COLLABAT

From research to road – how R&D battery projects can help to overcome challenges in European Battery EV uptake

ALBATROSS HELIOS LIBERTY MARBEL iBattMan InnoBMS ARISE 5MILE

COLLABAT Cluster Intro

prepared for BID 2025 in Graz & online, 3rd Dec 2025

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BATTERY INNOVATION DAYS
5th edition!
2-3 DECEMBER 2025
GRAZ, AUSTRIA ..and online

All Collabat projects have received funding from the European Union under Horizon research and innovation programme. This presentation reflects only the views of the projects.

about the **COLLABAT** cluster

Historically, the Collabat Cluster of Battery R&D projects, co-funded within the EU Horizon programme, started with 4 projects from LC-Bat-10-call *Next generation and realisation of battery packs for BEV and PHEV,*

now 2 new projects from HORIZON-CL5-2023-D5-01-02 *Innovative battery management systems for next generation vehicles (2ZERO & Batt4EU Partnership),*

and the last 2 from HORIZON-CL5-2024-D5-01-03 *Advanced battery system integration for next generation vehicles (2ZERO Partnership)* have joined.

COLLABAT is a European cluster uniting R&D projects to advance BEV battery packs. The cluster brings together independent R&D projects focused on advancements in electric battery systems, aiming to boost awareness and promote tech transfer across academia, OEMs, and the EV battery supply chain.

Focus areas include battery integration, BMS, lightweight materials, battery passports with recycling focus, charging station interactions, and others… to support next-gen e-mobility innovation.

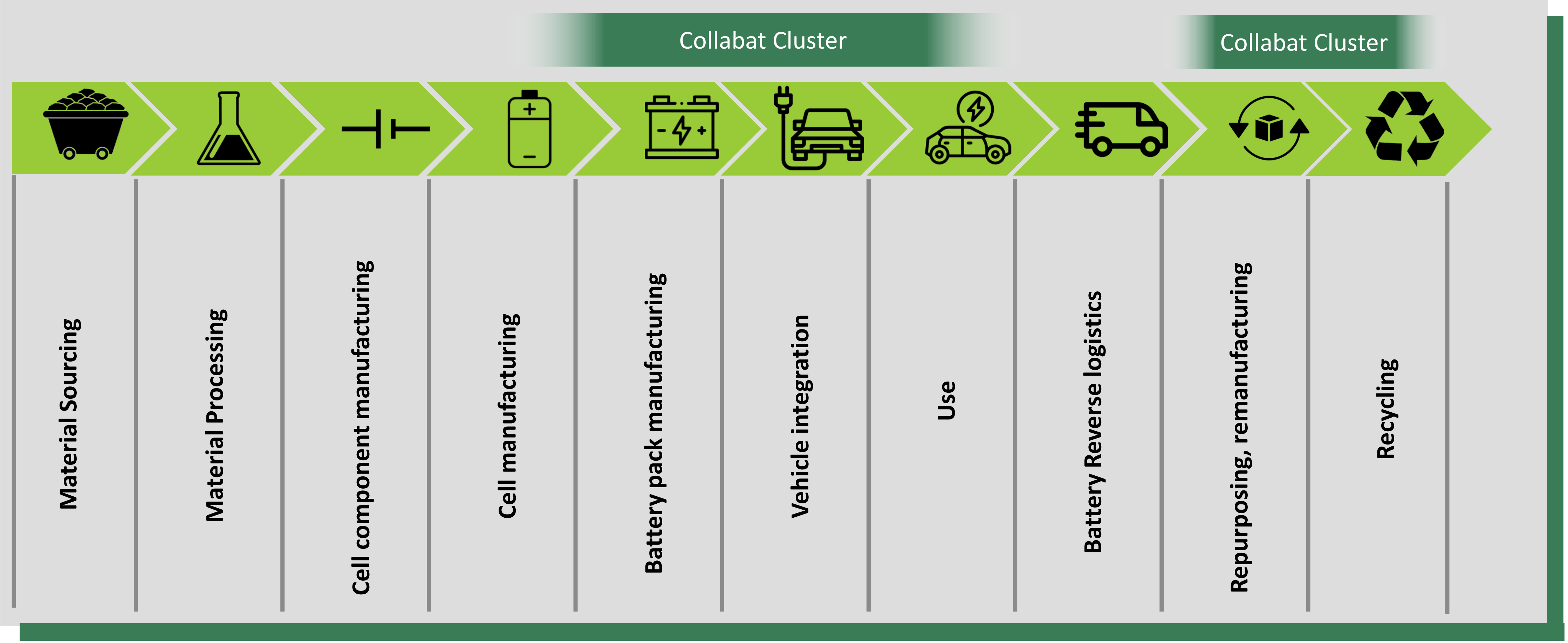
COLLABAT transition

- 4 founders project have/will end soon

- We have already 4 new project members to continue

- … more projects to join & keep the flame alive !

COLLABAT in Battery Value Chain



COLLABAT cluster goals

- Accelerate the mass market take-up of electric vehicles by addressing challenges like vehicle range, charging time, safety, durability, easier recovery & recycling, 2nd life usage and better sustainability
- Expected Impact:
  - Reduce battery system weight while improving battery performance, fast charging speed , battery pack volumetric density, safety and prolongation of battery life-time
  - Innovative battery management system (BMS) including data for 2nd life and Vehicle-to-everything (V2X) applications.
  - Interfaces to allow access to the BMS and its database by vehicle charging infrastructure and related mobility services providers
  - Enhanced communication between battery and vehicle control unit for a more efficient battery operation.
  - Novel approaches to battery integration into vehicle structure focusing on solid state generation-4 cells
  - Reduced battery system cost considering the functionalities of the vehicle structure and safety aspects.

COLLABAT in detail

- 3 main subclusters until 2025 – *new subclusters will be defined soon:*
  - Sub – A: Sustainability (LCA, 2nd life, Ecodesign)
  - Sub – B: Testing & Validation
  - Sub – C: BMS (Hardware & Software)

- The main purpose is to engage on technical topics of discussion and identify potential synergies among projects.
- We provide specific outcomes valuable to upcoming EU projects, academia, industry etc.
- Our advances have been showcased on dissemination events, incl series of webinars.

COLLABAT cluster members

High-performance modular battery packs for sustainable urban electromobility services

Some Key-Innovations:
- Hybrid combination of High Energy with High Power cells in one pack
- Modular & scalable design combining different battery modules & DC/DC
- Advanced BMS and Multi-Sensor-Unit using wireless communication
- Digital Twin, IoT Cloud based solutions, Fleet management software
- Ultrafast-charging at 360 kW
- Validation on a) small city EV car and b) full-size Bozankaya E-Bus

Manufacturing and Assembly of modular and Reusable EV Battery for Environment-friendly and Lightweight mobility

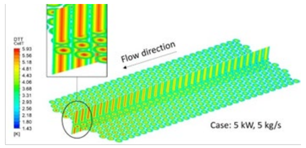
Some Key-Innovations:
- > 20% weight reduction
- > 25% charging time reduction
- > 40% LCA improvement by using modularity
- Useful Battery life up to 300,000 km
- Easy & Safe (dis-)assembly automatization
- Reparability and 2nd life transition
- Adaptable to all cells and vehicles

COLLABAT cluster members

Advanced Light-weight BATteRy systems Optimized for fast charging, Safety, and Second-life applications

Some Key-Innovations:
- Weight reduction by 20%
- Recharging time, 25% shorter
- Useful battery life enhancement
- Life Cycle Analysis – LCA improvement by 20%
- Sensorisation and thermal management knowledge
- Operational battery pack
- Validation on a BMW i3

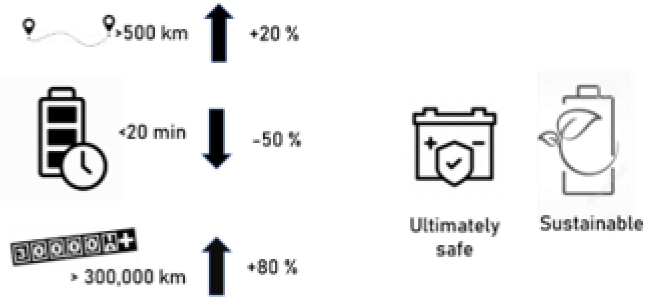




Lightweight Battery System For Extended Range at Improved Safety

LIBERTY
LIGHTWEIGHT BATTERY SYSTEM
FOR EXTENDED RANGE AT IMPROVED SAFETY

Some Key-Innovations:
- Cell-to-Pack solution
- Immersion cooling
- Enhanced Safety System
- Advanced BMS and SOX algorithms
- Validation on a Mercedes EQC



COLLABAT cluster members

iBattMan

Smart, Connected and Secure Battery Management System Enhanced by Next-Generation Edge- and Cloud-Computing, Sensors and Interoperable Architecture

Some Key-Innovations:
- Innovative modular BMS platform to enhance battery performance and reduce TCO
- Incorporate novel sensors and methodologies for monitoring the SoH of the cells during operation and in charging
- Cutting-edge technologies and tools for V2X and second-life applications
- Use advanced physics- and data-based models implemented on-board and on-cloud

InnoBMS

Situationally aware innovative battery management system for next generation vehicles

Some Key-Innovations:
- Integrated system, highly connected and self-testing, for balanced decisions
- predictive SoX diagnostics
- Use of advanced models and secure real-time battery management to reduce margins
- Collecting and managing data for accurate second life classification, and interfacing to Vehicle-to-everything applications (V2X)

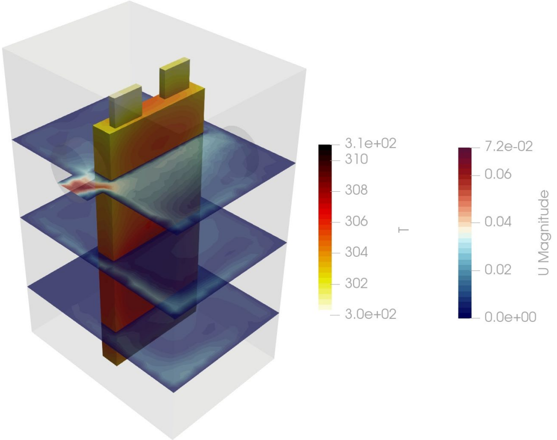
COLLABAT cluster members

ARISE

Advanced BatteRy System and Integration for Generation-4 Solid State Cells

Some Key-Innovations:

- Innovative thermal management approaches, with a strong emphasis on two-phase heat transfer.
- Integration of immersion cooling method for 4th-generation SSB cells.
- Optimization and Benchmarking existing Thermal management methods on SSB cells
- Prototyping an end-user SSB-based expansion pack to evaluate system-level performance.



S-MILE

Solid State Battery Smart & Structural Modular Integration into Vehicle through Flexible Module to Chassis Design

Some Key-Innovations:

- Fully integrated permanent V-module enabling a "near-to-skateboard" (N_SKBRD) vehicle layout for optimal packaging and structural efficiency.
- "Plug' n' Play" V-Boxes, physically identical to V-Modules, allowing on-demand expansion of battery capacity.
- C2M2C frameless modular battery system, following a cell-to-module-to-chassis (C2M2C) architecture for maximum integration and scalability.

contributions of COLLABAT

Expected final results from the Collabat projects will contribute to...

Longer vehicle range

- hybrid dual chemistry battery pack
- by improving state estimation and energy-management, without battery oversizing
- enabling over 30% total battery capacity expansion through Plug'n'Play V-Boxes

Faster charging time

- up to 10C with 360kW charging stations
- by applying multi-step constant-current, boost/pulse and model-based strategies
- enabling higher C-rate capability of solid-state chemistry supported with improved thermal spreading and smart charging algorithms.

Reduced battery pack weight & volume, increased energy/ power density of the battery pack

- lightweight materials & structures
- integrating BMS electronics and using wireless communication to cut pack volume and wiring
- adopting cell-to-pack architecture, lightweight enclosures
- reducing thermal-management system weight by at least 25%

contributions of COLLABAT

Expected final results from the Collabat projects will contribute to…

Enhanced safety

- multi-sensor-unit to early detect & allert of thermal runaway
- employing fibre-Bragg and other sensors that detect temperature changes and pressure/gas anomalies
- using non-flammable solid electrolytes, advanced intrusion-resistant structural design, and improved thermal runaway mitigation layers
- improving torsional stiffness by at least 12%, increasing frontal & side impact safety with optimized structures

Better LCA and sustainability

- extending battery life and improving utilisation to reduce environmental impact and align with circular-economy goals.
- employing recyclable materials, modular pack architecture, and reduced cooling/energy demand throughout the battery’s lifetime.
- by reducing the system carbon footprint by 20% compared to current systems

Easier recycling

- enable for semi-automated dismantling, screw connections of busbars instead of laser welding
- using detailed SoH data plus battery passport to speed classification and processing of EoL batteries
- modular SCA-based construction and reduced use of adhesives
- achieving a recycling rate potential of 90% of total system mass

contributions of COLLABAT

Expected final results from the Collabat projects will contribute to…

Easier repurposing and use in 2nd life

- wireless BMS and modular boxes for each type of cells (High Power box vs High Energy box) for easier repurpose
- adopting interoperable BMS hardware, rapid second-life characterisation and a microgrid demonstrator to simplify repurposing and reduce testing for aged batteries
- enabling cell-level health monitoring and modular 12/16-cell blocks suitable for stationary storage.

Reduced battery system costs

- utilization of low-cost of the shelf available High Power and High Energy cells, combined in dual chemistry hybrid pack
- achieving a ≈10 % volume reduction, ~97 % cheaper temperature sensors and ≈30 % shorter testing time through integrated BMS electronics, fibre-Bragg sensors and high-fidelity models
- minimizing wiring harnesses, simplifying cooling systems, and standardizing module designs
- targeting a 10% overall system cost reduction though innovative designs

COLLABAT acknowledgment

All Collabat projects have received funding from the European Union under Horizon research and innovation programme. The respective grant agreements n° see below:

COLLABAT members

Project	Grant Agreement
ALBATROSS	963580
HELIOS	963646
LIBERTY	963522
MARBEL	963540
iBattMan	101138856
InnoBMS	101137975
ARISE	101192291
SMILE	101193026

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Thank you !