

PLANNED ADDITIONAL ACTIVITIES FOR THE BATT4EU PARTNERSHIP

JUNE 2021 – DECEMBER 2022

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Executive Summary

Within the Batt4EU Partnership, the Partners other than the Union, united in the Batteries European Partnership Association (BEPA), envisage to dedicate up to EUR 925 million for the period 2021 - 2030 in research, engaging their constituent and affiliated entities to make such investments. These contributions will complement the Union contribution and will at least match the Union contribution.

In this first Additional Activities Plan, the Partners other than the Union envisage to conduct at least **291 million EUR** in additional activities in the period covering June 2021- December 2022, already making a big step towards the final target. Furthermore they will spend up to **1.1 million EUR** and **180 person-months** on the workings of the Partnership.

These headline figures are based on the responses to a survey by 38 BEPA members and an assessment of the work done by BEPA members within the BEPA organisation. The underlying survey has targeted full industry and research members of BEPA and not yet the associations that are members of BEPA and their constituent members.

Additional Activities within the Batt4EU Partnership

The Batt4EU Partnership is a co-programmed European Partnership under Horizon Europe. The Partnership was launched in June 2021 and is built on a Memorandum of Understanding between the European Union and the Partners other than the Union, united in the Batteries European Partnership Association (BEPA).

The European Union envisages to dedicate up to EUR 925 million to actions within the scope of the Batt4EU Partnership. The Partners other than the Union in turn envisage to match this amount by in-kind contributions. This will take the form of in-kind contributions to the Actions funded by the European Union, but also the form of other in-kind contributions that are in the scope of the Partnership as set out in the Strategic Research and Innovation Agenda.¹ These activities are called In-Kind Additional Activities (IKAA).

The SRIA of the Batt4EU Partnership covers the entire battery value chain, from raw materials to battery cells manufacturing, end-use application and recycling, regardless of the chemistry or technology (as long as it matches the objectives of the partnership). While R&I will be performed on all parts of the value chain, advanced materials and battery cell design and manufacturing are seen as the key activities of the partnership,

for which well-structured coordination will allow Europe to develop the most differentiating technologies.

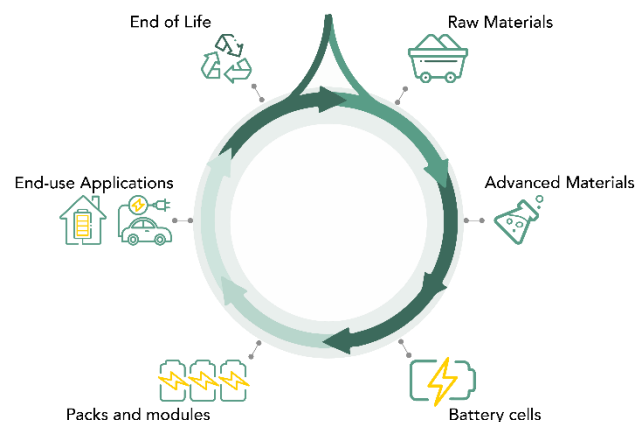


Figure 1: Scope of BEPA R&I Activities: a darker colour means more involvement

In terms of TRLs, both the enhancement of close-to-market Li-ion technologies (TRL 5-8), as well as new promising and longer-term breakthrough technological solutions (TRL 2-4) are included, provided they significantly contribute to achieving the defined specific objectives and to the long-term directionality of the proposed partnership within a reasonable timeframe. The objectives of the Partnership are listed on the BEPA website²

¹ <https://bepassociation.eu/our-work/sria/>

² <https://bepassociation.eu/about/batt4eu-partnership/>

Additional Activity Plan: scope and methodology

The Annual Activity Plan is foreseen to be approved by the Partnership Board on an annual basis. As the Partnership was officially launched in June 23 2021, this first Additional Activity Plan exceptionally covers the activities from June 2021 until December 2022.

In order to elaborate this first Additional Activity Plan, BEPA has conducted the following steps:

- Sending a survey to all its Industry and Research members to collect their IKAA for the planned period;
- Assessing the IKAA that are directly conducted within BEPA, either by the BEPA Office and/or the members of BEPA.

The Additional Activity Plan is structured along the different categories provided by the European Commission in a pre-defined template:

1. Supporting additional R&I (not publicly funded)
2. Scale up of technologies
3. Demonstrators
4. Creating new business opportunities
5. Training and skills development
6. Contribution to the development of new standards and regulations
7. Supporting ecosystem development
8. Communication, dissemination, awareness raising, citizen engagement

The template outlines different types of activities that fall within each category. However, in this survey, the BEPA members were free to describe the type of the activities they have planned per category. This was done to make sure that full flexibility was given in this first survey to make sure no IKAA was a priori excluded because of wrong assumptions about the types of activities.

The feedback collected by the survey will also be used to inform the ongoing development of the future reporting tool.

The survey did not ask the members to link all their activities to specific objectives, as many members have signalled that this would impose too much of a reporting burden. However, to give an indication of how activities link to the objectives, the BEPA Office has provided an estimate to which operational objectives of the Batt4EU Partnership. In Annex III, an overview of the objectives of the Batt4EU Partnership is given, including an indication which operational objectives contribute to which specific objectives.

IKAA reported by the BEPA Members

In total, 38 BEPA members answered the survey. The home bases of the 38 industry and research members span a total of 14 European countries. The survey targeted the industrial and research members of BEPA, although two trade organisations also replied.

Of these 38 members, 34 members were able to submit investment plans for their IKAA for the period June '21 – December '22. In total, these 34 members are planning to conduct **291 million EUR** worth of additional activities over the reporting period, covering all 8 categories mentioned. This figure shows a strong commitment by the Partners other than the Union to make the investments necessary to create a competitive battery R&I ecosystem in Europe.

	Replies	Investments
Industry	17	234.3 million EUR
Research	15	56.4 million EUR
Trade organisations	2	0.4 million EUR
Total	34	291.1 million EUR

Table 1: Total of IKAA investments reported in the survey

The picture shows that the majority investments are made by the European battery industry, but it also shows that the research members invest significant amounts in the necessary R&I needed.

In terms of distribution over the categories, by far the most investments go into supporting additional R&I, with over 172 million EUR of investments. The second biggest category is the

demonstrator category with nearly 62 million EUR in investments. The third biggest category, with over 44 million EUR investments, is the scale-up of technologies category. The other categories will see investments between 1.7 million and 3.2 million each.

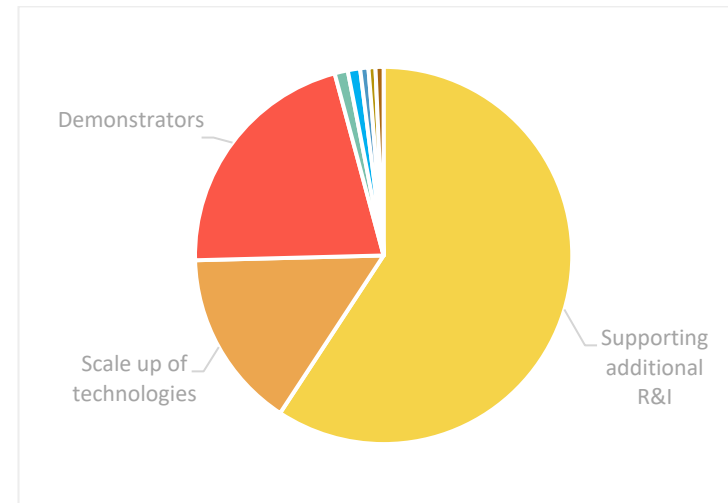


Figure 2: Investments in the different categories

The supporting additional R&I figure stands out. This figure is relatively high for this reporting period, as some companies are reporting the privately funded activities that are supporting the two Important Projects of Common European Interest (IPCEIs). In addition, the nature of the categorisation means that a large part of the activities conducted by the RTOs are listed in this category as well.

REPORTED IKAA AS A REPRESENTATIVE NUMBER FOR THE WHOLE BATTERY VALUE CHAIN

The figures for the reported IKAA have been provided by a small subset of the BEPA Membership. In itself, the entities that are direct members of BEPA does not cover all player that are active in the battery value chain, as a lot of companies have joined BEPA as part of an association like EASE, Recharge or EUCAR. The total investments in the European battery value chain are therefore much higher than the figures submitted in this report, also given the impetus given by the two IPCEI projects in this period.

In terms of timeline, it is good to take into account the timing of the investments. Especially the industry figures for '21 and '22 reflect business decision that date back to an earlier date, before the establishment of BEPA and the launch of the Partnership. However, a first indication that the appetite for R&I in the battery value chain will also outstrip the funds provided within the Horizon Europe framework, are the number of proposals submitted for the 2021 Work Programme. A total of 61 projects, worth 430 million EUR were tabled, where in the end only 22, with a value of 155 million EUR are poised to be funded.

INDUSTRY IKAA

The planned investments by the European battery industry are divided as follows over the different categories.

Category	Investments
Supporting additional R&I (not publicly funded)	124.4 million EUR
Scale up of technologies	38.8 million EUR
Demonstrators	61.6 million EUR
Creating new business opportunities	3.1 million EUR
Training and skills development	2 million EUR
Contribution to the development of new standards and regulations	1.8 million EUR
Supporting ecosystem development	0.9 million EUR
Communication, dissemination, awareness raising, citizen engagement	1.5 million EUR
Total	234.3 million EUR

Table 2: Total of IKAA investments reported by industry members

It can come as no surprise that the majority of the investments in scale up, demonstrators and creating new business opportunities come from the industry side. However, we see broad commitment, also in industry, to invest in training and the

³ For definitions of large, intermediate and SME, see; <https://bepassociation.eu/membership/become-a-member/>

development of skills and help develop the supporting ecosystem.

Of the 19 replies on the survey, 16 came from large and intermediate members. 3 came from SMEs.³ The survey shows that it's not only the large companies driving the investments, but it's also intermediate and SMEs are pulling their weight.

	Replies	Investments
Large	6	91.7 million EUR
Intermediate	8	114.5 million EUR
SME	3	26.6 million EUR

Table 3: Total of IKAA investments reported by different industry categories

In Annex I the types of activities reported by the industry members are further specified.

RESEARCH IKAA

The research and technology organisations and universities have reported the following investments in IKAA.

Category	Investments
Supporting additional R&I (not publicly funded)	48 million EUR
Scale up of technologies	5.8 million EUR
Demonstrators	0.1 million EUR
Creating new business opportunities	0.1 million EUR
Training and skills development	1 million EUR
Contribution to the development of new standards and regulations	0.2 million EUR
Supporting ecosystem development	0.7 million EUR
Communication, dissemination, awareness raising, citizen engagement	0.2 million EUR
Total	56.4 million EUR

Table 4: Total of IKAA investments reported by research members

Due to the nature of the categories, most of the work done by publicly funded RTOs and universities fall in the first category. The research members match the industry members in training and skills development and also in the support of the ecosystem development. This shows that the development of the ecosystems is being nurtured by both the industry and de research communities.

The majority of the IKAA investments by the research community have been reported by the large RTOs. However, universities reported more often difficulty in gathering the required information over dispersed faculties.

	Replies	Investments
Large RTO	9	46.1 million EUR
Small RTO	2	2.2 million EUR
University	4	7.5 million EUR

Table 5: Total of IKAA investments reported by different research categories

In Annex II the types of activities reported by the research members are further specified.

Additional Activities within BEPA

In parallel with the direct investments in IKAA by the industry and research members of BEPA, the members also invest time and effort in the working of the Partnership itself, both via financial contributions to BEPA, and via significant time spent on working towards the goals of the Partnership.

ACTIVITIES PLANNED BY BEPA DURING THE REPORTING PERIOD

During the reporting period, BEPA is planning to execute the following activities:

- Establishing five Technical Working Groups
- Establishing two Supporting Task Forces
- Publishing and updating the SRIA
- Working on the recommendations for the Horizon Europe Work Programme 23-24
- Organising matchmaking activities for the 2021 and 2022 Horizon Europe calls
- Establishing working relations with other Partnerships, including a trilateral collaboration with the 2Zero Partnership and the JRC.
- Reporting on the progress of the Partnership, on the in-kind additional activities and reporting the progress of Horizon projects.
- Organising, together with other European initiatives, the annual Battery Innovation Days
- Other communication activities, including the set-up of public and members-only websites.

CONTRIBUTIONS VIA MEMBERSHIP FEES

The activities by BEPA are supported by the BEPA Office, led by the Secretary General. The Office and all out-of-pocket costs are covered by membership fees paid by the BEPA members.

Year	BEPA budget
2021	0.6 million EUR (0.3 to count towards this reporting period)
2022	0.8 million EUR

Table 6: Annual budgets for the activities by the Partnership funded by membership fees.

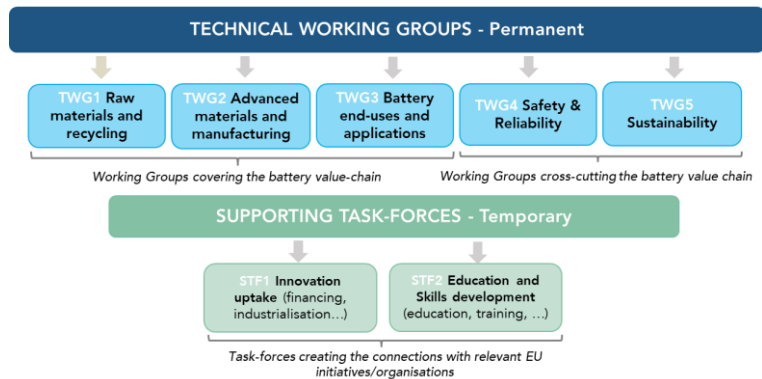
OTHER IN-KIND CONTRIBUTIONS BY THE MEMBERS TO THE PARTNERSHIP

In addition to the membership fees, the BEPA members contribute actively to achieving the goals of the Partnership by dedicating manpower to the various bodies that make up BEPA and the Partnership.

The governing bodies of BEPA meet regularly. There are four meetings of the General Assembly foreseen in the reporting period, assembling all members (183 as of 1-12-2021). Furthermore there are 15 meetings foreseen of the BEPA Executive Board (10 members) and multiple meetings of the BEPA Association Delegation (25 members) and the Partnership Board with the European Commission.

In addition to the time that members spend on the governing of the Partnership, they invest also in the activities of the Technical

Working Groups. The five technical working groups are poised to meet 10 times per year each, gathering roughly 350 members to contribute to tasks like the preparation of the 2023-24 Work Programme and the update of the SRIA. For the recommendations of the 2023-24 Work Programme, the Technical Working Groups will break down into dedicated drafting teams of 20-30 members, meeting up to 5 times to discuss the content of the draft call texts. In 2022 BEPA will start with two Supporting Task Forces, expected to gather around 20 experts who will meet roughly six times over the course of the year.



Finally, members contribute to the collaborations with other Partnerships. Here, one to three BEPA members per Partnership volunteer to be the bridge between BEPA and the other Partnership, ensuring the exchange of relevant technical information and reviewing the relevant call texts for the 2023-24 Work Programme, guarding for duplication

In total, this leads to the following contribution of BEPA members to the inner workings of the Partnership and the association in Person Months:

Type	Person-months
BEPA member involvement governing bodies	39
BEPA TWGs (incl. drafting teams), STFs and meetings with other Partnerships	141
Total	180

Table 7: Time spent by BEPA members on the functioning of the Partnership and BEPA in person-months.

For this AAP, these hours have not been costed, as some members have filed these contributions under category 7 (supporting the ecosystem) in the survey.

Annex I: Activities planned by Industry members

Supporting additional R&I (not publicly funded): 124.4 million EUR

Additional R&I activities in advanced materials, including:

- Early stage battery material research and development, exploring novel material concepts and manufacturing methods
- Additional activities in low-TRL accelerated material discovery
- Active material development (anode/cathode), product process development, application understanding,
- Developing new methods and materials for battery applications
- Additional activities on Li-ion, generations 3 and 4 (solid-state)

Linked to technical and scientific objectives a), b), c), d) and e)

Additional R&I activities in cell design and manufacturing, including:

- Development of proof of concept, enabling new processes for lithium battery manufacturing (e.g. process control systems, modular and flexible approach);
- Innovative lithium battery manufacturing production processes to achieve high quality and efficiency cell assembly system, and reducing the cell assembly lines energy consumption (low carbon footprint);
- Developing innovative lithium battery automation processes, complete with product traceability

(mapping each process with process and product data, digitization);

- Development of assembly processes and testing equipment for large scale production;
- Maximize Overall Equipment Effectiveness, increasing productivity in terms output rate (e.g. increasing mono-cells produced per minute, compared to the previous generation machines);
- Renewed machine architecture, and product performance, in terms of energy capacity, quality and durability.

Linked to technical and scientific objectives d), e), f) and g)

Additional R&I activities in recycling, including:

- Circular economy services, processes and products for the battery value
- (spent) Battery recycling technology development
- Battery recycling and precursor process development.

Linked to technical and scientific objectives d), e), f) and g).

Additional R&I activities in circularity and traceability:

- Circular economy services, processes and products for the battery value
- Battery passport for traceability

Linked to technical and scientific objectives e) and g).

Scale up of technologies: 38.8 million EUR

Scale up in the field of advanced materials:

- Research and development activities at components and system levels
- Advanced materials for solid-state battery technology
- Developing a continuous high throughput nanocoating technology to enhance battery performance
- Scaleup trials, feasibility studies and preliminary validation programs for battery materials
- Advanced sensing, including impedance spectroscopy
- Advanced data analysis, including:
 - o server-side and embedded AI techniques
 - o estimation of SoH, residual life, early detection of anomalies, early application of new (chemical) technologies
- Evaluating and developing dispersants for conductive additives.
- Investigating of electrolyte additives.

Linked to technical and scientific objectives a), b), c), d) and e).

Scale up in the field of cell design and manufacturing:

- Prototypes, pilot lines, research in new cell technologies and related production technologies
- Design and concepting of lithium battery pilot lines to produce new generation battery cells, implementing standardized manufacturing processes to reduce costs, energy consumption and improve

product performance. A modular approach will be implemented for a greater flexibility.

- Development of lithium battery manufacturing processes aimed at reducing carbon footprint through industry 4.0 strategies, including digitization with full traceability and advanced analytical tools (AI, machine learning).
- Feasibility study on the main lithium battery manufacturing processes and layout of automatic machinery.
- Development of innovative lamination techniques related to new generation batteries (all solid state).
- Development of ultracapacitor cells production equipment including laser welding process to improve the power cell performances.
- The testing of new types of cells (from mAh to 100Ah).
- Validation of new battery production/assembly technologies in prototype workshop

Linked to technical and scientific objectives d), e), f) and g).

Additional R&I activities in circularity and traceability:

- Battery passport for traceability
- Scale-up of technologies related to circular economy services, processes and products within the battery value chain

Linked to technical and scientific objective g).

Scale up in the field of recycling:

- Scale-up of precursor from lab-scale to pilot scale.

Linked to technical and scientific objectives d), f) and, g).

Scale up in the field of applications:

- Special charging systems (CCS vehicle-to-grid protocol, special high-power charging stations, induction charging)

Linked to technical and scientific objectives b), d), e) and g).

Demonstrators: 61.6 million EUR

Demonstrators in the field of advanced materials:

- Testing nanocoated material at industrial scale

Linked to technical and scientific objectives a), b), c), d) and e)

Demonstrators in the field of cell design and manufacturing:

- Investments within the battery business line
- the evaluation of the industrial processes of cells and modules.
- Demonstrators for LMFP batteries
- Simulations of production environments
- operational prototypes for electrical, leak, and mechanical testing of automotive battery pack
- the evaluation of the industrial processes of cells and modules.
- Building a pilot line for battery material production, extensive including validation programs

Linked to technical and scientific objectives d), e), f) and g).

Demonstrators the field of applications:

- System integration and management for mobility and stationary
Local/national battery prototype demonstrator (integrated in prototype vehicles)
- Local/national business model demonstration

- Set up of demonstrative battery packs for testing new sensors, new function implementation, end-application compatibility
- Fully circular vehicle (including battery)

Linked to technical and scientific objectives d), e) and g).

Demonstrators in the field of recycling

- a hydrometallurgical recycling facility
- development of (spent) battery recycling technology demonstrators

Linked to technical and scientific objectives d), f) and g).

Creating new business opportunities: 3.1 million EUR

- Investments in and projects with spin-offs/start-ups on solutions developed within the partnership projects
- Investments jointly organised with SMEs
- Salary of business development staff
- Promotional material, client visits, conferences, etc.

Linked to all technical and scientific objectives

Training and skills development 2 million EUR

- Training and skills development activities
- Skilling up of labour for the transformation

Linked to functional target f)

Contribution to the development of new standards and regulations: 1.8 million EUR

Contribution to:

- the battery directive (carbon footprint, recycling, 2nd life provisions,...)
- the development of new standards/standardisation/homologation efforts
- other activities dealing with other new regulations and standards, like charging
- work on IEC standards applicable to Li-ion batteries
- national platforms in the areas covered by the Partnership
- Scientific input to policy

Linked to functional targets c) and d)

Supporting ecosystem development: 0.9 million EUR

- Supporting ecosystem development by participating in technology clusters and innovations hubs, collaboration with universities, support of PhD projects.
- Participation/membership in regional and national battery initiatives
- Participation/membership in other European and transnational R&I initiatives and associations
- Building links between the national programmes and European activities
- Brokerage activities
- Roadmap development
- Support of industrial partners with R&D activities for the definition of sustainable and advanced lithium

battery production processes to be validated in first industrial deployment.

- To develop a fully digitalized, low energy consumption lithium battery production platform to produce battery cell assembly lines and will validate customized battery cell production lines to meet partner requirements
- Development of modular but integrated lithium battery assembly line concepts including comprehensive data acquisition and analytics capabilities. Emphasis will be done on the reduction of energy and CO2 consumption
- Development of new lithium battery welding / soldering machine platform.
- Promoting the transfer of lithium battery manufacturing-related knowledge to Universities, RTOs and companies

Linked to functional target a)

Communication, dissemination, awareness raising, citizen engagement: 1.5 million EUR

- Dissemination of results from projects and of the achievements of the partnership
- Dissemination of results, inventions and findings on zero emission mobility
- Specific communication and dissemination activities on Partnership results towards decision-makers
- Communication/marketing activities allocated for battery business
 - o Attending conferences and fairs (as speaker, with or without booth)

- Marketing activities to present products and develop visibility
- Press releases, papers, etc.
- Company blog
- Content creation in cooperation with trade magazines with a predominantly industrial circulation, together with magazines and newspapers with a more general circulation.
- Organization of round tables on electrification topics in hybrid mode, in the framework of national and international exhibitions.
- Activities to involve and raise awareness of users and communities at national, regional and local levels.
- Citizen engagement, public communication activities that target at all stakeholder groups, examples include company blog to disseminate of technical content on electrification that is easy for citizens to understand.

Linked to functional targets e) and f)

Annex II: Activities planned by Research members

Supporting additional R&I: 48 million EUR

- Research projects on batteries funded by industry (private fundings) and national institutions, such as the Ministry of Education, University and Research (public fundings), implemented by our research members.

Linked to all technical and scientific objectives.

Additional R&I activities in raw materials, including:

- R&I: projects / project work related to battery raw materials
- R&I-infrastructure (mineral processing pilot plant development / enhanced services including battery raw material processing)

Linked to technical and scientific objectives d), and, g).

Additional R&I activities in advanced materials, including:

- Development of electrode materials for Gen. 3 batteries
- Development of Li-metal anodes
- Development of electrode materials for post-Li batteries
- Development of electrode materials for Li-S batteries
- Synthesis and characterization of Lithium Thio-OxyBorate Solid Electrolyte
- R&I activities on redox flow and post-Lithium batteries from material development to cell and module design and prototyping (TRL 1-5).
- R&I on cells, packs, systems and BMS.

- Storage materials and components for electrochemical and thermal storage
- Advanced material characterisation including economic assessments
- Understanding battery electrode materials and electrode/electrolyte interfaces by advanced electron microscopy
- Neutron beam time for non-destructive observations

Linked to technical and scientific objectives a), b), c), d) and e)

Additional R&I activities in the field of applications, including:

- Research into BMS (including thermal management), integration, development of charging infrastructure, stationary storage and 2nd life batteries.
- Hybridization studies for stationary storage
- R&D and consultancy work on storage integration into the network
- Storage modelling (battery digital twin).

Linked to technical and scientific objectives b), d), e) and g).

Additional R&I activities in the field of recycling, including:

- Research in battery recycling
- LCA of recycling processes
- Cell recycling

Linked to technical and scientific objectives d), f) and, g).

Scale up of technologies: 5.8 million EUR

- Validation of technology in a lab: personnel and infrastructure
- Scale up of materials synthesis
- Implementation of a pilot line for battery cell production
- Validating and scaling up industrial processes

Linked to all technical and scientific objectives.

Demonstrators: 0.1 million EUR

- E-vehicles, stationary batteries coupled to PV
- Flow Batteries

Linked to technical and scientific objectives c), d), e) and g).

Creating new business opportunities: 0.1 million EUR

- Supporting spin-offs companies through a dedicated technology transfer division
- Matchmaking and support for start-ups
- Kick-starting investment to launch a solid state battery cells factory

Linked to technical and scientific objectives a), b), c), d) and e).

Linked to functional targets e).

Training and skills development 1 million EUR

- PhD scholarships on the subject and PhD students tutoring of our researchers.
- Co-supervision of PhD students by public RTOs.
- Summer student work programmes for Master students that are focused on the integration of batteries for energy storage and maritime
- Joint education/training programs with industry
- Teaching at a university by RTO employees
- Scientific career development program: Inhouse PhD grants

Linked to functional target f).

Contributions to the development of new standards and regulations: 0.2 million EUR

RTO contributions to:

- Public policy-making processes (European, national regional).
- Development of new standards for the energy system.
- Policy papers (e.g. on battery reliability standards)

Linked to functional targets c) and d)

Supporting ecosystem development: 0.7 million EUR

- Supporting ecosystem development by being engaged in European institutions and associations, and Partnerships.
- Supporting ecosystem development at local and national level by participating in innovation hubs, streamlining the value chain and working on battery R&I roadmaps.
- Activities to support open science, open innovation and data sharing, including open source modelling and publication.
- Partnering with international universities to analyse the commercial viability of battery-related patents.

Linked to functional targets a), b) and e).

Communication, dissemination, awareness raising, citizen engagement: 0.2 million EUR

- Organisation of conferences and webinars on specific topics, networking events
- Participation of researchers to workshops and conferences on batteries as speakers and scientific publications on the subject.
- Engagement in several projects and initiatives involving local level regions and stakeholders in particular in relation to stationary storage and charging infrastructure.
- Participation in the organisation of national events to highlight the opportunities for the battery industry in joining Batteries Europe and BEPA.

- Creation and/or collaboration with industry relevant publications
- Knowledge building and repository
- Activities to ensure a stronger engagement at local level with regions, cities, citizens and other local stakeholders
- Organization of workshops bringing together the national and regional stakeholders along the battery value chain, to discuss the potential for collaboration.

Linked to functional targets a), b), e) and f).

Annex III: Objectives of the Batt4EU Partnership

The general objectives of the Co-programmed European Partnership are defined as follows:

- GO1: Contribute to making Europe the first climate-neutral continent by 2050 by widespread adoption of e-mobility and stationary electrical energy storage;
- GO2: Enable European leadership in the battery industry across the value chain, creating economic growth and quality jobs in a circular economy, by supporting the development of an innovative, competitive and sustainable battery manufacturing industry and a skilled workforce in Europe;
- GO3: Contribute to achieving a zero-pollution ambition for a toxic-free environment, by providing safer and more sustainable batteries and processes in the context of the circular economy (along the whole value chain, including recycling).

The specific objectives are the following:

- SO1: Support the development of differentiating technologies in battery materials, cell design and manufacturing and battery recycling, leading to demonstrations of new chemistries, cells, production lines and proof of concept of recycling logistics and methods.
- SO2: Accelerate the development and deployment of sustainable and affordable battery solutions for clean mobility, by building a strong innovation ecosystem with downstream partnerships leading to joint demonstrations in different transport modes.
- SO3: Enable a cost-effective integration of renewable energy sources in the power grid, by developing affordable batteries for stationary energy storage applications, leading to demonstrations of different scales of storage systems.

The operational objectives are shown below. An indication to which specific objective these operational objectives contribute is shown in brackets behind each objective.

A: By 2030, achieve the following **technical and scientific targets**:

- a) increase battery energy density (+60% compared to 2019 values) (SO1,2)
- b) increase battery power density and charging rate (SO1,2,3)
- c) improve cycle lifetime (at least by a factor of 2 compared to 2019 state-of-the-art values) (SO1,2,3)
- d) reduce battery cost (-60% compared to 2019 values) (SO2,3)
- e) ensure battery safety in the different targeted application sectors (SO2,3)
- f) implement worldwide Best Available Technologies in manufacturing and recycling operations (SO1)
- g) enhance the sustainability of the main supply chains of battery raw materials and achieve the lowest possible carbon footprint of the supply chain from raw materials extraction through battery manufacturing, use and recycling. (SO1,2,3)

B: Throughout the life span of the Partnership, achieve the following **functional targets**:

- a) promote the involvement of relevant stakeholders in the activities of the partnership, including by appropriate geographical representation, gender balance and increasing the membership of private side association;
- b) establish close working relationships with the other partnerships listed in section 5.4;
- c) support the related standardisation activities in close cooperation with standardisation bodies;
- d) provide scientific input for informed regulation and related Union policies;
- e) ensure a wide communication and dissemination of activities and results;
- f) contribute to the education of future workers and the public awareness.