

## DOCTORATE THESIS

### 3-way energy flow architecture for Li-ion battery packs in electric and hybrid vehicles

**Research domain**

Clean Powertrains

**Topic**

*Context:* Vehicle electrification is a hot topic nowadays. Current architecture of energy flow in PHEV, HEV and EV is 2 ways from electrical point of view. This means that the battery is charged or discharged at discrete independent moments, thus independent state of the car. During driving the battery is discharged when for traction purpose energy from the battery is needed and charged during regenerative braking. At standstill the battery is either in stand-by, in balancing mode or charging mode through a plug-in device. However future charging strategies are supposed to go towards semi-dynamic or full-dynamic charging modes.

*Aim:* The objective of the doctorate thesis is to create the architectural structure to facilitate inductive charging systems into electric vehicles. The concept of dynamic charging is a vehicle driving over a build-in charging loop. Wireless inductive charging energy flows into the vehicle system. While this happens the vehicle is travelling at constant speed or in transient condition. A new energy management system in the car needs to be dimensioned and designed to deal with simultaneous energy demands. Good knowledge of Li ion batteries, supercaps and power electronics will help the student to overview the complexity of this phenomenon and creates an architectural structure, which will be build and tested by the student in a second phase.

**Profile**

Master of Applied Engineering: Electronics and Power systems.

The doctorate thesis student should have a strong interest in electronics and the development of energy storage systems for vehicles. Knowledge of MATLAB and Simulink is considered an asset. The student should be able to be at least two days per week at the premises of Flanders' DRIVE in Lommel.

**Term**

Q2 2010 - Q2 2011

**Supervisor**

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