ENERGETICS

MUR DM 117/Stellantis - Analysis on components/systems and LCA on cells for EV batteries

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Dipartimento DISAT CENTRO RICERCHE FIAT [P.iva/CF:07084560015] Politecnico di TORINO [P.iva/CF:00518460019]
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Context of the research activity	Full-life cycle of the environmental impact of Gen5 battery cells and viability of cell recycling for the new investigated solutions Progetto finanziato nell'ambito del PNRR - DM 117/2023 - CUP E14D23001950004
Objectives	Our road transport system is rapidly transforming in response to climate change and resulting demand for a high sustainability over the full value chain and the full life cycle. Electric propulsion systems are achieving steadily increasing market shares, and next generation battery concepts will be needed to achieve the targets of climate-neutral mobility and logistics. During any decision-making process regarding next generation solutions for batteries, environmental sustainability is one of the key factors in order to achieve low carbon footprint and implement circular economy strategies ([1]). The first scientific goal of this project is to develop a Prospective Life Cycle Assessment (P-LCA) methodology and apply it to the assessment of the environmental impact of next-generation battery cells, taking different recycling paths into account. In fact, despite LCA is a well-known and valid tool for assessing environmental sustainability, it is appropriate for the analysis of steady-state (i.e., industrial-scale) technologies. Contrarily, for assessing emerging technologies where scaling effects must be included ([2]), a P-LCA is needed to ensure comparability between next-generation and current Li-ion cells. The second scientific goal is to increase knowledge-based improvements of cells and battery, by considering the recyclability, environmental performance, and optimization to reduce CO2 emissions. As part of the conceptualization, the state of the art regarding methodologies, tools and datasets plus their management will be analyzed. Based on identified needs and gaps, the respective building blocks of a single LCA approach will be adapted where

	needed and harmonized. The third goal is to identify a model to evaluate the Carbon Footprint of batteries as required by the upcoming European Battery Regulation and related technical documents. Finally, the impacts on vehicle system design will be analyzed based on the hypothetical scenarios defined according to the evolution of the next generation battery technologies The goals and activities are in line with Italian PNRR mission M2C2, with specific reference to sustainable mobility and improvement of circular economy. References [1] European Technology and Innovation Platform on Batteries – Batteries Europe. Strategic Research Agenda for batteries 2020. European Commission; 2020. [2] Thonemann N, Schulte A, Maga D. How to Conduct Prospective Life Cycle Assessment for Emerging Technologies? A Systematic Review and Methodological Guidance. Sustainability. 2020 Feb 7;12(3):1192.

Skills and competencies for the development of the activity	Technical competences about: pollutant and GHG emissions from vehicles, legislative framework for road transport and energy sector. Good knowledge of programming and simulation tools (Matlab, Simulink) and funamental knowledge about Life-Cycle Assessment approaches. Capability to work in a multidisciplinary research team Good knowledge of English