

## **EU projects on innovative re-use and recycling solutions for lithium-ion batteries**

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The rise of the electric mobility market will bring the issue of end-of-life management of batteries into focus. Used lithium-ion batteries (LIBs) are, on one hand, suitable for second-life applications, representing an opportunity for reuse and thus reducing dependence on energy and raw materials from countries outside Europe. On the other hand, there are still technical obstacles that prevent their reuse and even proper recycling. In addition, there is a great heterogeneity in battery formats and the assessment of their condition for further use is a slow process, currently performed with equipments not suitable for industrial settings.

New processes suitable for reuse and recycling need to be developed to achieve higher efficiencies and recovery rates, and to reintroduce critical raw materials (CRMs) from spent LIBs. As Erion, Italy's largest multi-consortium producer responsibility organization for different EoL products, such as WEEE, batteries, packaging, and tobacco, our role in value chains is crucial as we connect producers and recyclers, enabling and testing possible solutions to the "closing the loop" challenge. In Erion's Strategic Development and Innovation department, we are partners in two EU-funded projects, FREE4LIB and REBELION, which aim to develop innovative technologies to facilitate the reuse, recycling and remanufacturing of lithium-ion batteries.

FREE4LIB stands for "feasible recovery of critical raw materials through a new circular ecosystem for a li-ion battery cross-value chain in Europe". It has the objective to develop technologies for the Lithium-ion batteries dismantling, pre-treatment, recycling, manufacturing, and 2nd life, and provide an analysis of the value chain of end-of-life lithium-ion batteries, including its LCA, and considering the Digital Battery Passport. Started in September 2022, it will last for 48 months.

The overall objective of REBELION is to develop cutting-edge technologies to promote a circular model for e-mobility LIBs, enabling feasible industry practices in the coming years to maximise second-life applications and future recycling. This will require achieving the following technical objectives: 1) study and develop a diagnostic method for batteries based on Electronic noise Analysis to sort them into different standard states; 2) develop and automated testing and dismantling system for different battery formats; 3) generate a safety protocol for every step of the value chain; 4) develop a of standardized battery labelling system enabling all interested parties to automatically obtain necessary data of second life batteries.

The presentation will show the progress of both projects on the development of technologies related to battery reuse and recycling.