BATTERIES REUSE AND DIRECT PRODUCTION OF HIGH-PERFORMANCES CATHODIC AND ANODIC MATERIALS AND OTHER RAW MATERIALS FROM BATTERIES RECYCLING USING LOW-COST AND ENVIRONMENTALLY FRIENDLY TECHNOLOGIES

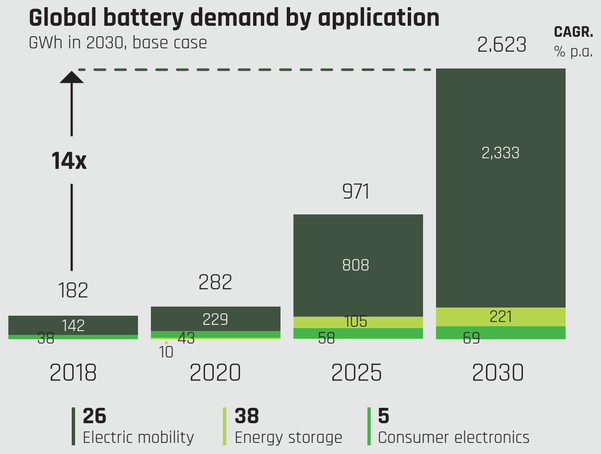


A GREENER SCENARIO REQUIRES SAFER MATERIAL SUPPLY FOR THE PRODUCTION OF LIB

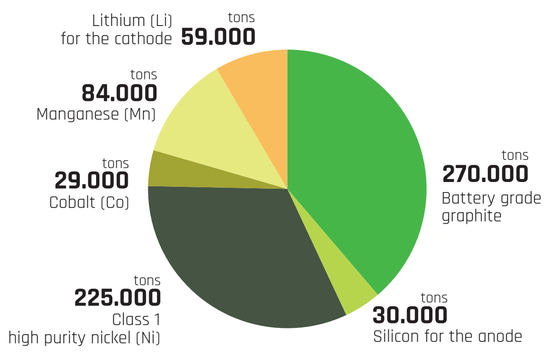
Versatile energy storage technologies, Lithium-ion batteries (LIB) have proven to be a reliable solution, especially when it comes to the production of low-emission fleets (electric vehicles), followed by stationary storage market and consumer electronics. By 2030, the global demand for Li-ion batteries is estimated to increase 14 times, while the production in Europe is expected to rise to 300 GWh/year.

Global battery demand by application

GWh in 2030, base case

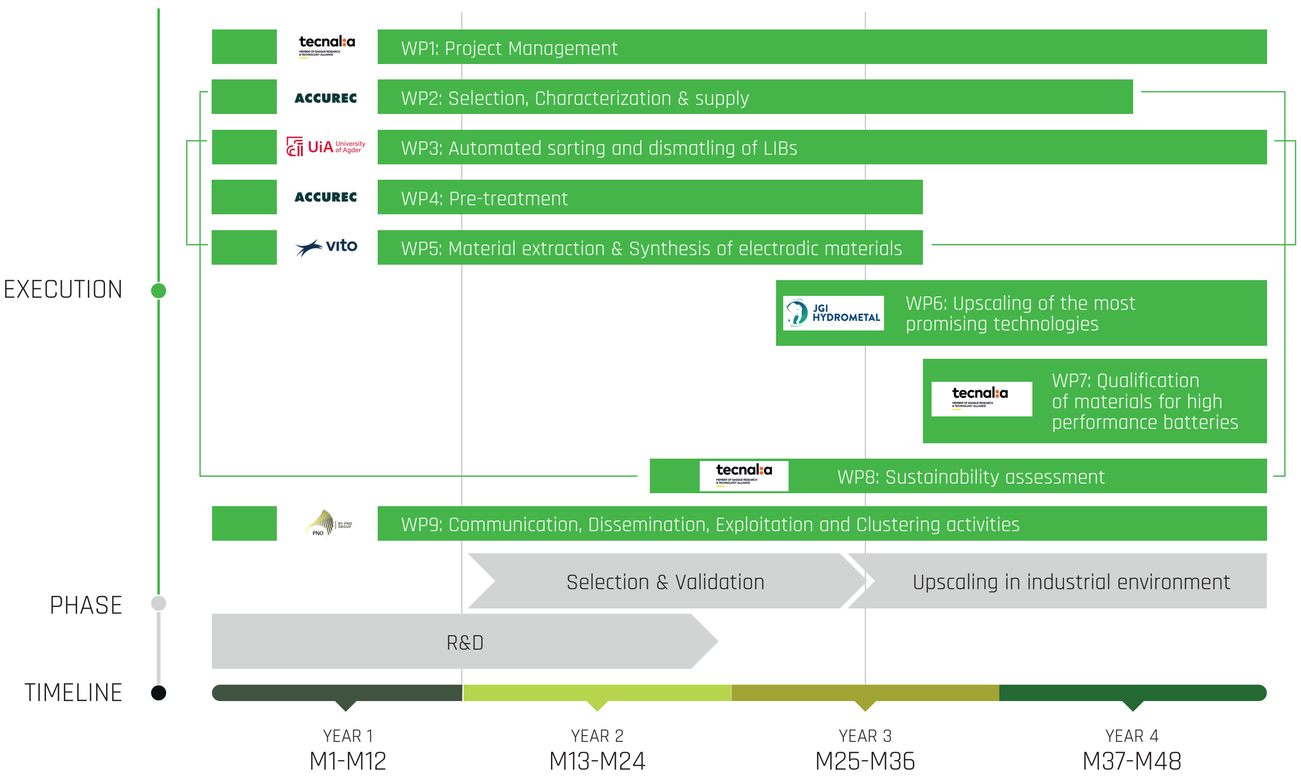


Estimation of raw material requirements for the annual production of LIBs in 2030



RHINOCEROS'S CONTRIBUTION TO THE EUROPEAN RAW MATERIALS INDEPENDENCY

Currently dependent on imports amid growing demand for materials required by the production of LIBs, Europe is looking for innovative recycling technologies that will recover not only valuable raw materials, but whenever possible, all cell components, thus increasing sustainability.
The RHINOCEROS project proposes novel technologies for the recycling and production of high-performance and low-cost battery materials targeting high recycling rates, materials' purity, low carbon footprint and increased scalability potential.



OBJECTIVES

The main objective of RHINOCEROS is to develop and improve economically and environmentally viable routes for re-using and recycling end-of-life electric vehicles and stationary energy storage LIBs. Within the project, these innovative recycling solutions will be tested and demonstrated in an industrially relevant environment.

- Develop a smart sorting and dismantling system that enable the automated classification and dismantling of LIBs from EV and stationary energy systems, and the reassembly of operational modules in new repurposed batteries.
- Propose novel solutions for the reuse and repurpose of batteries for second life applications.
- Develop a set of cost-efficient, flexible and environmentally friendly routes targeting the recycling of all materials present in LIBs (e.g., metals, graphite, fluorinated compounds and polymers, active materials).
- Identify and address health risks, environmental impacts, safety hazards and new safety practices related to the developed processes;
- Perform cost analysis.
- Validate the recovered material through the synthesis of new high-performance electrodes and elements for next generation batteries – thus demonstrating the circularity, societal, environmental and economic benefits.
- Validate the most promising process at TRL 6 pilot level.
- Disseminate and communicate the results of the project and amplify their impact.

PROJECT'S PATHWAY TO IMPACT

The RHINOCEROS project aims to facilitate access to battery materials by developing an innovative, circular, and highly performing processing chain that will repurpose or target the recovery of most of the materials from EoL batteries at high purity and competitive prices. Demonstrating a recycling route for EoL EV and stationary batteries, the project will contribute to decreasing Europe's dependency on CRM import (Li, Co, graphite).

SCIENTIFIC
- New breakthrough scientific discovery on repurposing and reusing LIBs for second-life applications;

ENVIRONMENT
- Sustainable, safe, low-carbon footprint technologies
- Zero liquid waste discharge process

ECONOMIC/TECHNOLOGICAL
- Pilot recycling process which will accelerate the growth of innovative, competitive and sustainable battery recycling and manufacturing industry.

SOCIETAL
- Safer processes for operators
- Less toxic waste released
- Strengthened resilience, lowered dependency on CRMs imports required by the emerging European green growth

€ 8.943.025 BUDGET

48 MONTHS

17 PARTNERS

9 COUNTRIES

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PROJECT COORDINATION

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