EU R&I Policies for Bioenergy

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EUROPEAN COMMISSION

FORBIO – GBEP Workshops, Rome, 26-28 November 2018
Outline

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

Agreed headline targets

- 2020:
  - -20% Greenhouse Gas Emissions
  - 20% Renewable Energy
  - 20% Energy Efficiency
  - 10% Interconnection

- 2030:
  - ≥ -40% Greenhouse Gas Emissions
  - ≥27% Renewable Energy
  - ≥27% Energy Efficiency
  - 15% Interconnection

Other EU policy priorities
- Digital Single Market
- Jobs, Growth and Investments
- EU as a strong global actor
- ...
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

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*
5. New Electricity Market Design Legislation *COM(2016)861 862 864*
7. Revised Effort Sharing Decision and LULUCF *COM(2016) 482*
8. Strategy for Low-emission Mobility *COM(2016) 501*
10. Accelerating Clean Energy Innovation ACEI *COM(2016)763*

*NOT LEGALLY BINDING*
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.

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

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**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

"Accelerating Clean Energy Innovation" (COM(2016)763)

EU's global role

Policy Signals
- Mission Innovation
- EU-Africa cooperation
- Subsidies
- Innovation-principle
- Public Procurement
- Standards

InnovFin
- EDP
- EFSI

Financial Instruments

Funding Energy Science and Technology

> EUR 2.2 billion in H2020 2018-2020
- Decarbonising EU building
- EU leadership in renewables
- Energy storage
- E-mobility
- European Innovation Council

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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

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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

<table>
<thead>
<tr>
<th>Description</th>
<th>Billions €</th>
<th>Industry</th>
<th>MS Funding</th>
<th>EU</th>
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</thead>
<tbody>
<tr>
<td>Total Bioenergy and Renewable Fuels for Sustainable Transport</td>
<td>106.61</td>
<td>77.74</td>
<td>22.23</td>
<td>6.64</td>
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<tr>
<td><strong>Renewable Fuels for Sustainable Transport</strong></td>
<td>84.81</td>
<td>62.34</td>
<td>17.48</td>
<td>4.99</td>
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<tr>
<td><strong>Advanced Biofuels</strong></td>
<td>73.00</td>
<td>53.75</td>
<td>15.00</td>
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<tr>
<td>#1 Development</td>
<td>1.00</td>
<td>0.25</td>
<td>0.50</td>
<td>0.25</td>
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<tr>
<td>#2 Demonstration</td>
<td>2.00</td>
<td>1.00</td>
<td>0.50</td>
<td>0.50</td>
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<tr>
<td>#3 Scale-Up</td>
<td>70.00</td>
<td>52.50</td>
<td>14.00</td>
<td>3.50</td>
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<tr>
<td><strong>Other renewable liquid and gaseous fuels</strong></td>
<td>11.40</td>
<td>8.35</td>
<td>2.36</td>
<td>0.69</td>
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<td>#4 Development</td>
<td>0.20</td>
<td>0.05</td>
<td>0.10</td>
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<td>#5 Demonstration</td>
<td>0.40</td>
<td>0.20</td>
<td>0.10</td>
<td>0.10</td>
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<tr>
<td>#6 Scale-Up</td>
<td>10.80</td>
<td>8.10</td>
<td>2.16</td>
<td>0.54</td>
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<tr>
<td><strong>#7 Renewable Hydrogen</strong></td>
<td>0.41</td>
<td>0.24</td>
<td>0.12</td>
<td>0.05</td>
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<tr>
<td>TRL 2-6 (Development)</td>
<td>0.10</td>
<td>0.03</td>
<td>0.05</td>
<td>0.03</td>
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<tr>
<td>TRL 7-8 (Demonstration)</td>
<td>0.06</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
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<tr>
<td>TRL 9 (Scale-Up)</td>
<td>0.25</td>
<td>0.19</td>
<td>0.05</td>
<td>0.01</td>
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<tr>
<td><strong>Bioenergy</strong></td>
<td>11.30</td>
<td>8.03</td>
<td>2.45</td>
<td>0.83</td>
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<tr>
<td>#8 Development</td>
<td>0.50</td>
<td>0.13</td>
<td>0.25</td>
<td>0.13</td>
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<tr>
<td>#9 Demonstration</td>
<td>0.80</td>
<td>0.40</td>
<td>0.20</td>
<td>0.20</td>
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<tr>
<td>#10 Scale-Up</td>
<td>10.00</td>
<td>7.50</td>
<td>2.00</td>
<td>0.50</td>
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<tr>
<td><strong>Intermediate Bioenergy Carriers</strong></td>
<td>10.50</td>
<td>7.38</td>
<td>2.30</td>
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<tr>
<td>#11 Development</td>
<td>0.50</td>
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<td>0.25</td>
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<tr>
<td>#12 Demonstration</td>
<td>1.00</td>
<td>0.50</td>
<td>0.25</td>
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<tr>
<td>#13 Scale-Up</td>
<td>9.00</td>
<td>6.75</td>
<td>1.80</td>
<td>0.45</td>
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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

Total budget for energy in H2020: ~ EUR 8.5 billion
Energy in other parts of Horizon 2020

- Advanced manufacturing
- Transport
- Materials
- ERC
- MSCA
- ICT

- 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

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InnovFin EDP Facility

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
- 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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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
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.

Study on Research and Innovation Perspective of the mid-and-long-term Potential for Advanced Biofuels in EU
For every level of feedstock demand, R&I significantly decreases the cost of biomass.
Decarbonizing the energy system using advanced biofuels is achievable without a negative impact on GDP
Industrial Biofuel Deployment in EU

**EXISTING COMMERCIAL BIOFUELS TECHNOLOGIES**
- New feedstocks
- Better economic and environmental performances of 1G, 2G fuels and biogas in fuel blends and drop-in products

**ADVANCED BIOFUELS TECHNOLOGIES**
- First units built on industrial sites
- Coproduction of green energy
- Production of chemicals
- Biorefinery development
- Learning curve
- Dedicated production aviation, marine and heavy duty transport

**ELECTROFUELS**
- Economic and industrial feasibility, strongly dependent on price of electricity

**Renewables in EU transport**
- 0%
- 4.9%
- 10%
- 15%
- 20%
- 25%

**GOAL:**
- Long term to compete with fossil
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
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

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
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

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


**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

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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"

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<tr>
<th>Signed Grants</th>
<th>H2020 EU Contribution</th>
<th>Total Cost</th>
<th>Average Participation per Project</th>
<th>Average EU Contribution per Project</th>
<th>Average Total Cost per Project</th>
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<tr>
<td>45</td>
<td>204,2M</td>
<td>244,7M</td>
<td>10,18</td>
<td>4,54M</td>
<td>5,44M</td>
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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 MC 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

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

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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: 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
Horizon Europe: Specific Objectives of the Programme

Support the creation and diffusion of high-quality knowledge
Strengthen the impact of R&I in supporting EU policies
Foster all forms of innovation and strengthen market deployment

Optimise the Programme’s delivery for impact in a strengthened ERA

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
Thank you for your attention!

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