

European R&I policy for renewable fuels and bioenergy

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Outline

Energy Policy Framework
The European Green Deal
R&I Policy

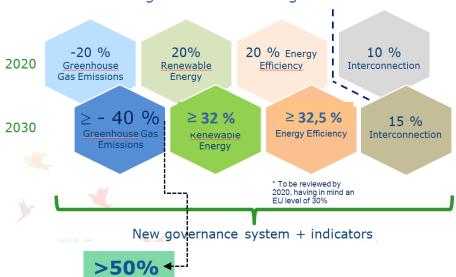


"European Green Deal"



"Clean Energy for all Europeans"

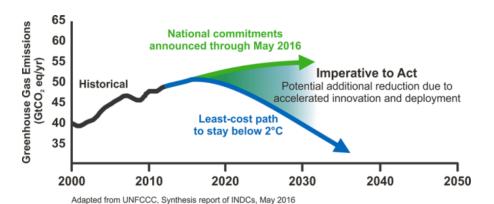
Agreed headline targets



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...

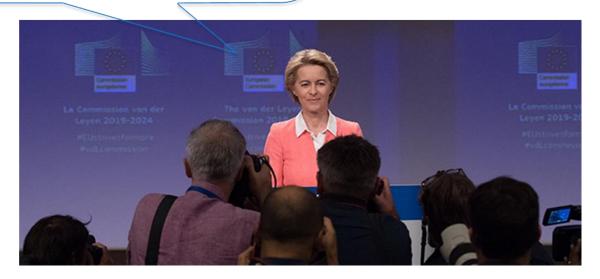


Other EU policy priorities

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



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





The European Green Deal

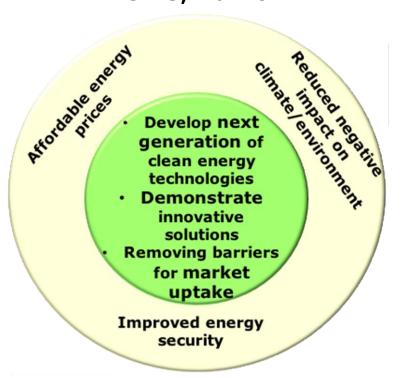
- 50% emission reduction target in 2030
- Lead international negotiations of major emitters by 2021
- Just Transition Fund
- Circular economy, blue economy
- Biodiversity
- Carbon footprint of EU transport
- Zero-pollution
- Carbon Border Tax
- Review of Energy Taxation Directive

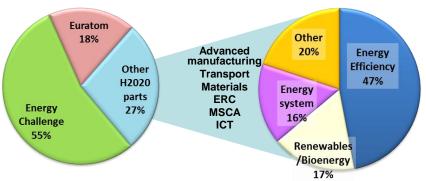


H2020 ENERGY Challenge

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

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





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

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



Advanced Bioenergy, Biofuels and Renewable Fuels

Essential for energy use and as energy carriers

Growing market for advanced biofuels and renewable fuels

Biofuels deployable solution for aviation, shipping and heavy road Reaching competitiveness via R&I to improve cost, performance, sustainability

R&I Policy

International cooperation to tackle global societal challenges

Coordinated R&I funding / risk-funding needed for marketuptake Technology improvement & diversification



Breakthrough research and market-creating innovation

Feedstock diversification

Market uptake and on particular transport needs

Opportunities & Challenges



Horizon 2020 topics Secure Clean and Efficient Energy

48 topics 2014 to 2020

- •20 RIAs,
- •11 IAs
- 7 MUM
- 10 Strategic Actions

~350 million

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

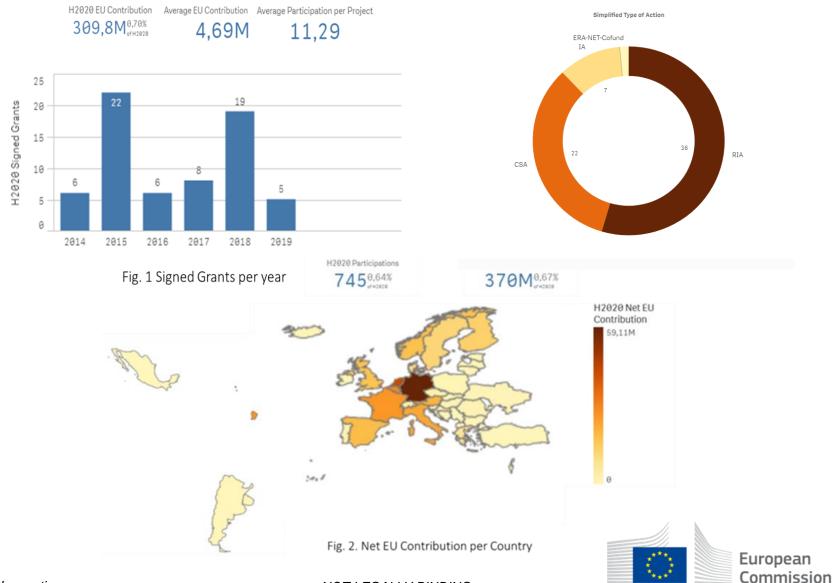
Renewable energy solutions for energy system implementation

Market Uptake Support

Supporting the development of a European research area in the field of energy

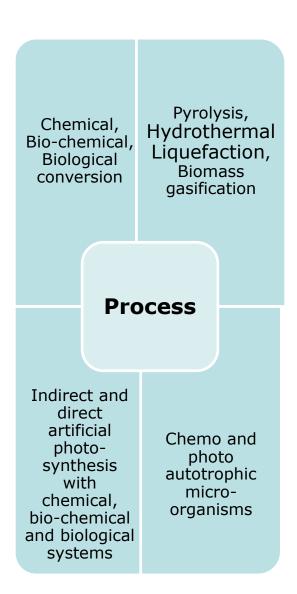


Horizon 2020 funded projects "Secure Clean and Efficient Energy"



Thematic areas - Renewable fuels

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



Product

paraffinic biofuels and higher alcohols
 middle distillate range biofuels e.g., diesel and jet fuel
 drop-in biofuels, e.g., liquid diesel- and gasolinelike
 biofuels for shipping, aviation
 renewable alternative and synthetic fuels from CO2

intermediate bioenergy

carriers



Technologies of the EIBI seven value chains

Biomethane through gasification

Lignocellulosic ethanol

Bioenergy carriers by pyrolysis, torrefaction

Biofuels for aviation

Biofuels from the carbon content in flue gases

Biofuels from aquatic biomass

Biofuels from wastes and residues (forest, agricultural, organic fraction of municipal and industrial wastes)

Demonstration of advanced biofuel technologies

~ € 100 million Investment



Thematic areas - Renewable power, H&C

Next generation technologies

- micro, and small-scale CHP systems
- residential-scale low emission boilers
- medium and large-scale biomass-based cogeneration
- renewable energy integration to biomass heating and cogeneration
- intermediate bioenergy carriers from biogenic residues and wastes and energy crops from marginal lands.

Demonstration of medium to largescale biomass CHP

- retrofitting existing plants
- production of intermediate bioenergy carriers



Thematic areas - Cross cutting

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 Bionic Leaf precommercial production of advanced aviation biofuel

retrofitting of existing industrial installations

international cooperation



CEN-CENELEC Framework Partnership Agreement

Engine tests with new types of biofuels and development of biofuel standards

Objective: input to standardization work under CEN/TC 19

E20 in Euro 6c vehicles

Feasibility of a CI engine to high octane fuels

Robustness of FAME standard EN 14214

Quality requirements of paraffinic diesel blends and emissions benefits in engines

Feasible to move to an E20 fuel for infrastructure and vehicles Gasoline in CI
engine functions
over the entire
speed load range
with an efficiency
similar to a normal
diesel engine

Results

Reliable FAME test methods predict fuel-related filter plugging in diesel vehicles The density of diesel in the EN 590 fuel specification can be lowered without modifications and use more paraffinic fuels



BioEnergy Sustaining The Future ERANET CoFund Actions

Demo Projects

BESTF1

BioSNG – UK/Germany - project complete – Development of an innovative process to convert gas and biomass into bio substitute natural gas to be used in existing gas network

BioProgress – Sweden/Germany – project complete – Demonstrate a novel technology to simply gas clean-up following biomass gasification

BESTF2

CoryFee – Denmark/Sweden – project complete – Reduce production costs of cellulosic ethanol

BioWaterMethanisation – Spain/UK/Netherlands – project complete – Demonstrate feasibility of anaerobic membrane bioreactor to achieve sustainable wastewater treatment.

BESTF3

Pheonix – UK/Netherlands – on going – develop port injection gas engines to provide novel approach to power generation from syngas derived from biomass gasification.

Waste2Bio – Spain/UK – on going – Demonstrate a process for treatment of MSW via recovery of bioethanol and biogas to enhance valorisation of residues

SegraBio – Denmark/Sweden – on going - develop and demonstrate the production of bio-ethanol and biogas from second grade and low cost biomass



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



The Strategic Energy Technology Plan (SET Plan) - coordinating research and



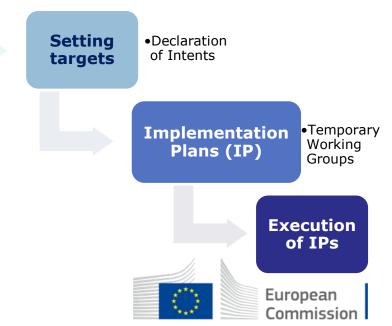
Overall objective: Accelerating the development and low-carbon deployment technologies through cooperation among EU countries, companies, research institutions, and the EU itself, based on common priorities, targets and actions.

> **Defining** priorities

 SET-Plan Communication 2015

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**
- Energy Efficiency in Industry 6.
- 7. Batteries and e-Mobility
- 8. Renewable Fuels and Bioenergy
- 9. Carbon Capture Utilisation and Storage
- 10. **Nuclear Safety**





ICELAND

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

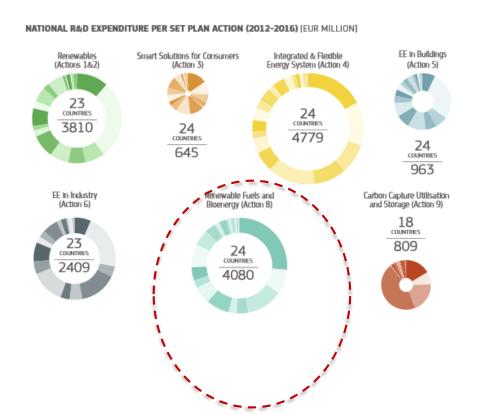
- Batteries for E-Mobility and Stationary Storage IP (7)
- Renewable Fuels and Bioenergy IP (8)

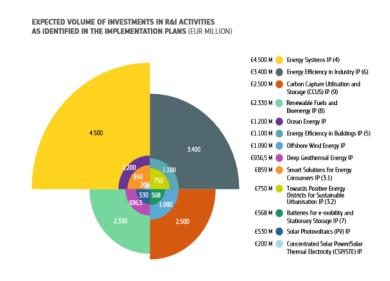
CCUS

- Carbon Capture Utilisation and Storage IP (9)
- Chair



National R&I Expenditure SET Plan Investments





- In 2030 more than EUR 20 billion aggregated investments in R&I
- 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: Renewable Fuels and Bioenergy for Sustainable Transport

Table 1: Total investment for R&I activities

	Billions €		Industry		MS Funding		EU	
	al Bioenergy and Renewable Fuels for	106,61	77,74	73%	22,23	21%	6,64	6%
Sus	tainable Transport							
Renewable Fuels for Sustainable Transport 84,81		62,34	74%	17,48	21%	4,99	6%	
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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%
Oth	er renewable liquid and gaseous fuels	11,40	8,35	73%	2.36	21%	0.69	6%
#4	Development	0,20	-	25%		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		25%		50%		25%
	TRL 7-8 (Demonstration)	0,06		50%	,	25%	,	25%
	TRL 9 (Scale-Up)	0,25	,	75%	l '	20%	0,01	5%
Bioenergy		11,30	8 03	71%	2.45	22%	0.83	7%
#8	Development	0,50		25%		50%	0,13	25%
#9	Demonstration	0,80		50%	,	25%	0,20	25%
#10	Scale-Up	10,00	7,50	75%	l '	20%	0,50	5%
Inte	Intermediate Bioenergy Carriers 10,50		7 38	70%	2 30	22%	0.83	8%
	#11 Development		-	25%		50%	0,03	25%
	Demonstration	0,50 1,00	,	50%		25%	0,15	25%
	Scale-Up	9,00		75%	· '	20%	0,45	5%



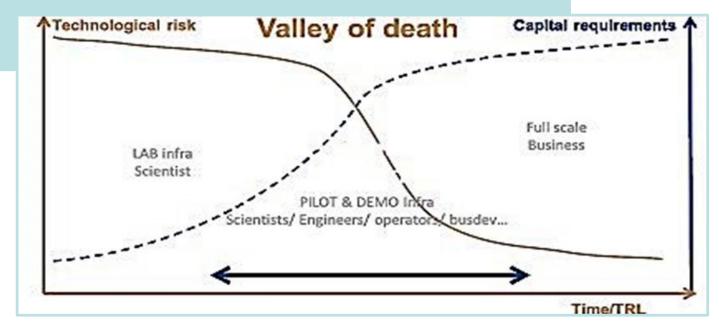
Market up-take challenges

Lack of investments due to financial risks => lack of new technologies coming into the market

Innovative technologies considered more risky, need higher upfront capital => banks more reluctant to finance them

Most mature technologies confronted with uncertainty on investment returns => pay-off costs much harder to calculate

Lack of awareness, capacity, cost and infrastructure





Energy Financing in the Energy Union

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



Mission Innovation





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 20





The way forward

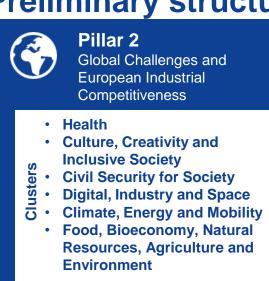
- A vast portfolio of technologies and value chains
- Support at all TRL & value chains including new
- Flexibility of installations
- Collaboration across EU and internationally
- Understanding early innovation potential
- Ensuring financing at later stages
- Regional approach and clustering of market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



Horizon Europe The next EU R&I Investment Programme (2021-2027)

Preliminary structure





Pillar 3
Innovative Europe

European Innovation Council

European innovation
ecosystems

European Institute of
Innovation
and Technology

Widening Participation and Strengthening the European Research Area

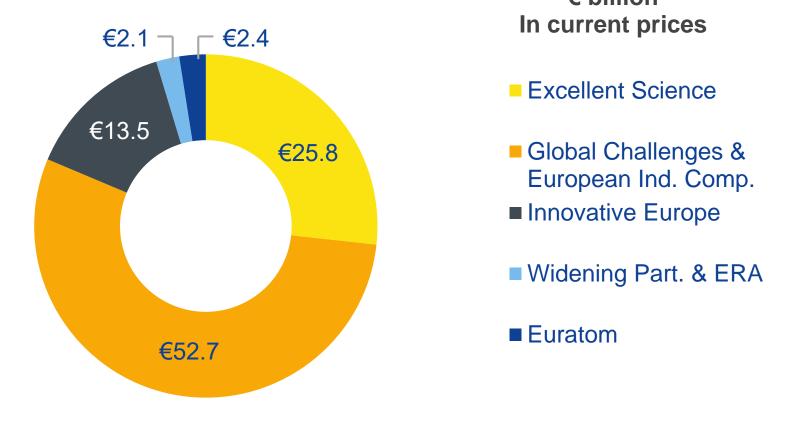
Joint Research Centre

Widening participation and spreading excellence

Reforming and Enhancing the European R&I system



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



European Commission

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

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 GovernanceSocial and economic transformations	Culture, cultural heritage and creativity				
Civil security for society	Disaster-resilient societiesProtection 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 observationAgriculture, forestry and rural areasCircular systemsFood systems	 Biodiversity and natural resources Seas, oceans and inland waters Bio-based innovation systems in the EU Bioeconomy 				



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

Autumnwinter 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





Thank you for your attention!

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