



EMR-based scaling laws applied to electrified vehicles

MEGEVH session

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EMR-based scaling laws applied to electrified vehicles

- MEGEVH – French network on xEV -

EMR'25, Lille, July 2025

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MEGEVH
French network on HEV's

Coordination:

2004-2020: A. Bouscayrol (L2EP)
since 2020: S. Jemei (FEMTO-ST)

Fostering collaborations between
academic institutions and industrial
partners on energy modelling and energy
management for xEV

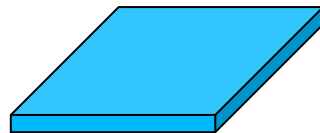
More than 20 PhD thesis defended
8 industrial partners
10 academic institutions

- ❑ Wide range of automotive applications
- ❑ Same powertrain layout and components
- ❑ Different requirements, dimensions

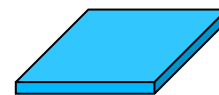


reference: <https://www.renaultgroup.com>

Modular, scalable powertrains are key to rapid xEV growth

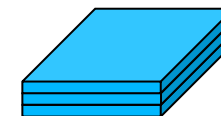


Scalability



Reference

Modularity



ability to **change the scale** of a reference component to increase or shrink its size (volume)

ability to split the system's components into **interdependent components**

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- Scaling laws applied to various components-

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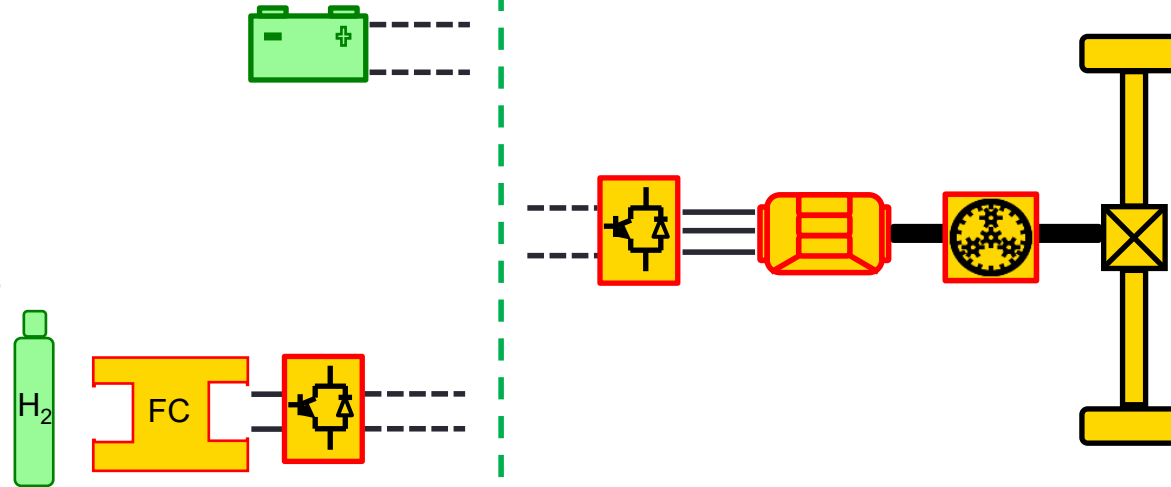
Common electrical powertrain for different types of electrified vehicles

- Battery electric vehicle

MSc thesis of
Van Cay Nguyen (2025)

- Fuel cell electric vehicle

MSc thesis of
Fayçal Mamoun (2025)



MARSHALL project (2025-2028)

Modular and scalable
battery and fuel cell systems
for on-road heavy-duty EV



PhD of Ayoub Aroua (2020-2023)

Scalability of Electric Axles
for on-road light-duty EV

