

Titre Thèse	TESSA "Techno-Economical Study of Second Life Batteries for Affordable E-Mobility Campus".	
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Subject abstract :

The thesis is part of the WILL (Welcoming Internationals to Lille) chairs. The project is titled TESSA (Techno-Economical Study of Second Life Batteries for Affordable E-Mobility Campus). It aims to build a techno-economic model concerning second-life batteries. The project is part of the CUMIN program (Innovative and Carbon Neutral University Campus).

This is a cross-disciplinary subject. It brings together aspects of battery testing, economic modeling, and geographical implementation.

The involved laboratories will be as follows:

- The Laboratory of Electrical Engineering Laboratory and Power Electronics of Lille (L2EP) is responsible for establishing a simplified aging model for electric vehicle batteries.
- The Rochester Institute of Technology (RIT) is in charge of the economic part.
- The Territories, Cities, Environment, and Society Laboratory (TVES) is responsible for the territorial implementation of charging stations using second-life batteries.

The goal is to model the battery in the context of first-life (vehicle) and second-life (use in PV panel/charger sets). The modeling will be multi-domain and will involve notions of electrical engineering (impedance, capacity...) as well as thermal and economic aspects.

The scientific locks are as follows:

- Achieve an average battery aging model based on different parameters (number of cycles, anode technology). Integrate users and manufacturers databases.
- Optimization of the granularity of electro-thermal and battery aging models.
- Integrate the variables of various Li-ion battery improvements over time (energy density, power density, series resistance).
- Using aging, electro-thermal, and economic models, determine the best time to change the battery.
- The second-hand market (batteries and electric cars) needs to be studied.
- Simplify the multi-domain models (electro-thermal with aging) of the batteries to integrate a cost model.
- Study the gain between buying new batteries and second-life batteries. Include the ecological impact of the extended second life of the batteries. This is probably the main gain because second-life batteries can be very expensive.

Application deadline: 06th May 2024

Send to Dr. Ronan GERMAN and Pr. Hittinger:

- a detailed CV,
- a cover letter,
- the detailed academic results for bachelor and master (3 years),
- a recommendation letter with at least one of your actual work/ academic year.