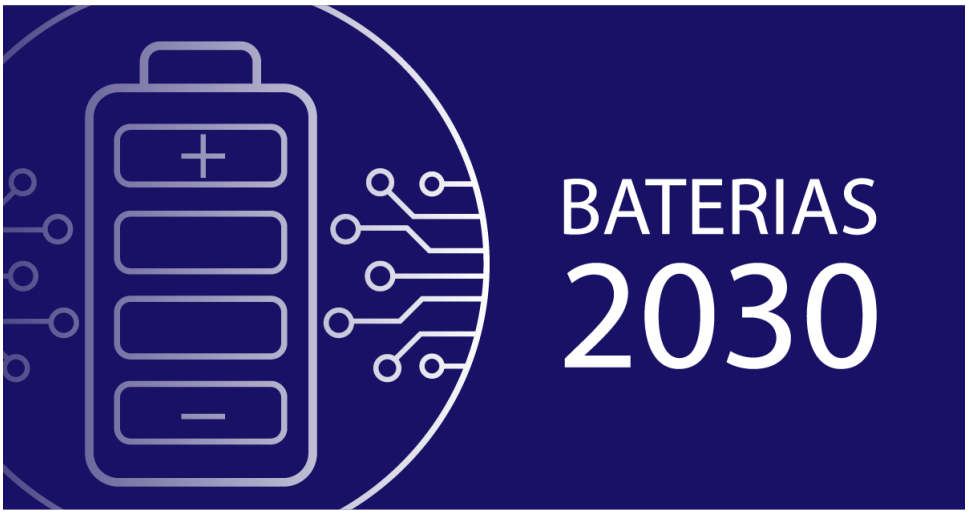
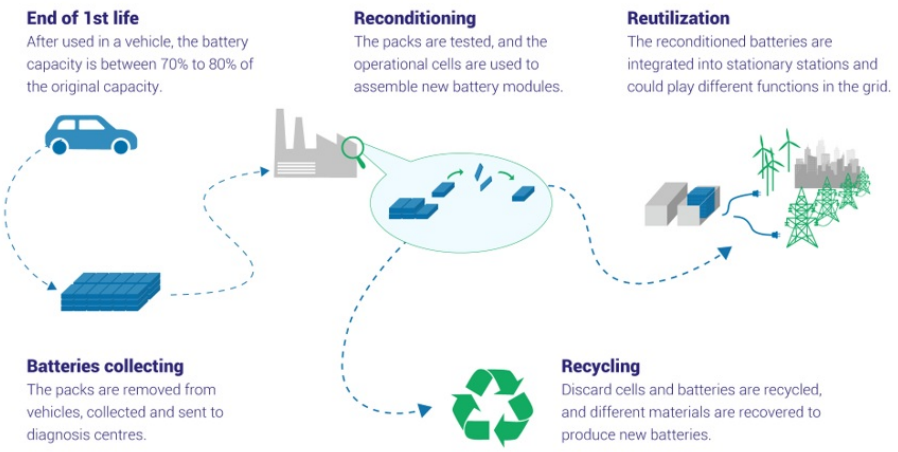


Batteries life-cycle valorisation

With the growth of the electric car market in the next years, it is expectable that an increasing number of batteries no longer meeting the requirements of automotive applications will flood the market. This prospect is further supported by the Council of the European Union targeting the end of combustion engine vehicles by 2035 in Europe and achieving carbon neutrality by 2050. Although several environmental and safety concerns will arise from this reality, wasted batteries could offer new opportunities to the Portuguese industry.



In the scope of the Baterias2030 project, dst Solar, Addvolt, ZeeV, Omniflow, CeNTI, LNEG, IST, UMinho, 3Drivers are joined together with the same objective of adding value to the lithium battery chain. The diversity of available competencies has enabled the consortium to explore different challenges, from improving diagnosis tools for wasted batteries to developing new methodologies for their reconditioning and recycling.

After collecting wasted batteries, the first step is evaluating their SoH (State-of-Health) and, based on the obtained information, selecting what will be the best option for the battery. In the Baterias2030 project, the consortium is exploring new diagnosis methods based on electrochemical impedance spectroscopy (EIS). EIS allows to extract electrochemical parameters so as to build a circuit model. This is an advantage when comparing with current measurement methods because it allows to get insights about the failure modes and improved time predictions.

Because electric mobility requires high energy densities, usually batteries are rejected when capacity reaches 70 to 80% of the initial value. These wasted batteries could be used in less demanding applications for up to 10-20 years before recycling. In Baterias2030, the consortium is exploring new methodologies for batteries reconditioning. New printed sensors for temperature and mechanical deformation monitoring and specific housings are being developed as well as storage systems based on wasted batteries. A system of 70 kWh composed of 50 wasted modules to store energy from solar panels and smaller systems to store energy from urban wind turbines are being assembled.

Another project focus is the development of new and more efficient recycling methodologies, that would minimize the environment impact of lithium batteries and the risk of a future lithium shortage. The consortium's focus is on hydrometallurgical processes, including leaching, precipitation and solvent extraction, to recover lithium, cobalt and nickel. Both processes are usually conducted at low temperatures, a great advantage over the current pyrometallurgical processes.

The project also includes life-cycle analysis to evaluate and quantify the environmental impact of the new processes and products developed in the scope of the project and guarantee the environmental viability of the selected processes/methodologies.