

FREE4LiB

TREASURE Spring School

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POLITECNICO MILANO 1863



Funded by
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FREE4LIB IN A NUTSHELL

Feasible **RE**covery of critical raw materials through a new circular **E**cosystem **FOR** a **Li-Ion B**attery cross-value chain in Europe [FREE4LIB Project video \(youtube.com\)](https://www.youtube.com/watch?v=...)

Duration of the project: 4 years (1 Sept 2022 – 31 Aug 2026)

Project funded under Horizon Europe research and innovation programme under Grant Agreement No 1069890

Topic: HORIZON-CL5-2021-D2-01-06 - Sustainable, safe and efficient recycling processes (Batteries Partnership)

EU Funding: 9,3 M€



FREE4LIB

FREE4LIB Concept

22 partners from 7 different countries, coordinated by CARTIF



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FREE4LIB

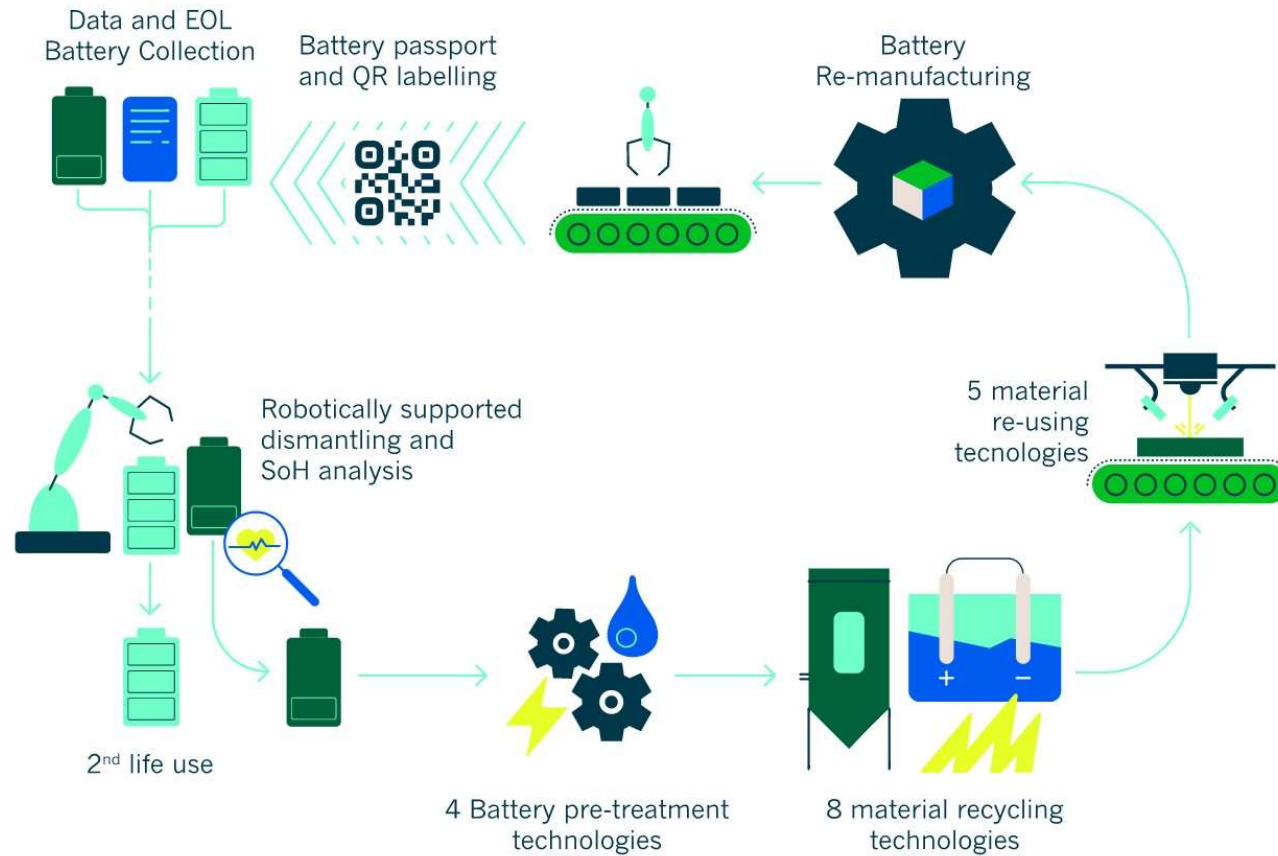
Objectives

FREE4LIB tackles the following objectives

- **Create feasible and holistic recycling processes** by analysing and evaluating data from LIBs.
- **Develop sustainable and efficient technological solutions for recycling different Li-battery chemistries and material re-using** based on intelligent process design to optimise its scale up.
- **Recover higher amount of resources from spent LIBs to use as secondary raw materials in new batteries** based on a sustainable transferability model to improve vertical integration on manufacturing.
- **Design for Recycling (DfR)** of new Li-batteries
- **Create a Battery Passport and battery recycling modelling platforms**
- **Research on 21 technologies covering the entire Li-ion battery value chain**



FREE4LIB's concept



Expected Results

Recycling Technologies

1. Robotically-supported dismantling of battery pack.
2. Mechanical pre-treatment.
3. Hydromechanical pre-treatment.
4. Manual delamination.
5. Ultrasonic delamination.
6. Direct NADES leaching of cathode paste.
7. Re-lithiation of cathode paste.
8. Electrochemical Re-lithiation of cathode foil.
9. Carboreduction of black mass.
10. Leaching of black mass.
11. Decontamination of recovered thermoplastics by sc-CO₂ and material upcycling.
12. Thermoset materials recovery (microwave assisted by pyrolysis).
13. Centrifugal powder atomisation.

Other results

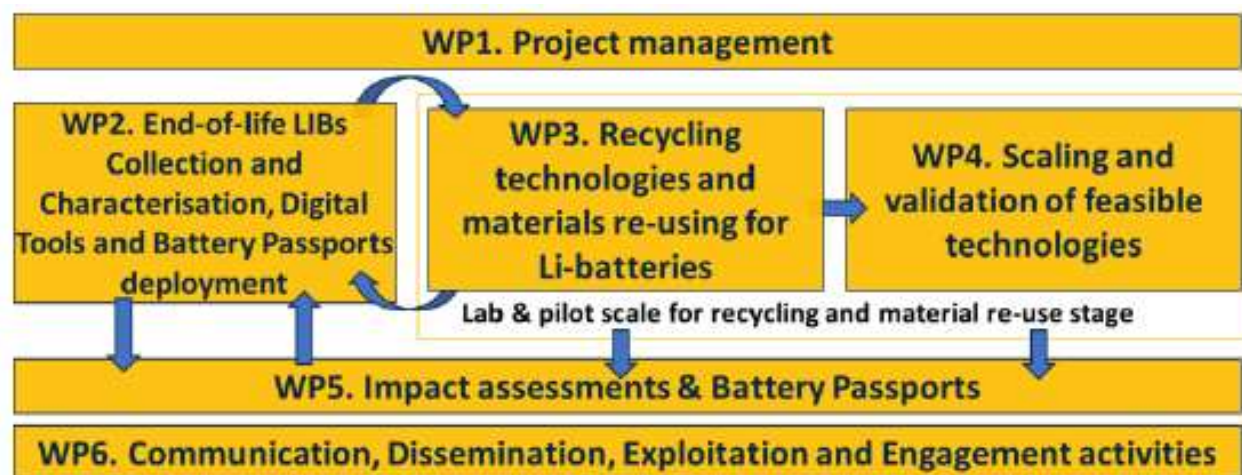
1. Battery passport Platform.
2. Guidelines for Design for Recycling.

Life Cycle Assessment, Technoeconomic Analysis, Social Life Cycle Assessment, Hazard and operability studies.

Remanufacturing technologies

1. Selective Laser Melting.
2. Extrusion of recovered Aluminium alloys.
3. Solid state electrode synthesis.
4. Hydrothermal electrode synthesis.
5. Flame Spray Pyrolysis electrode synthesis.
6. Electrode coating.
7. Electrode fabrication for coin cells.
8. Puch cells manufacturing.

Project Work Packages



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KEEP IN TOUCH



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Thank you
