Battery R&I: Policy context and implementation

DG RTD C2 – Future Urban & Mobility Systems

ec.europa.eu
European Green Deal

- A zero pollution Europe
- Preserving Europe’s natural capital
- Sustainable Transport
- Achieving Climate Neutrality
- Clean, Reliable and Affordable energy
- Financing the transition
- Take everyone along (Just Transition Mechanism)
- Transition to a Circular Economy
- Farm to Fork
- Towards a Green CAP
Climate Neutrality Law and Climate Target Plan

EU Climate Law of 30 June 2021 (EU Regulation)

- at least 55% net emission reduction by 2030
- net zero GHG emissions by 2050

2030 Climate target plan underpinning Fit for 55 proposals, shows 55% emission reduction:

- 1) is feasible;
- 2) will put us on the right trajectory towards climate neutrality;
- 3) requires more effort and contribution of all sectors of economy.
The Fit for 55 Package – Overview

The package aims to make the EU ‘fit for 55’ and deliver the transformational change needed in a
• fair,
• cost-efficient and
• competitive way.
## Policy mix at a glance

<table>
<thead>
<tr>
<th>Pricing</th>
<th>Targets</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Stronger Emission Trading Scheme including in aviation&lt;br&gt;• Extending the ETS to maritime, road transport, and buildings&lt;br&gt;• Updated Energy Taxation Directive&lt;br&gt;• Carbon Border Adjustment Mechanism</td>
<td>• Updated Renewable Energy Directive&lt;br&gt;• Updated Energy Efficiency Directive&lt;br&gt;• Updated Effort Sharing Regulation&lt;br&gt;• Updated Land-use change and forestry Regulation</td>
<td>• Stricter CO₂ performance for cars &amp; vans&lt;br&gt;• New infrastructure for alternative fuels&lt;br&gt;• ReFuelEU: More sustainable aviation fuels&lt;br&gt;• FuelEU: Cleaner maritime fuels</td>
</tr>
</tbody>
</table>

### Support measures

Innovative and regulations to promote innovation, build solidarity and mitigate impacts for the vulnerable, notably through the Global Climate Fund and enhanced Modernisation and Innovation Funds

The Fit for 55 Package consists of a set of **inter-connected proposals that strike a careful balance between pricing, targets, standards and support measures.**
The European Battery Alliance – overview

EU and Member States providing the supportive framework

EU = Strategic Action Plan on Batteries
EU = Sustainable Batteries Regulation
Other legislative & funding initiatives at EU and national level

The industrial workstream of the Battery Alliance led by EIT InnoEnergy

Open and inclusive platform for the entire battery ecosystem
Policy insight
Accelerating battery projects

Business Investment Platform (BIP)

Battery Partnership
Battery specific programmes under Horizon Europe

Other partnerships
Battery downstream work programmes under Horizon Europe

Other R&I activities

Two Battery IPCEIs
Interregional partnership on advanced battery materials (ERDF/Smart specialisation)
National and bilateral R&I activities

R&I Networks and initiatives

Capture a new market worth 250B€/year in 2025
A competitive and sustainable European battery value chain!
European Battery Alliance: Covers all segments of the value chain

- Raw and processed materials
- Cell component manufacturing
- Cell manufacturing
- Battery pack manufacturing
- Electric vehicle manufacturing
- Recycling
Instruments/Actions

- Research and Innovation
- Financial support
- Access Raw materials
- Sustainability: Battery Regulation
- Global Regulatory Framework
- Skills
Under Horizon Europe, all battery research activities are grouped under a Partnership - **Batt4EU**

- Only a **partnership**, i.e. a long-lasting and coordinated effort involving industry, research and the public sector, can live up to the challenge and bring predictability to the European battery value chain stakeholders.
- Running from 2021-2030
- EU Contribution €925 M, to be matched by private side

**Partnership Vision:**

*To establish by 2030 in Europe the best in the world innovation ecosystem to boost a competitive, sustainable and circular European battery value chain and to drive the transformation towards a carbon-neutral society*
Towards a competitive European industrial battery value chain for stationary applications and e-mobility

**General objectives**
1. Contribute to make Europe the 1st climate-neutral continent by 2050
2. Enable the European leadership in the battery industry across the value chain, creating economic growth and jobs in a circular economy
3. Contribute to achieve a zero-pollution ambition for a toxic-free environment

**Specific objectives**
1. Provide the European Industry with differentiating technologies, supporting the development of an innovative, competitive and sustainable battery manufacturing industry in Europe
2. Develop sustainable and affordable battery solutions for clean mobility
3. Enable a cost-effective integration of renewable energy sources in the power grid

**Technical objectives**
(2030 targets vs 2019 values, in line with SET Plan)
1. Increase energy density +60%
2. Increase power density and charging rate (charging time < 20')
3. Improve cycle lifetime > 2x
4. Reduce battery cost - 60%
5. Ensure battery safety(1) automotive 4 / aviation and waterborne 2
6. implement BAT in manufacturing and recycling operations (plants 4.0 or 5.0)
7. Improve sustainability and circularity

Strong alignment with Green Deal, Batteries Regulation, Fit for 55
Batt4EU covers all parts of the battery value chain

Items in RED: core activities of Batt4EU, performed mainly inside the partnership.

- **Raw Materials**
  - Active material and related components (battery-grade raw materials, cathodes, anodes, binders, electrolytes (particularly solid-state future electrolytes), the processes and equipment to manufacture them, and novel methods for accelerated discovery and engineering of materials and interfaces)
  - Other materials (separators, casing, mechanical components,...)

- **Advanced Materials**
  - Cell design
  - Advanced technologies for manufacturing
  - Specialised equipment for new manufacturing technologies...
  - Assembly technologies
  - ...

- **Cells**

- **Modules**

- **Packs**
  - Decarbonised transport
  - Stationary energy storage.

  *For applications sectors with a dedicated partnership, this dedicated partnership will take the lead on the downstream R&I segments activities specific to this sector*

- **Application Integration**

- **End-of-life**
  - Re-use
  - Collecting, sorting, dismantling and recycling
  - Secondary raw materials
  - ...

**Appropriate balance between short-to-medium term and long-term R&I activities**

- Enhancement of close-to-market Li-ion technologies (TRL 5-8)
- New promising and longer-term breakthrough technological solutions (TRL 2-4)
Synergies with other instruments

- 2ZERO, Clean Aviation, ZEWI, Europe’s Rail, Clean Hydrogen: collaboration on batteries and battery systems to be demonstrated across different transport modes
- Clean Energy Transition: incorporation of battery systems in energy storage applications, allowing integration of renewable energy sources
- Key Digital Technologies: collaboration on battery sensors, battery modelling, battery passport
- Made in Europe, Processes4Planet: collaboration on sustainable manufacturing technologies
- EIT InnoEnergy, EIT Raw Materials, EIT Manufacturing: support for market uptake and skills development in the batteries sector
<table>
<thead>
<tr>
<th>Topic</th>
<th>Title</th>
<th>Action type</th>
<th>Budget M€</th>
<th>EU contr* M€</th>
<th># Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021-D2-01-01</td>
<td>Sustainable processing, refining and recycling of raw materials</td>
<td>RIA</td>
<td>21</td>
<td>6-7</td>
<td>3</td>
</tr>
<tr>
<td>2021-D2-01-02</td>
<td>Advanced high-performance Generation 3b Li-ion batteries supporting electro mobility and other applications</td>
<td>RIA</td>
<td>24</td>
<td>6-8</td>
<td>3</td>
</tr>
<tr>
<td>2021-D2-01-03</td>
<td>Advanced high-performance Generation 4a, 4b (solid-state) Li-ion batteries supporting electro mobility and other applications</td>
<td>RIA</td>
<td>36</td>
<td>8-9</td>
<td>4</td>
</tr>
<tr>
<td>2021-D2-01-04</td>
<td>Environmentally sustainable processing techniques applied to large scale electrode and cell component manufacturing for Li ion batteries</td>
<td>RIA</td>
<td>20</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2021-D2-01-05</td>
<td>Manufacturing technology development for solid-state batteries (SSB, Generations 4a - 4b batteries)</td>
<td>RIA</td>
<td>26</td>
<td>6-7</td>
<td>3</td>
</tr>
<tr>
<td>2021-D2-01-06</td>
<td>Sustainable, safe and efficient recycling processes</td>
<td>RIA</td>
<td>30</td>
<td>9-10</td>
<td>3</td>
</tr>
<tr>
<td>2021-D2-01-07</td>
<td>Support for establishment of R&amp;I ecosystem, ...</td>
<td>CSA</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

7 topics – total budget: €160 million
Call deadline: 19 October 2021
* Expected EU contribution per project
<table>
<thead>
<tr>
<th>Topic</th>
<th>Title</th>
<th>Action type</th>
<th>Budget M€</th>
<th>EU contr* M€</th>
<th># Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022-D2-01-01</td>
<td>Sustainable processing and refining of battery grade graphite</td>
<td>IA</td>
<td>10</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2022-D2-01-02</td>
<td>Interface and electron monitoring for the engineering of new and emerging battery technologies</td>
<td>RIA</td>
<td>10</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>2022-D2-01-03</td>
<td>Furthering the development of a materials acceleration platform for sustainable batteries (combining AI, big data, autonomous synthesis robotics, high throughput testing)</td>
<td>RIA</td>
<td>20</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>2022-D2-01-04</td>
<td>Towards creating an integrated manufacturing value chain in Europe: from machinery development to plant and site integrated design</td>
<td>IA</td>
<td>15</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>2022-D2-01-05</td>
<td>Next generation technologies for High-performance and safe-by-design battery systems for transport and mobile applications</td>
<td>RIA</td>
<td>15</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2022-D2-01-06</td>
<td>Embedding smart functionalities into battery cells (embedding sensing and self-healing functionalities to monitor and self-repair battery cells) maintainable, safe and efficient recycling processes</td>
<td>RIA</td>
<td>15</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

10 topics – total budget: €133 million
Call opening 28/04/22 – deadline 06/09/22

* Expected EU contribution per project
<table>
<thead>
<tr>
<th>Topic</th>
<th>Title</th>
<th>Action type</th>
<th>Budget M€</th>
<th>EU contr* M€</th>
<th># Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022-D2-01-07</td>
<td>Digitalisation of battery testing, from cell to system level, including lifetime assessment</td>
<td>RIA</td>
<td>15</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2022-D2-01-08</td>
<td>Coordination of large-scale initiative on future battery technologies</td>
<td>CSA</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2022-D2-01-09</td>
<td>Physics and data-based battery management for optimised battery utilisation</td>
<td>RIA</td>
<td>15</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2022-D2-01-10</td>
<td>Streamlined collection and reversed logistics, fully automated, safe and cost-efficient sorting, dismantling and second use before recycling</td>
<td>RIA</td>
<td>15</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

10 topics – total budget: €133 million
Call opening 28/04/22 – deadline 06/09/22

* Expected EU contribution per project
Batteries European Partnership Association
BEPA Aisbl - Governance scheme

The General Assembly - the supreme body of the Association
- approves the general policy of the Association on the basis of proposals of the Executive Board
- gives recommendations to the Executive Board for its application

The Executive Board
- follows the resolutions, instructions and recommendations adopted by the General Assembly.
- implements the policy and the work programme adopted by the General Assembly upon proposal of the Executive Board.

The Association delegation
- elaborates calls proposals in line with the work programme adopted by the General Assembly
- represents the private-side in the Partnership Board

The Alignment Board
- to align European and national priorities, identify opportunities for collaboration, avoid duplication of funding and disseminate information
- To identify outcomes of EU-funded projects of direct interest to national activities and offer demonstration possibilities to innovative solutions

The Office (under the authority of the Secretary General)
- Takes care of the daily management of the Association

BEPA

General Assembly
- Full members:
  - Industry Members
  - Research Members
- Associate Members

Executive Board
- 9 members + Secretary General

Partnership Board
- EC Delegates
  - DG RTD
  - DG MOVE
  - DG ENER
  - DG CNECT
  - DG CLIMA
  - DG GROW
  - JRC

Office
- Secretary General + Staff

Association Delegation
- Max ~25 members

MS Alignment Board
BEPA General Assembly 14/12/20

- General Assembly members: **178**
- Executive Board members (management of the Association): **8**
- Industry Delegation members (discussing topics with the EC): **22**

(SAFT)

(Umicore)

(CEA)

(Solvay/EMIRI)
The Partnership on Batteries, a central actor of the European R&I landscape

**PARTNERSHIP ON BATTERIES**

- **Identify the high priority topics to be implemented in its R&I work programmes**
  - Support and oversee the portfolio of funded projects
  - Reinforce networks between industry, RTOs, universities and other organisations
  - Attract engagement of more stakeholders in collaborative R&I activities and demo-projects
  - Encourage a robust lab-to-market process and innovation and technology transfer

**Inputs to define R&I calls (SRIA / Technology Roadmaps ...)**

**Coordination / Collaborations (facilitated by ETIP Batteries Europe)**

**Feedback for SRIA / roadmaps update**

**Other Partnerships**
- Battery downstream & complementary WP under Horizon Europe

**Other R&I activities**
- (under Horizon Europe, IPCEIs, S3 interregional Partnership, national and bilateral instruments,...)

**Horizon Europe Pillar 3 and other market uptake instruments**

**INNOVATION FUND**

**Skills development**

**Innovation and Technology Transfer**

**European Investment Bank**

**Other strategic bodies...**
Commission approves €3.2 billion support by seven Member States for project of common European interest for battery value chain.

<table>
<thead>
<tr>
<th>Raw and advanced materials</th>
<th>Cells and modules</th>
<th>Battery systems</th>
<th>Repurposing, recycling and refining</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASF</td>
<td>ACC</td>
<td>BMW</td>
<td>BASF</td>
</tr>
<tr>
<td>Eneris</td>
<td>BMW</td>
<td>Endurance</td>
<td>Endurance</td>
</tr>
<tr>
<td>Keliber</td>
<td>Endurance</td>
<td>Enel X</td>
<td>Elemental</td>
</tr>
<tr>
<td>Nanocyl</td>
<td>Eneris</td>
<td>Eneris</td>
<td>Eneris</td>
</tr>
<tr>
<td>Solvay</td>
<td>FAAM</td>
<td>Kaitek</td>
<td>FAAM</td>
</tr>
<tr>
<td>Terrafame</td>
<td>SEEL</td>
<td>SEEL</td>
<td>Fortum</td>
</tr>
<tr>
<td>Umicore</td>
<td>VARTA</td>
<td>Umicore</td>
<td>SEEL</td>
</tr>
</tbody>
</table>
Commission approves €2.9 billion support by twelve Member States for second important European project for **battery value chain**

<table>
<thead>
<tr>
<th>Raw and advanced materials</th>
<th>Battery cells</th>
<th>Battery systems</th>
<th>Recycling and sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACIS</td>
<td>Alumina Systems</td>
<td>ACIS</td>
<td>Borealis</td>
</tr>
<tr>
<td>Arkema</td>
<td>BMW</td>
<td>Alumina Systems</td>
<td>Enel X</td>
</tr>
<tr>
<td>Borealis</td>
<td>Cellforce Group</td>
<td>AVL</td>
<td>Engitec</td>
</tr>
<tr>
<td>Ferroglobe</td>
<td>ElringKlinger</td>
<td>BMW</td>
<td>FIAMM</td>
</tr>
<tr>
<td>Fluorsid</td>
<td>FCA</td>
<td>Endurance</td>
<td>Fortum</td>
</tr>
<tr>
<td>Green Energy Storage</td>
<td>Green Energy Storage</td>
<td>Energo Aqua</td>
<td>Hydrometal</td>
</tr>
<tr>
<td>Hydrometal</td>
<td>InoBat Auto</td>
<td>FCA</td>
<td>Italmatch</td>
</tr>
<tr>
<td>Italmatch Chemicals</td>
<td>Manz</td>
<td>FIAMM</td>
<td>Chemicals</td>
</tr>
<tr>
<td>Keliber</td>
<td>Midac</td>
<td>FPT Industrial</td>
<td>Keliber</td>
</tr>
<tr>
<td>Prayon</td>
<td>Northvolt</td>
<td>Green Energy Storage</td>
<td>Liofit</td>
</tr>
<tr>
<td>SGL Carbon</td>
<td>SGL Carbon</td>
<td>InoBat Energy</td>
<td>Little Electric Cars</td>
</tr>
<tr>
<td>Solvay</td>
<td>Skeleton Technologies</td>
<td>Manz</td>
<td>Midac</td>
</tr>
<tr>
<td>Tokai Carbon Group</td>
<td>Sunlight Systems</td>
<td>Miba eMobility</td>
<td>SGL Carbon</td>
</tr>
<tr>
<td>VARTA Micro Innovation</td>
<td>Tesla</td>
<td>Midac</td>
<td>Tesla</td>
</tr>
<tr>
<td></td>
<td>VARTA Micro Innovation</td>
<td>Rimac Automobili</td>
<td>Valmet Automotive</td>
</tr>
</tbody>
</table>

Financial support
Innovation Fund

Production and use of
Renewable energy
including manufacturing plants for components

Carbon Capture Use and Storage

Scaling up clean tech

Energy-intensive industries
including substitute products

Energy storage
including manufacturing plants for components
Innovation Fund - Key features

- Financed from the revenues of the EU Emissions Trading System
- Volume of at least EUR 14 billion until 2030 (at EUR 30 carbon price)
- Large projects: Support of up to 60% of additional capital and operating costs (up to 10 years)
  Small projects: up to 60% of CAPEX
- 40% of grant disbursed at financial close
- 60% of grant disbursed during 10-years operating period against GHG emission avoidance
  Small scale projects – shorter 3-years period
- Annual calls for large-scale and small-scale projects
- Single applicant or consortium
  Projects must be implemented in the EU, NO and IC
- Project development assistance
Award criteria

GHG emission avoidance
- Quantitative indicators for absolute and relative avoidance

Degree of innovation
- Beyond incremental innovation and impact on EU policy objectives

Project maturity
- Ready to reach financial close within 4 years? Viable investment? Ready to be implemented?

Scalability
- Market potential for widespread application

Cost efficiency
- Requested support per ton of CO2
<table>
<thead>
<tr>
<th>2020</th>
<th>Large-Scale call</th>
<th>Small-Scale call</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size of projects</strong></td>
<td>&gt; € 7.5M CAPEX</td>
<td>Between €2.5 and € 7.5M CAPEX</td>
</tr>
</tbody>
</table>
| **Eligible activities** | - Energy intensive industry  
- Renewables  
- Energy Storage  
- CCUS | Same |
| **Application process** | Two stages | Single stage |
| **Selection criteria** | - GHG emission avoidance  
- Degree of Innovation  
- Project maturity  
- Scalability  
- Cost efficiency | Same criteria  
Focus on innovative projects ready for market entry  
*Encouraged activities: DAC, net carbon removals and substitute products* |
| **Grant amount** | Up to 60% of additional costs | - Up to 60% of total CAPEX  
- Grant range = € 1.5 - 4.5M |
| **Grant disbursement** | - 40% at financial close  
- 60% dependent on delivery of GHG emission avoidance | Same, shorter monitoring period after entry into operation |
| **Project Development Assistance (PDA)** | Yes | Yes |
All call documents available on the **Funding and Tenders Portal**
https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/innovfund

- Guidance and calculation tools on GHG emissions and relevant costs
- **Frequently asked questions**

Further info, recorded webinars and videos available on IF Website
https://ec.europa.eu/clima/policies/innovation-fund_en