CUMIN - DILAN

HIL testing with the Nissan LEAF electric drive
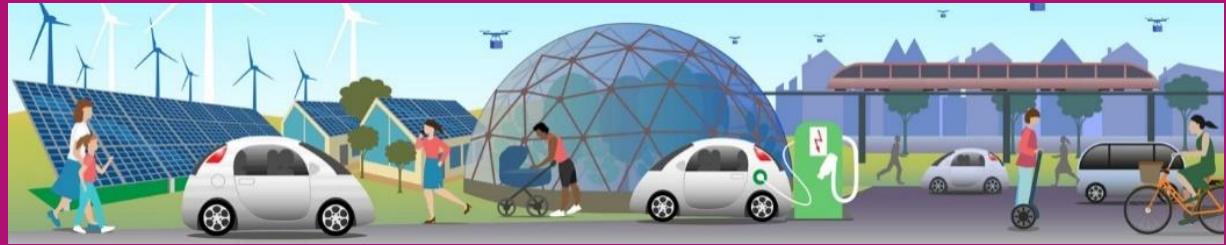
Marco DUQUESNE
Walter LHOMME

Master 2 VIE & L2EP

Outline

1   **Context**

2   **HIL testing**

3   **Simulation results**

4   **Conclusion**

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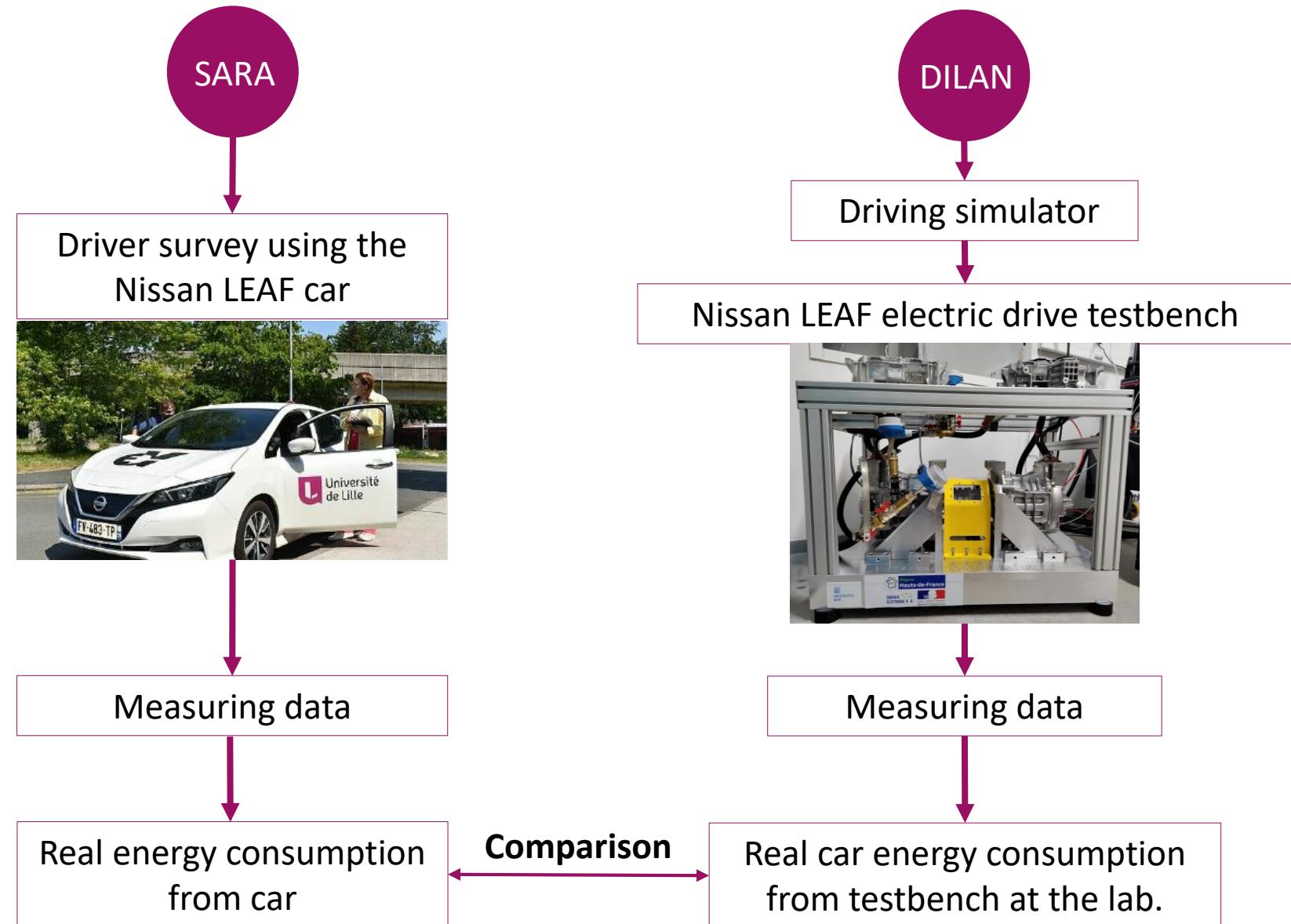
Context

Project positioning

Objective

Development of the HIL testing of the Nissan LEAF

HIL = Hardware In the Loop

SARA

Driver survey using the Nissan LEAF car

Measuring data

Real energy consumption from car

Comparison

DILAN

Driving simulator

Nissan LEAF electric drive testbench

Measuring data

Real car energy consumption from testbench at the lab.
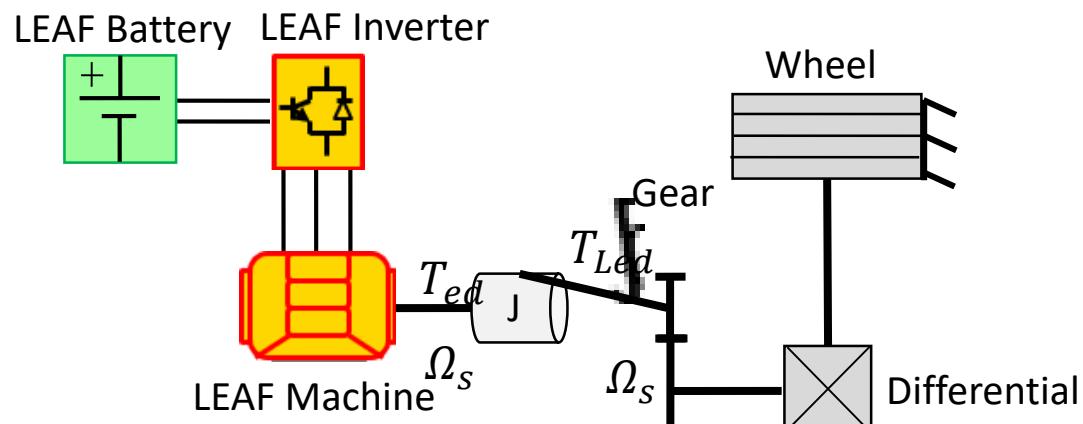
Emulation of the load at the laboratory

Structural scheme of the Nissan LEAF

Structural scheme of the test bench
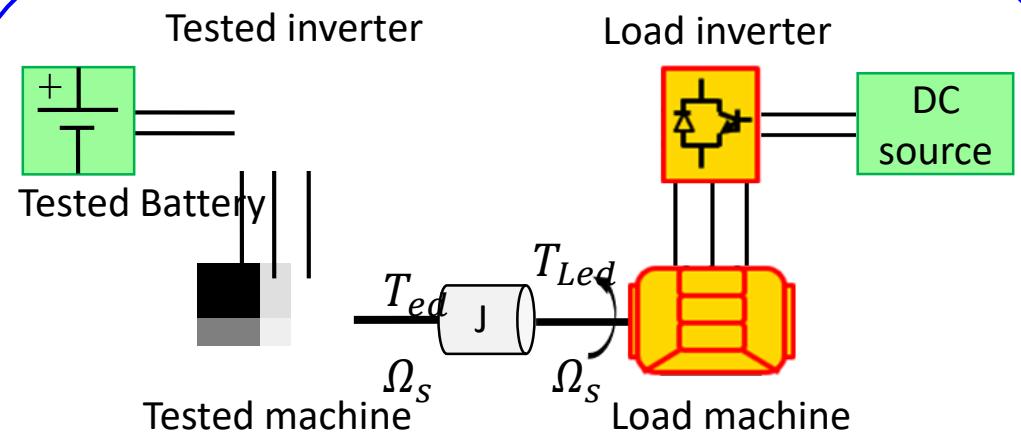
Vehicle and environment

Laboratory

LEAF Battery

LEAF Inverter

Wheel

Gear

T_{Led}

T_{ed} J

Ω_s

Ω_s

LEAF Machine

Differential

v_{ven}
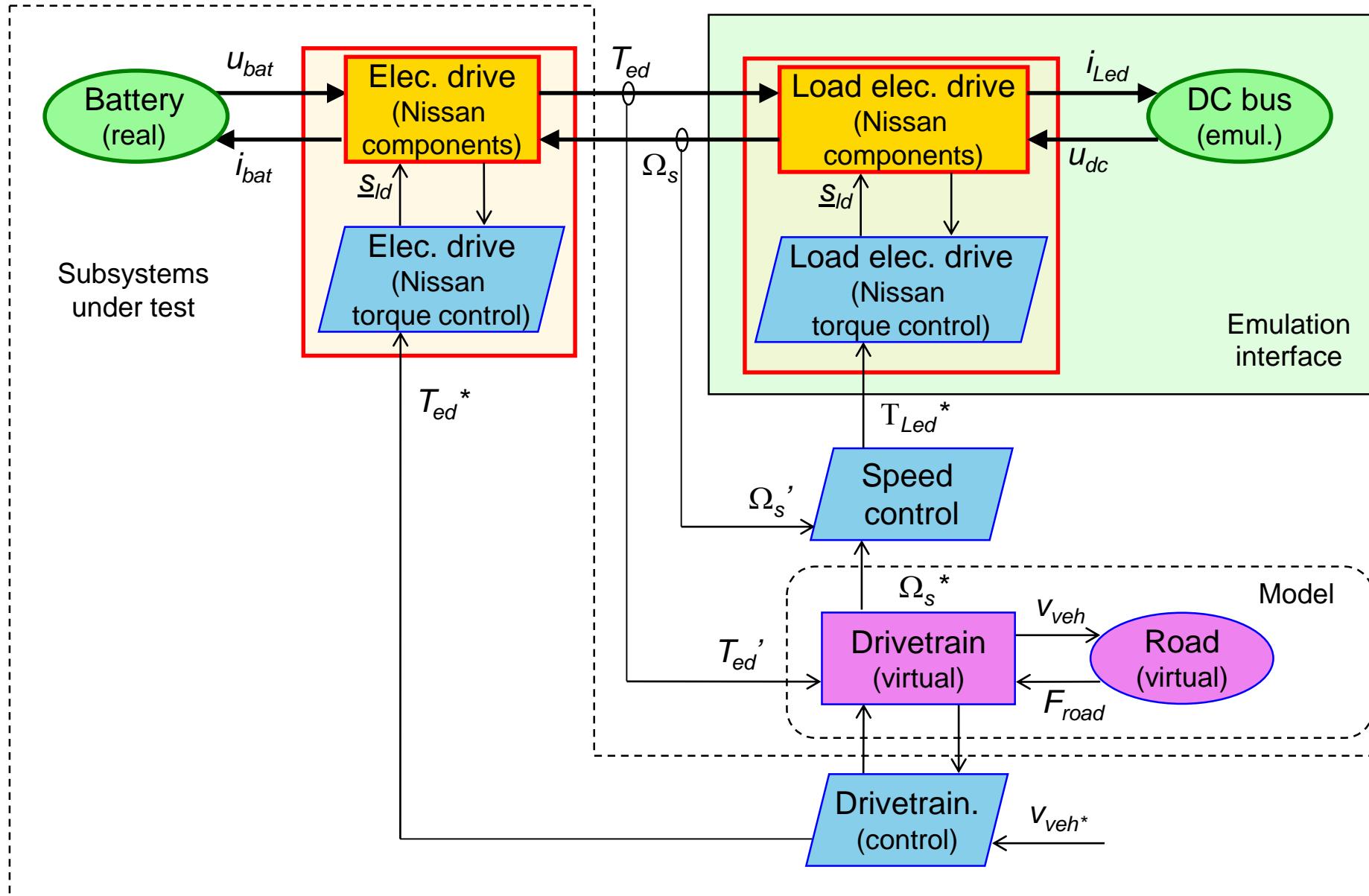
Source : automobile-propre.com

$\approx$

Tested inverter

Load inverter

DC source

Tested Battery

T_{Led}

T_{ed} J

Ω_s

Ω_s

Tested machine

Load machine

# HIL principle apply to the bench

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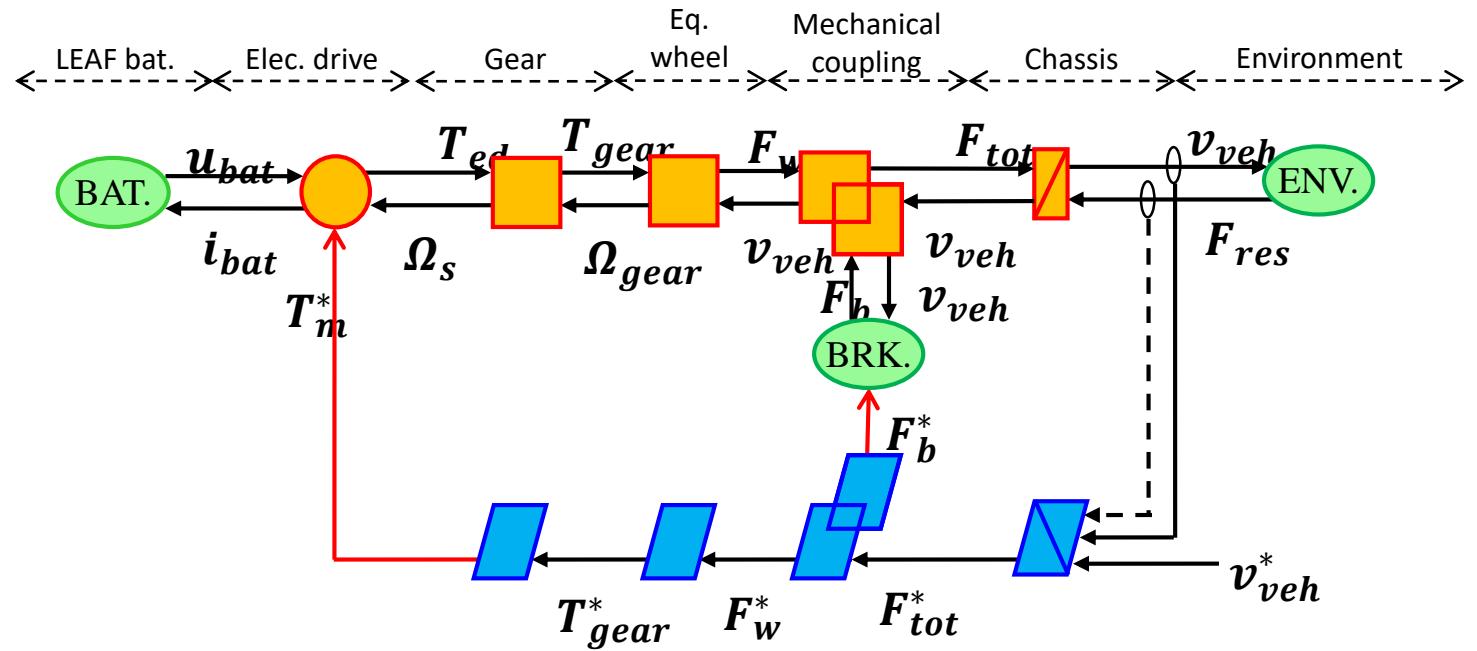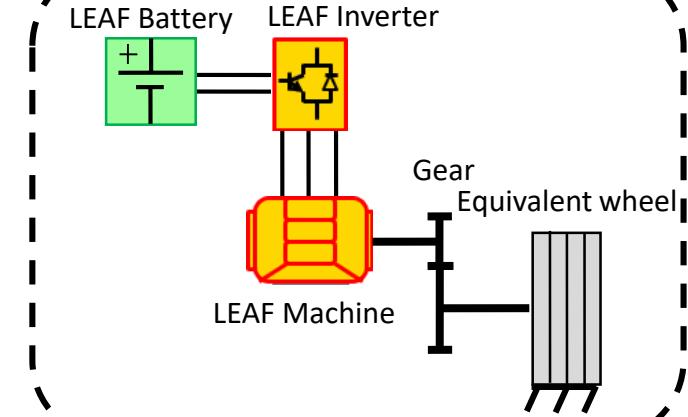
HIL testing

EMR of the Nissan LEAF

LEAF bat. | Elec. drive | Gear | Eq. wheel | Mechanical coupling | Chassis | Environment

u_{bat}, i_{bat}, T_m^*, T_{ed}, Ω_s, T_{gear}, Ω_{gear}, F_w, v_{veh}, F_{tot}, F_b, v_{veh}, v_{veh}, v_{veh}, F_{res}

BAT. ENV. BRK.

F_b^*, T_{gear}^*, F_w^*, F_{tot}^*, v_{veh}^*

Structural scheme of the Nissan LEAF

LEAF Battery LEAF Inverter Gear Equivalent wheel LEAF Machine

8
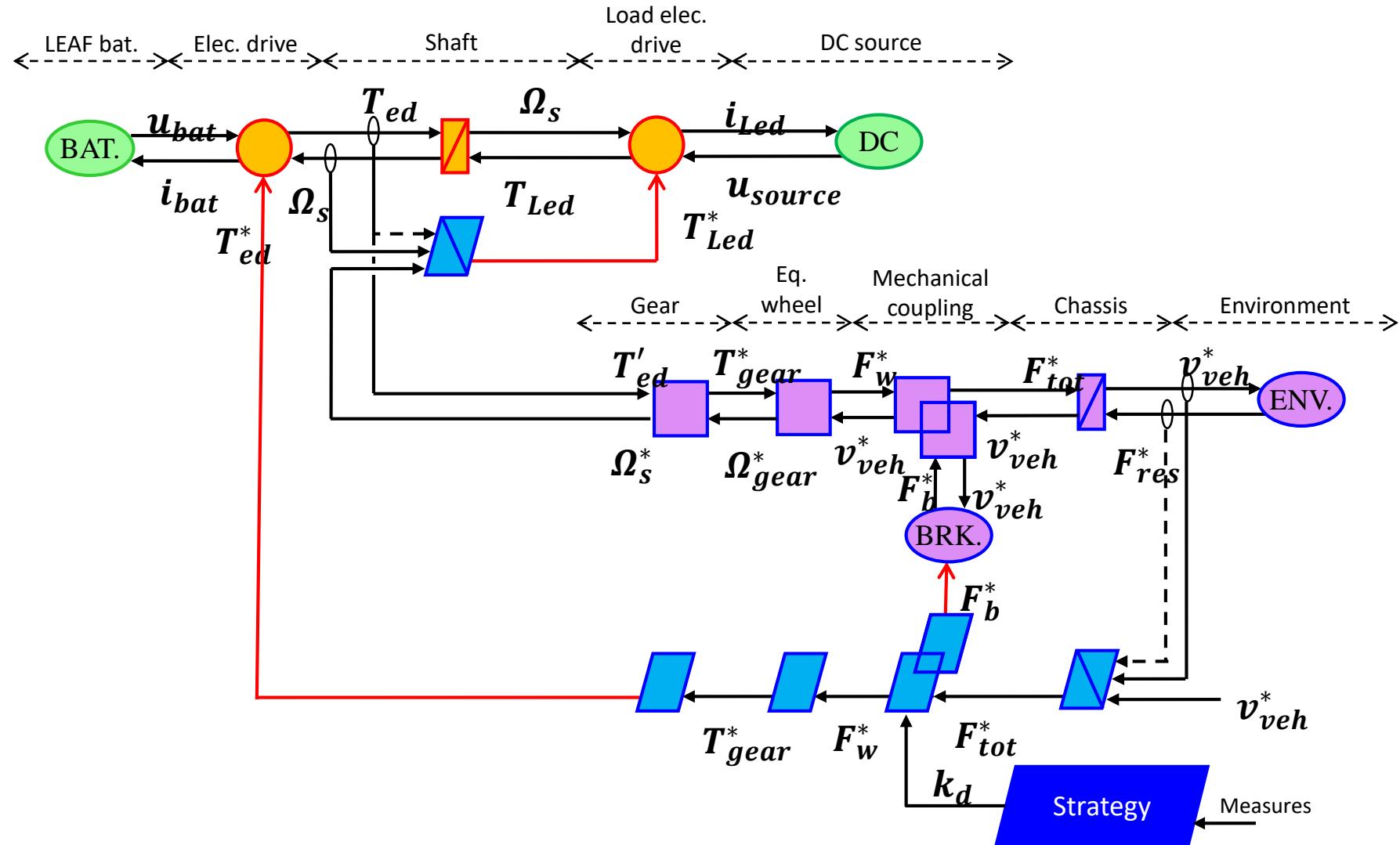
HIL testing using EMR

HIL testing using EMR

HIL testing with real driving cycle

# HIL testing piloted by driving simulator

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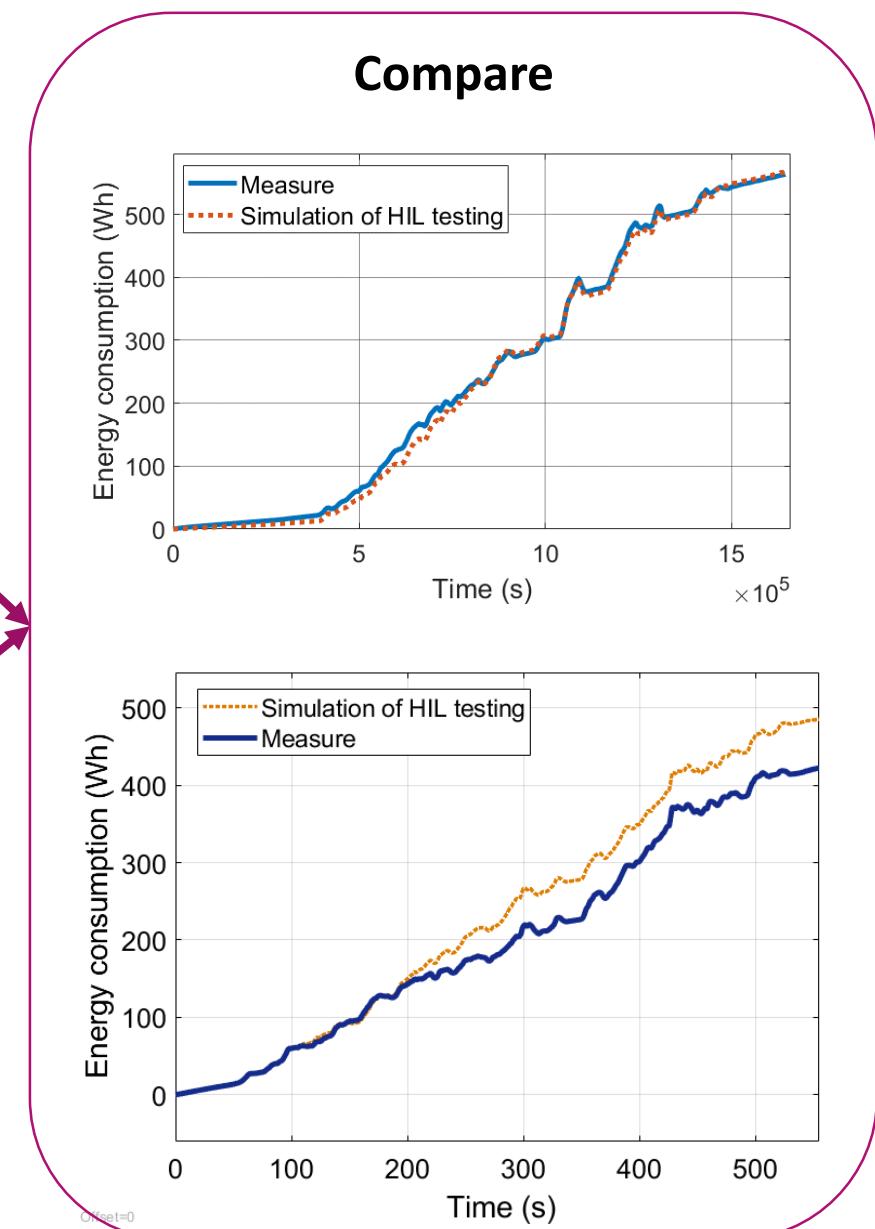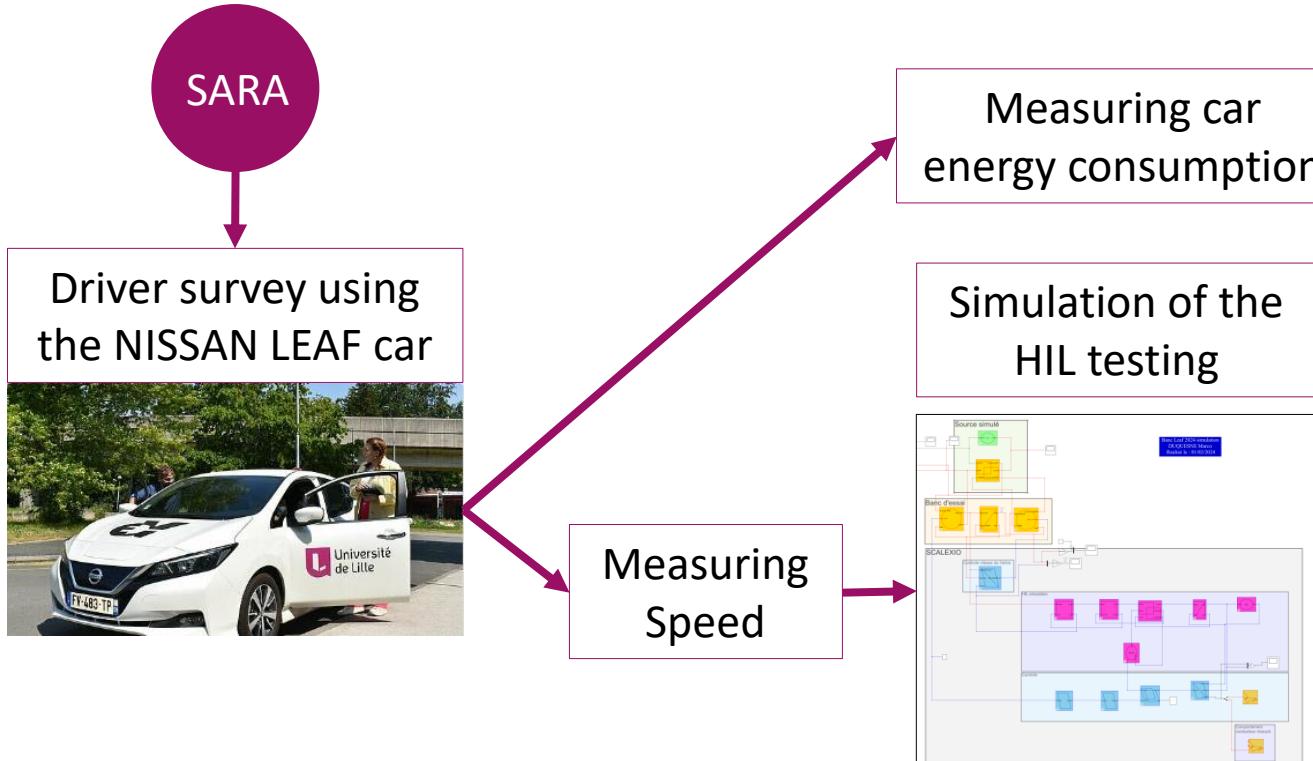
Simulation results

Results of the simulation of HIL testing

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Conclusion

Conclusion

SARA

Driver survey using the NISSAN LEAF car

Measuring car speed

HIL testing on the bench

Measuring car energy consumption

Measuring tested electric drive energy consumption

**Compare**

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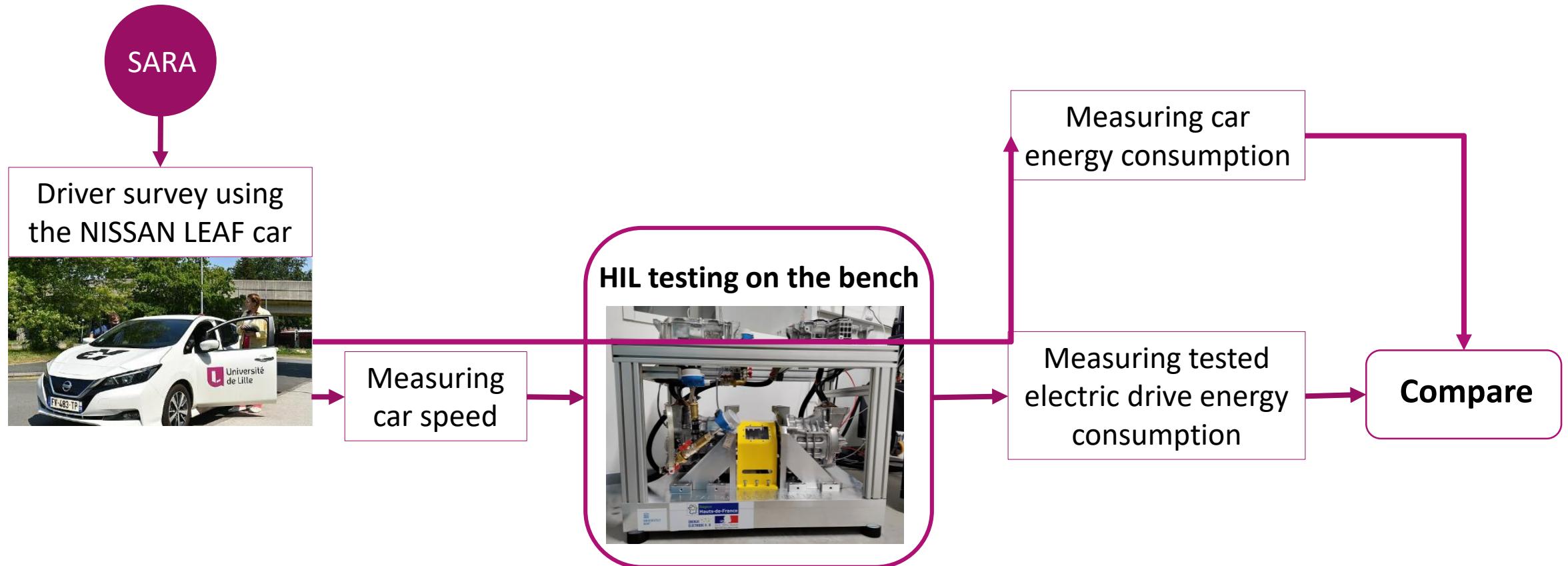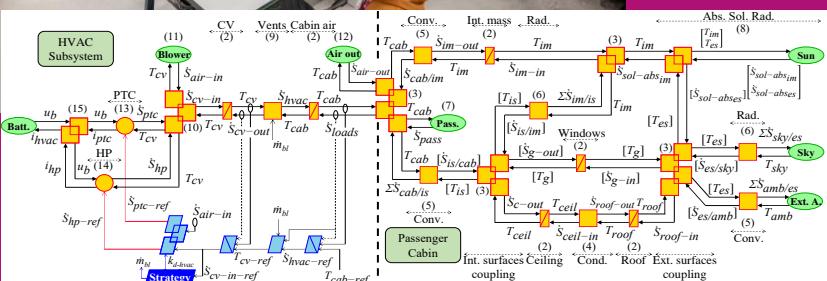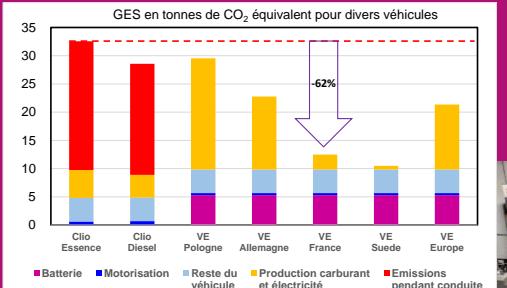
Our university as an exciting living lab towards eco-cities through an innovative transdisciplinary framework !