2019:** Implementation Plans of SET Plan CSA, € 1 million
- LC-SC3-CC-4-2018: Support to Renewable Fuels and Bioenergy ETIP

Market-uptake support

RES-28-2018-2019-2020

Challenges for large-scale deployment of RES: initial high cost, consumer acceptance, legal and financial barriers, competition with incumbent solutions

Support for a broad range of issues, including:

- Recommendation for harmonisation of regulations, life cycle assessment approaches, environmental impact methodologies of renewable energy solutions;
- Development of additional features for RES to be compliant with the electricity market requirements, making them 'market fit';
- Sharing of best practice between public funding bodies for the cross-border participation in RES electricity support schemes
- Increasing the use of the 'RES co-operation mechanisms'
- Development of insurance schemes
- Development of innovative financing mechanisms/schemes
- Support tools to facilitate export markets
- …

Engagement of relevant stakeholder and market actors is crucial!

CSA, recommended EU contribution: EUR 1-3 million/project

Market-uptake support

Bioenergy specific:

- Determining conditions and defining options for retrofitting existing energy and industrial installations for the complete or partial integration of bioenergy, with concrete proposals for such retrofitting for the different cases…, on the basis of the assessment of the capital expenditure (CAPEX) reduction and market benefit;
- Development of optimisation strategies regarding cost, energy-performance and LCA for bioenergy and sustainable renewable fuels in upgraded energy and industrial installations;
- Development of cost-effective logistics, feedstock mobilisation strategies and trade-centres for intermediate bioenergy carriers

Impact

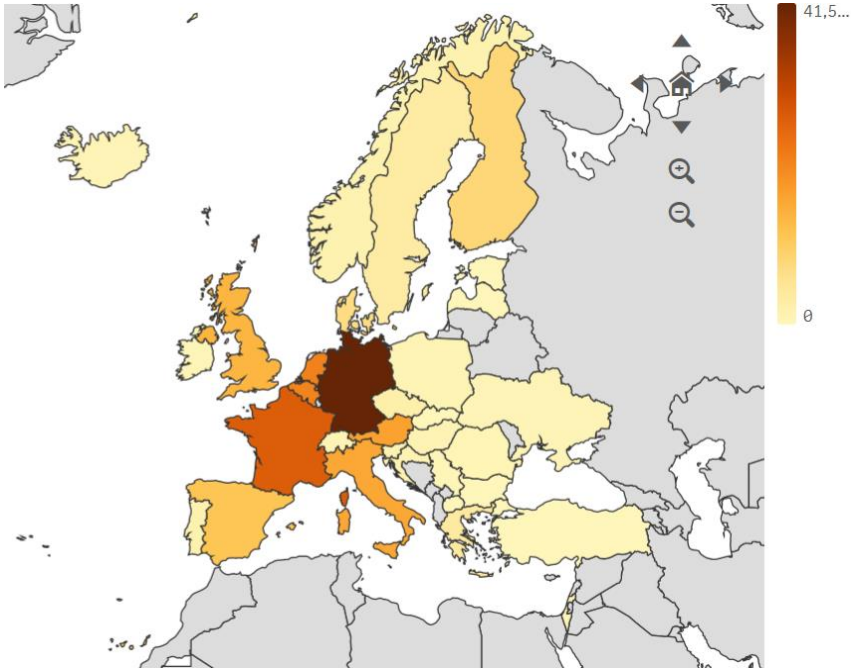
- Facilitate the introduction of these technologies and increase the share of renewable energy in the final energy consumption;
- Lead to substantial and measurable reductions for project developments, whilst still fully addressing the needs for environmental impact assessments and public engagement;
- Develop more informed policy, market support and financial frameworks, notably at national, regional and local level, leading to more cost effective support schemes and lower financing costs for RES facilities.

Deadline: ***11 December 2018***

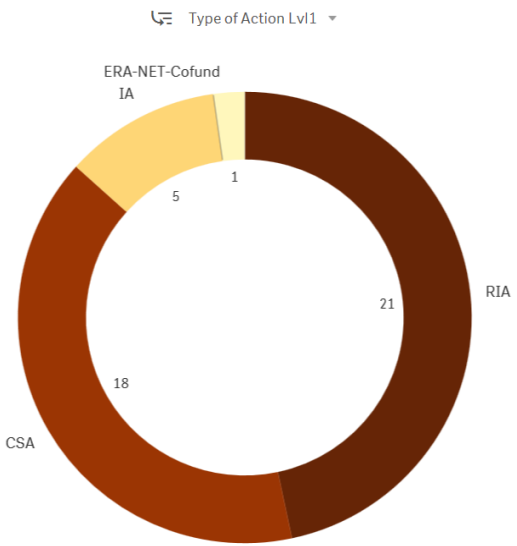
Horizon 2020 funded projects in advanced bioenergy, biofuels and renewable fuels under "Secure Clean and Efficient Energy"

H2020 Signed Grants	H2020 EU Contribution	H2020 Total Cost	Average Participation per Project	Average EU Contribution per Project	Average Total Cost per Project
45 0,24% of H2020	204,2M 0,65% of H2020	244,7M 0,63% of H2020	10,18	4,54M	5,44M

Participant EU contribution by Country



Signed Grants by type of Action



(Selection of relevant projects in Cordis/Dashboard, excluding projects signed in 2018)

WP 2016-2017 InnovFin EDP Pilot Facility: 30 M€ loan from EIB to CHO Tiper flagship project on large scale biomass cogeneration supported by H2020 for renewable energy

The way forward for Bioenergy, Advanced Biofuels and Renewable Fuels

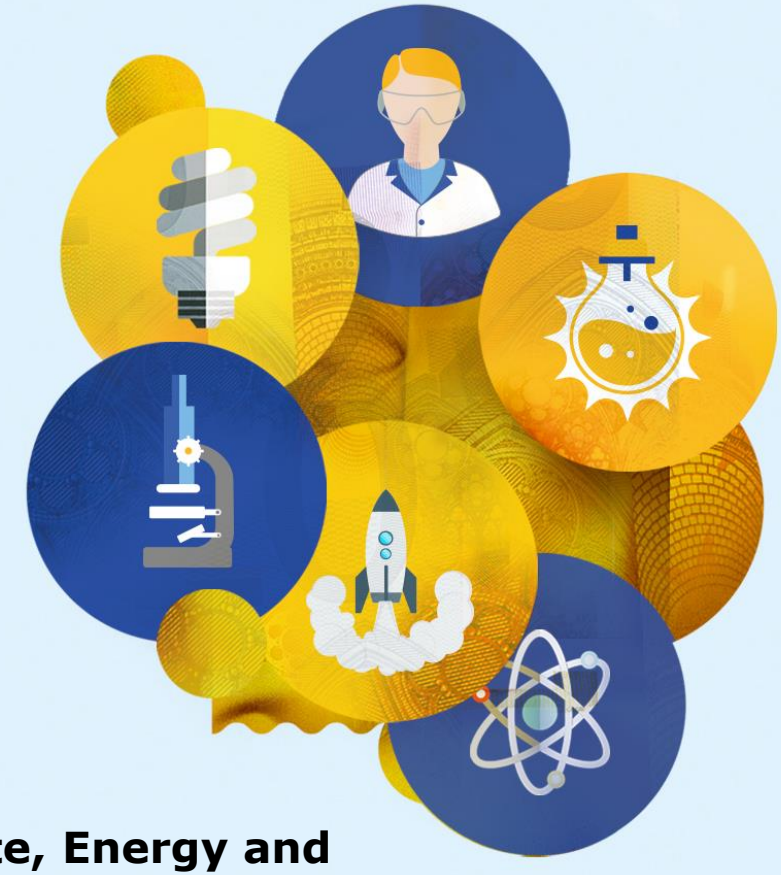
Key messages

- A vast portfolio of technologies and value chains combining feedstock types to conversion processes exists now at different TRL and breakthrough technologies are emerging
- Support is necessary at all TRL stages and value chains including new
- Flexibility of installations to feedstock type and conversion technology needed for cost-effective products
- Collaboration across EU and internationally is key
- Understanding innovation potential needed at early development stage
- Ensuring financing at later stages of development is necessary engaging public and private bodies
- Regional approach and clustering of market players crucial for market uptake
- Value added from social and environmental benefits should be associated to products
- Communication and education essential for implementation of technologies

Horizon Europe (2021-2027)
The next EU R&I Framework Programme
€100 billion

€ billion
In current prices

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



Pillar 1
Open Science

Pillar 2
Global Challenges and Industrial Competitiveness

Pillar 3
Open Innovation

First Work Programmes in **summer 2019**

Total budget for Climate, Energy and Mobility Cluster: € 15 billion

European Commission

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

European Commission

Horizon Europe: investing in R&I to shape our future

- The vision:

  " a Europe that protects,
  a Europe that empowers,
  a Europe that defends"

  Jean-Claude Juncker

- Tackling **climate change** (35 % budgetary target)

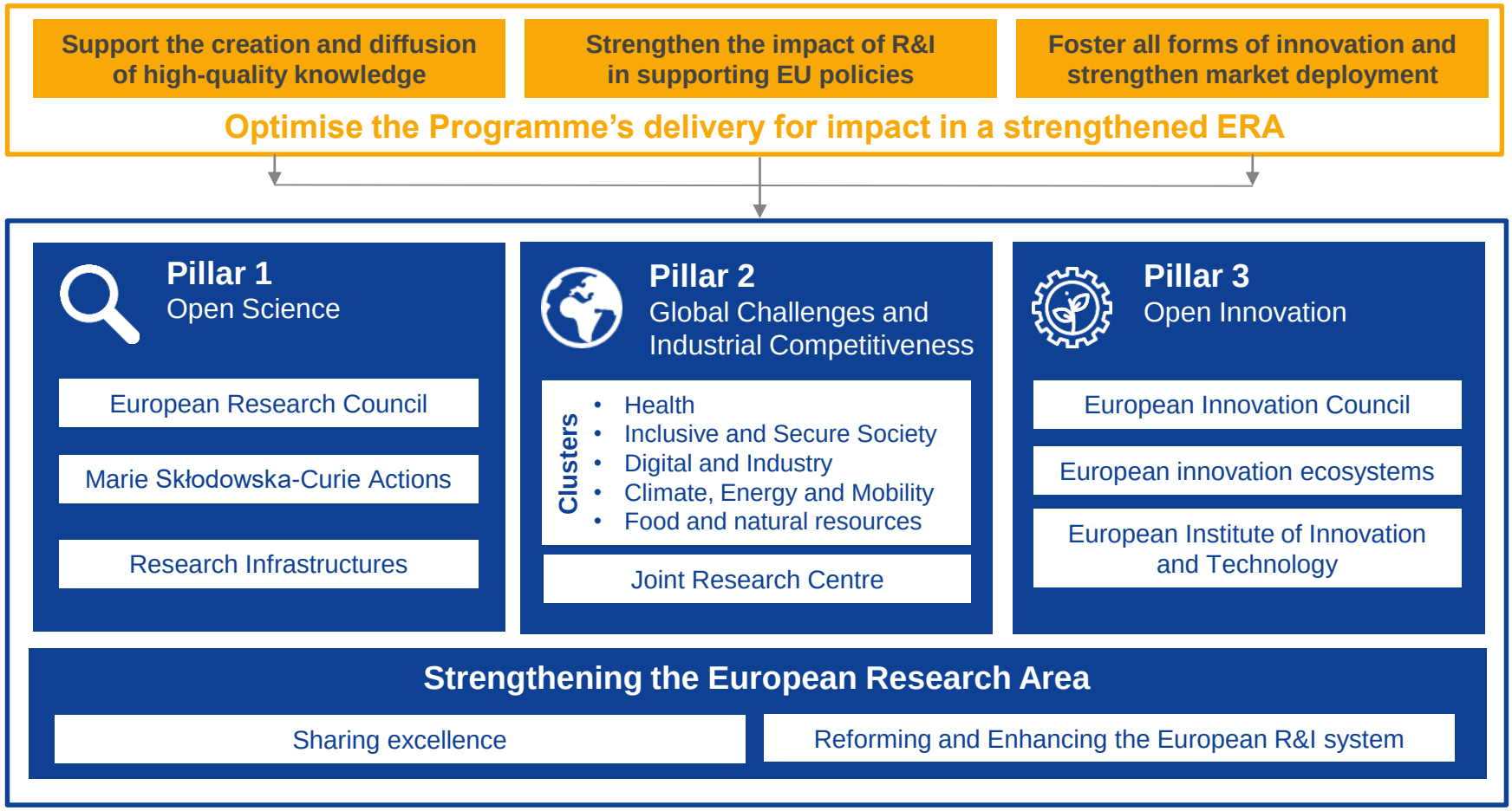
- Helping to achieve **Sustainable Development Goals**

- Boosting the Union's **competitiveness and growth**

Credits: https://www.un.org/sustainabledevelopment/sustainable-development-goals/

European Commission

Horizon Europe:
Specific Objectives of the Programme



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Thank you for your attention!

CDMA 70,B-1049
Brussels/Belgium
Tel: +32 2 29 59846
maria.georgiadou@ec.europa.eu
http://ec.europa.eu/research