

The storage issue is becoming more and more important the more ambitious the decarbonisation objectives become. The growing penetration of non-programmable renewable sources (vRES) and the growing electrification of transport lead to a series of challenges related to the stability and flexibility of the power system, making it necessary to resort to solutions capable of storing renewable energy excess for use it later where and when it is needed.

These challenges are the focus of the project in the present System Research three-year period (2019-2021) which sees RSE engaged in the technological development of electrochemical and electrical (batteries and supercapacitors), chemical or power-to-gas (production, distribution and accumulation of natural gas and hydrogen) and thermal (accumulation of heat produced from renewable sources) storage systems. The technological solutions under development are oriented towards stationary storage, but some may also find space in vehicular applications.

The subject of the presentation is the activity concerning the development of innovative batteries. RSE extends its research to the entire battery value chain, starting from the raw materials supply, to the synthesis of active materials and electrolytes for the construction of mono-cells, to the assembly of cells and modules in a battery pack, creating intelligent control systems, to diagnostics and testing, up to the 2<sup>nd</sup> life and recycling area. RSE wants to implement technological solutions capable of increasing the specific capacity of active materials (and therefore the energy density which translates into lightness) and the number of charge and discharge cycles without losing specific capacity (and therefore the life time), also through the development of appropriate control systems. At the same time, RSE aims for each solution under study to ensure maximum sustainability from an environmental and economic point of view for the entire life cycle, which is why it combines Life Cycle Assessment and Life Cycle Cost studies with the research and experimental activities it conducts.

The presentation shows the main results achieved in 2019.