European bioenergy research and innovation policies and the Energy Union

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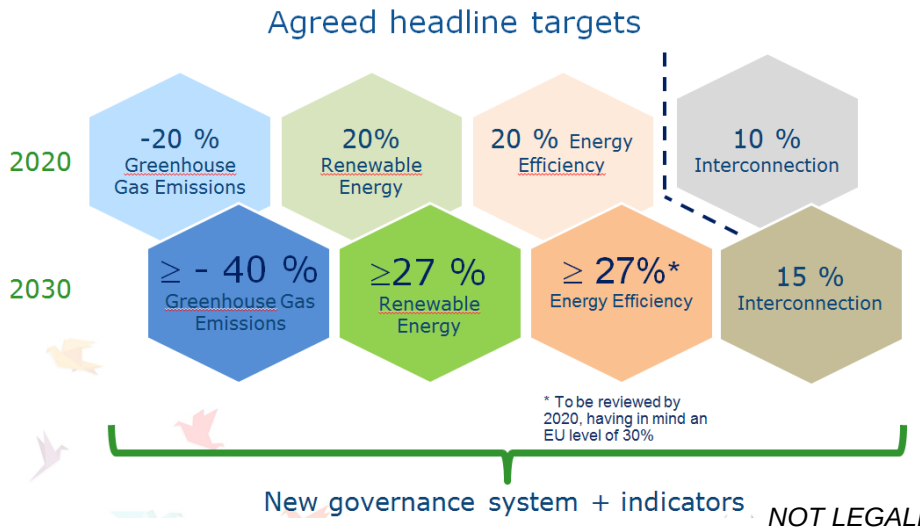
Policy Framework

"Clean Energy for all Europeans"

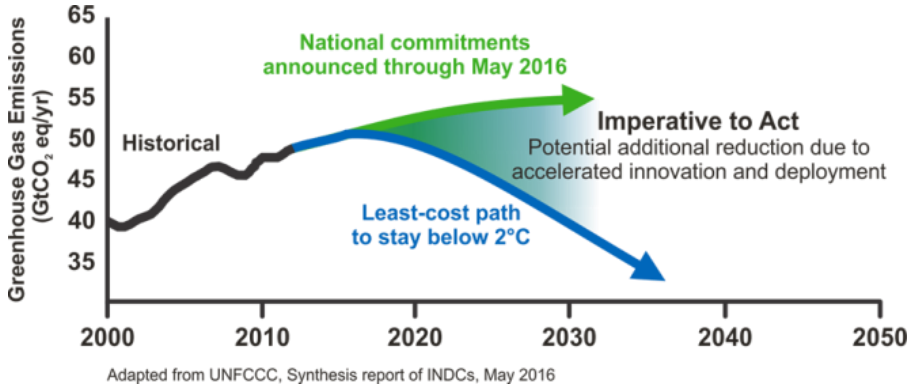
- *Putting energy efficiency first*
- *Demonstrating global leadership in renewables*
- *Delivering a fair deal for consumers*



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
- …

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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 *FQD 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

<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

EC is proactively engaged :

- 150 Million € on MI-relevant calls by 2020 in Horizon 2020
- Engaged in all the 7 Innovation Challenge (IC)
  - ✓ smart grids, off-grid access to electricity, CCS, biofuels, solar fuels, clean energy materials, H&C buildings
- Co-leading IC5 and IC7
- Chair of MI Steering Committee
- Co-host ministerial meeting in Malmo, Sweden 23-24 May 2018

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**.

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

Defining priorities
- SET-Plan Communication 2015

Setting targets
- Declaration of Intents

Implementation Plans (IP)
- Temporary Working Groups

Execution of IPs

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Action 8 - Renewable Fuels and Bioenergy

- ✓ Targets in Declaration of Intend – November 2016
- ✓ Implementation Plan will be endorsed in 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

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

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 € 800 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

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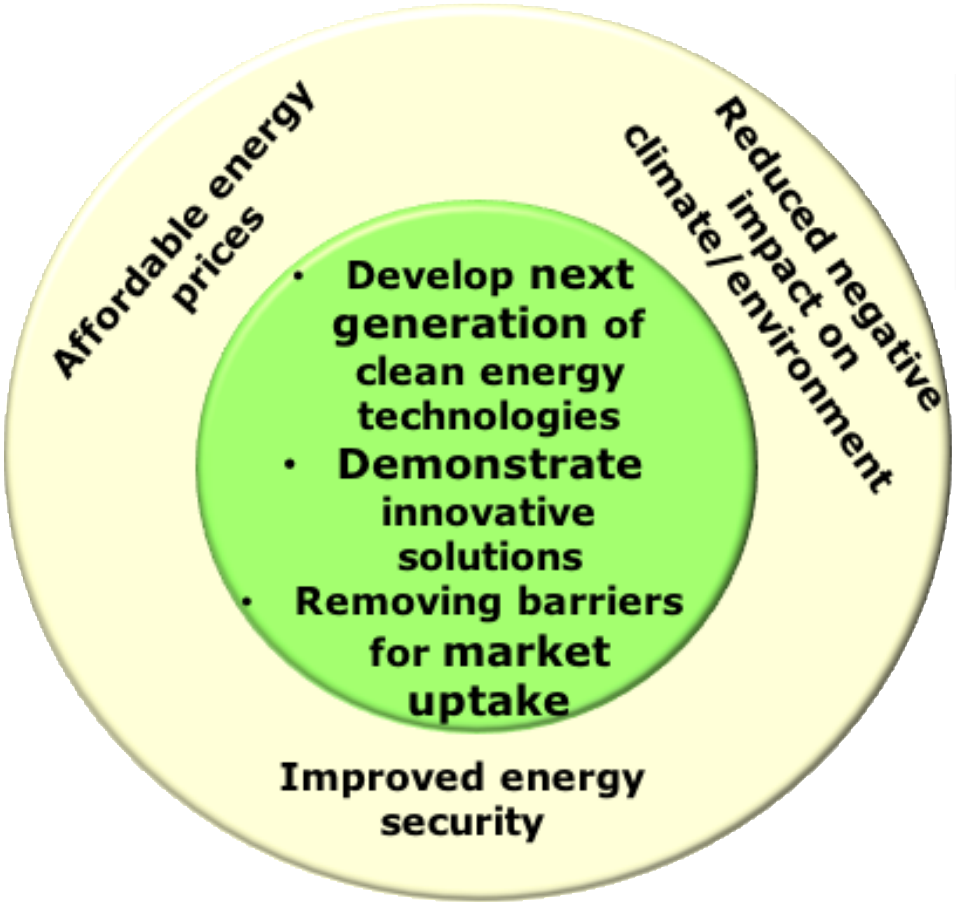
Research Policy Framework

H2020 ENERGY Challenge



FP7 Energy (2007-2013) EUR 3.25 bn

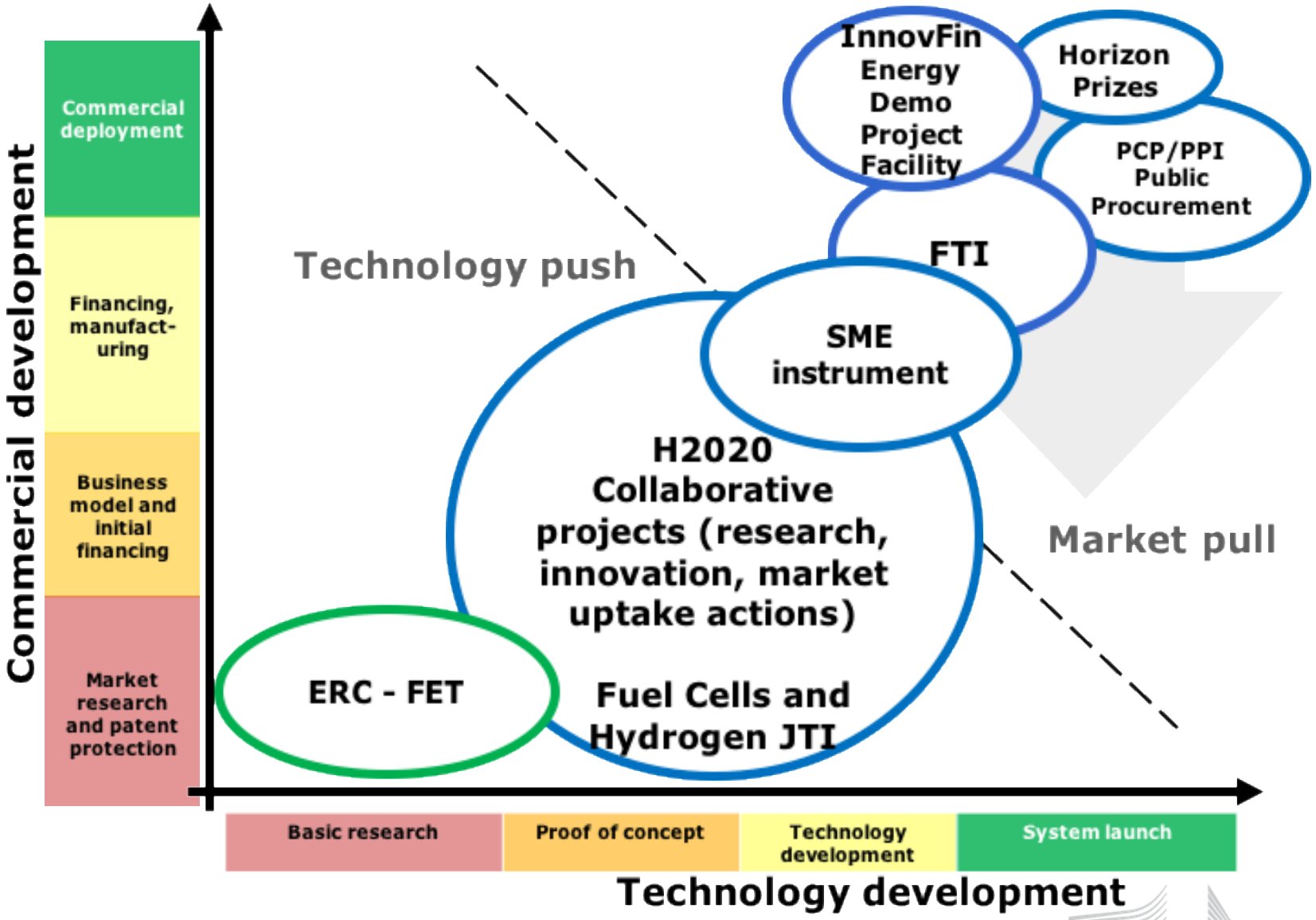
Intelligent Energy for Europe (IEE) (2007-2013) EUR 0.73 bn

H2020 – Energy Challenge

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

- Additional energy-related spending in H2020 outside Energy Challenge: ~ **50% of the Energy Challenge budget**
- Total budget for energy in H2020: **~ EUR 8.5 billion** (11.4% of the total H2020 budget)

Research Financing Instruments

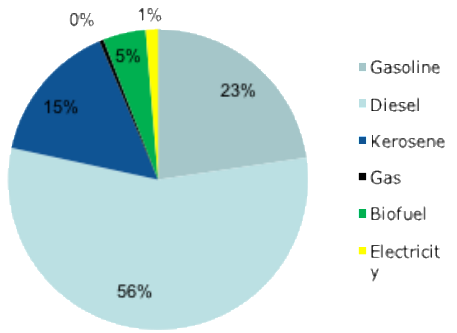


Opportunities and Challenges for Advanced Biofuels, Bioenergy & Renewable Fuels

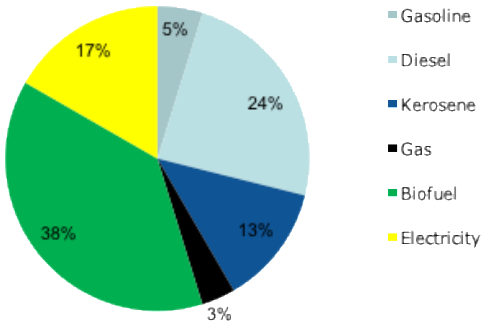
- Advanced biofuels and bioenergy intermediates essential for both **energy storage and use** (grid balancing, use in electricity, heat and transport)
- Growing market for advanced biofuels
- Biofuels are the medium term solution for road & maritime and the **long-term** solution for air transport
- 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

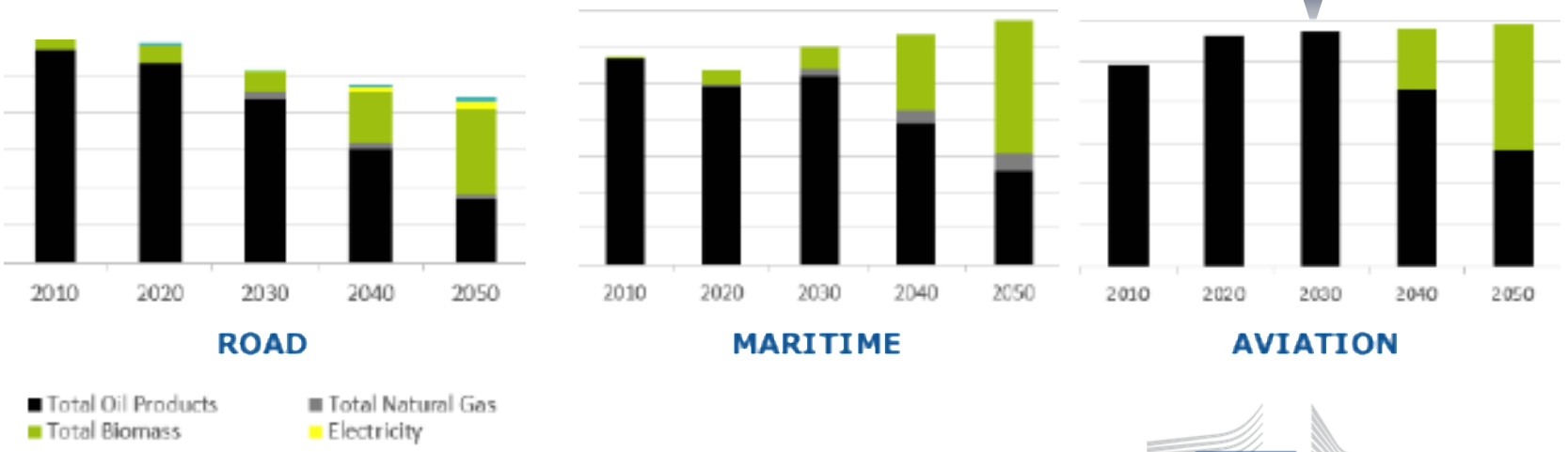


Projected share of transport fuels in 2050 (compatible with decarbonisation objectives)



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

EC studies



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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 through technology improvement and diversification
- Feedstock availability through feedstock diversification
- Market up-take by focusing on particular transport sectorial needs and aligning market up-take measures
- Breakthrough research and market-creating innovation for alternative renewable fuels that outperform fossil
- International cooperation to reinforce knowledge and innovation link and tackle global societal challenges

in order to create

- **Positive social and economic impact** by targeting Europe's competitiveness, environmental benefits and energy security

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

Next renewable energy solutions

- **LC-SC3-RES-1-2019-2020**: sustainable renewable fuels
- LC-SC3-RES-2-2018: the Bionic leaf technology

Market Uptake Support

- **LC-SC3-RES-28-2018-2019-2020**: bioenergy specific

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
- **LC-SC3-RES-17-2019**: bioenergy intermediate carriers

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
- **LC-SC3-RES-24-2019**: pre-commercial production of advanced aviation biofuels

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
- LC-SC3-CC-4-2018: Support to Renewable Fuels and Bioenergy ETIP

Renewable Fuels for transports

LC-SC3-RES-23-2019

Decarbonise the aviation and shipping transport sectors, which are expanding fast and increasing the overall fossil fuel consumption

TRL 3 to 5

RIA

EUR 3 to 5 million

20 million budget

Deadline:
27 August 2019

Development of next generation biofuel and alternative renewable fuel technologies for aviation and shipping

Non-food/feed drop-in biofuel and alternative renewable fuel technologies for aviation and shipping

Liquid jet-like biofuels and alternative renewable fuels **from biogenic residues and wastes by chemical, biochemical and thermochemical pathways**, or a combination

Bunker fuel-like biofuels for shipping uses

Improved conversion efficiency, cost and feedstock supply

Reduce costs and improve fuel performance for environment and society

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Renewable Fuels for transports

Reduce the carbon foot-print of aviation in the long-term by producing drop-in advanced biofuels for aviation at pre-commercial scale

TRL 5 to 7

IA

EUR 15 to 20 million

20 million budget

Deadline:

11 December 2018 or 2 February 2019

LC-SC3-RES-24-2019

Boosting pre-commercial production of advanced aviation biofuels

Demonstrate **pre-commercial production** of sustainable and cost-competitive advanced biofuels for **aviation** for boosting their market up-take

Large-scale production of aviation biofuels from **non-food/feed** sustainable feedstock and certified pathways according to international aviation fuel standards

30 to 50 thousand tonnes of aviation biofuel and continuous plant operation of 1000 hr **within project**

Pre-commercial plants

Facilitate market entry and increase **commercial capacity of advanced biofuels for aviation**

Deployment will allow the competitive production of bio-jet fuels on a commercial scale

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Renewable energy solutions for energy system level implementation

LC-SC3-RES-16-2019

Increase the potential and performance of dispatchable technologies to provide flexibility services to the energy system

TRL 3-4 to TRL 4-5

RIA

EUR 3 to 5 million

Penetration of a higher share of variable output renewables in the energy mix without affecting system stability

Development of solutions based on renewable sources that provide flexibility to the energy system

Bioenergy Development of intermediate bioenergy carriers for energy and transport from biogenic residues and wastes and energy crops from marginal lands not applicable to food or feed production, through feedstock flexible technologies at a conversion cost reduced by at least 25% from the state-of-the-art, with increased energy density storage and trade characteristics and improved GHG performance;

…

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Renewable energy solutions for energy system level implementation

LC-SC3-RES-17-2019

Increase the potential and performance of dispatchable technologies to provide flexibility services to the energy system

TRL 5 to 7

IA

EUR 12 to 15 million

Technologies that allow plant and system operators to operate successfully in the modern power markets

Demonstration of solutions based on renewable sources that provide flexibility to the energy system

Bioenergy Demonstration of the most cost-efficient intermediate bioenergy carrier pathways for energy and transport, addressing solid, liquid and gaseous intermediate bioenergy carriers from biogenic residues and wastes with increased energy density, storage and trade characteristics (where relevant) and improved GHG performance. Production at a scale of up to 5000 tons and process feasibility through applications to fuel production including for the heavy duty, maritime and aviation sectors, as well as to combined heat and power generation, are to be included.

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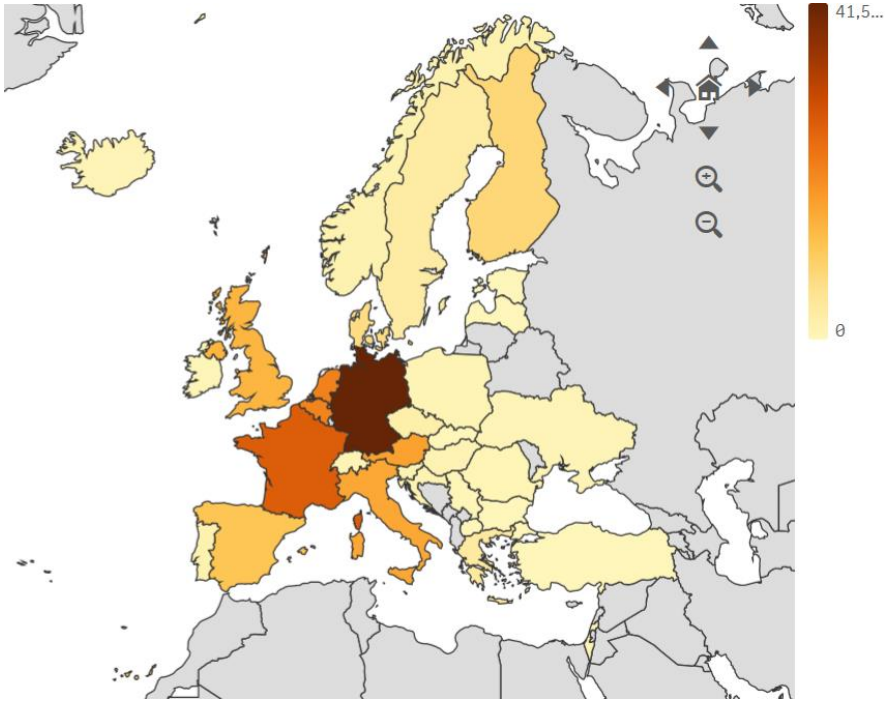
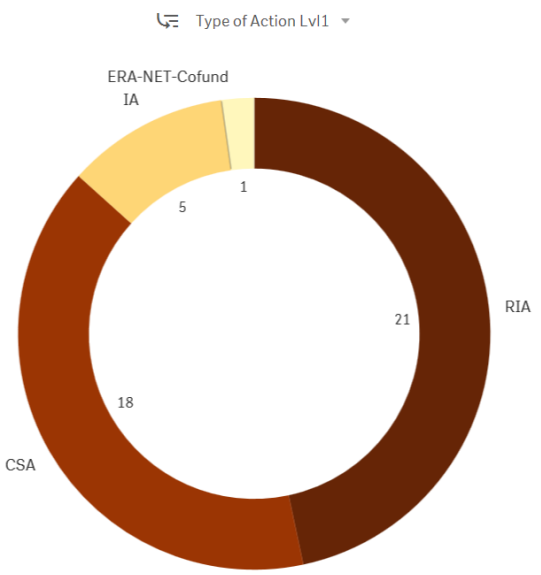
Horizon 2020 funded projects in advanced bioenergy, biofuels and renewable fuels under "Secure Clean and Efficient Energy"

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)

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

Aim

- Identify progress made in research and innovation in the sector through support under Horizon 2020
- Discuss gaps and needs for further funding, as well as measures of pushing innovation to the market
- Provide input to the way forward in the area on future research, development and innovation needs, market up-take, and non-technological ways

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

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

Future support

- Horizon 2020 Work Programme for 2020 in preparation
- MFF adoption on 2nd May 2018
- "Horizon Europe" is EU's 9th Framework Programme for R&I with proposed EUR 100 billion for 2021-2027
- Increased focus on impact of the Programme lifecycle and to policy, industrial competitiveness, knowledge
- Maximizing synergies with other relevant EU Programmes
- Reinforcing collegiality and efficiency in governance of programming
- Enhancing cooperation with Member States
- Intensifying interaction with society and stakeholders
- 3 Parts: Frontier Science, Global Challenges, Open to Innovation
- Strategic Programming end of 2018
- First Work Programmes in summer 2019

Thank you for your attention!

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