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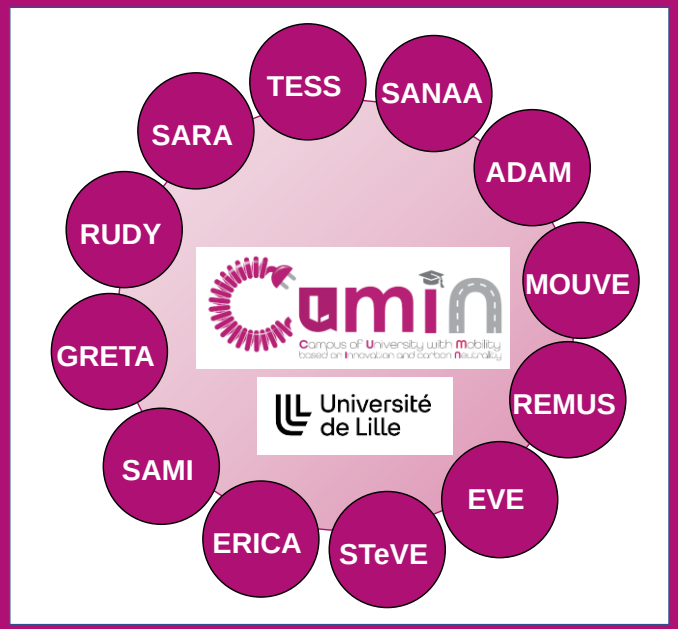

CUMIN - EVE

Université de Lille

Hydrogen bus energy consumption

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supervisor : LHOMME Walter

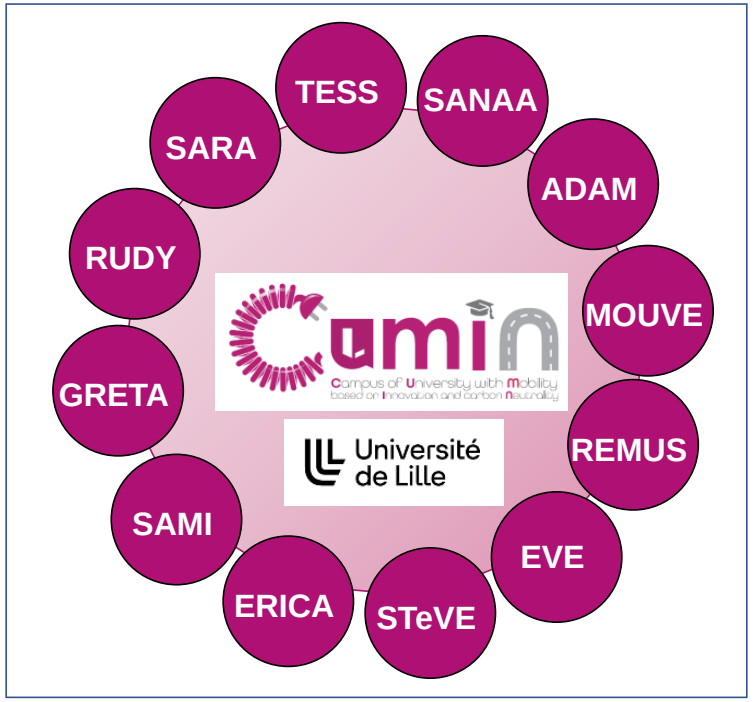
Master 2 VIE

Outline

1. Introduction
2. Studied H2bus topology
3. Conclusion and perspectives

Context and Objective

MÉTROPOLE EUROPÉENNE DE LILLE



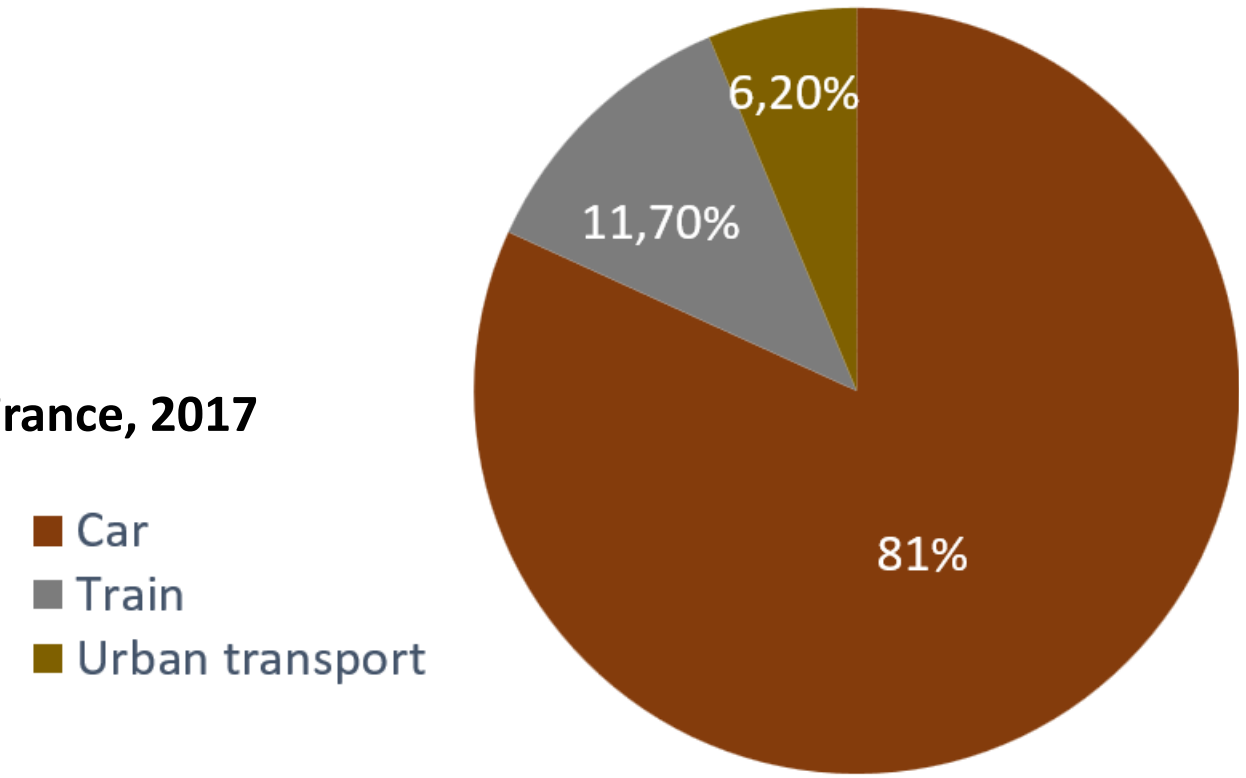
EVE: Electric Vehicle, Estimation of mobility for an eco-campus

Objective: Quantifying the consumption of a hydrogen bus.

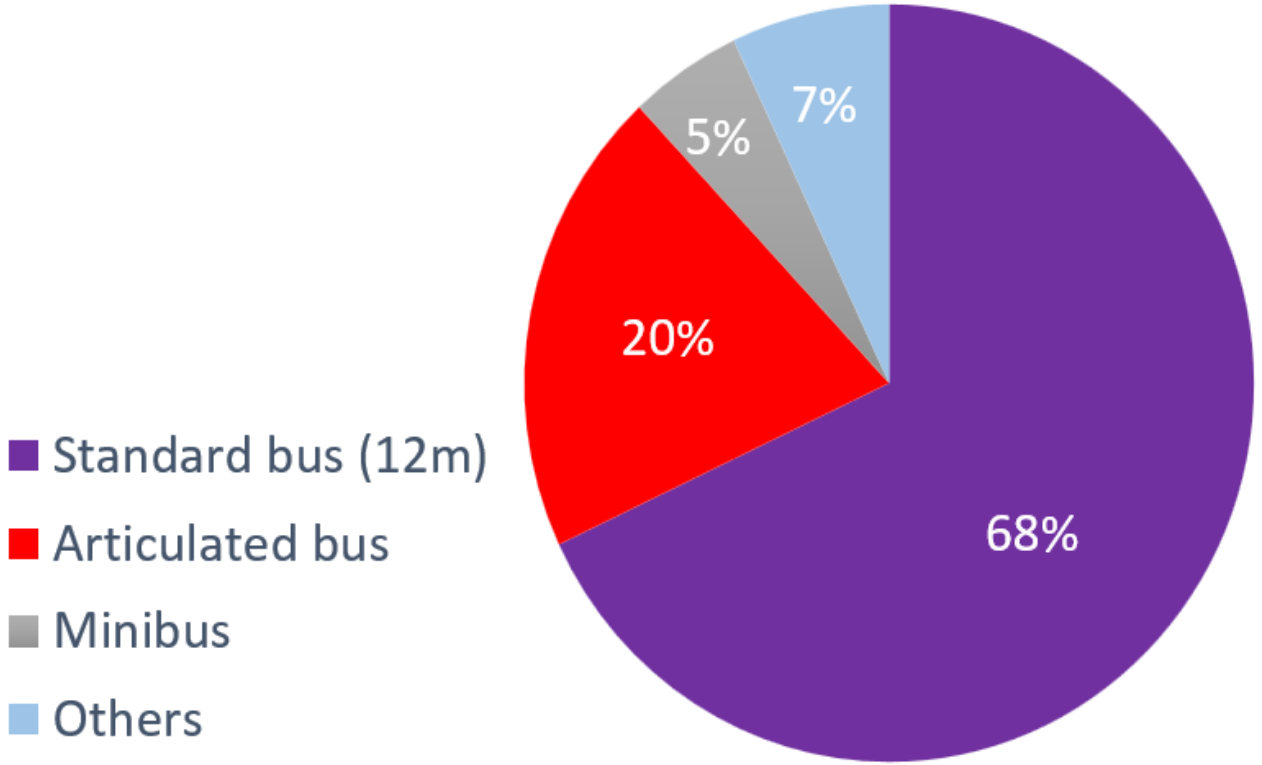
The typology of the French bus fleet

Passenger movements per square kilometer

France, 2017



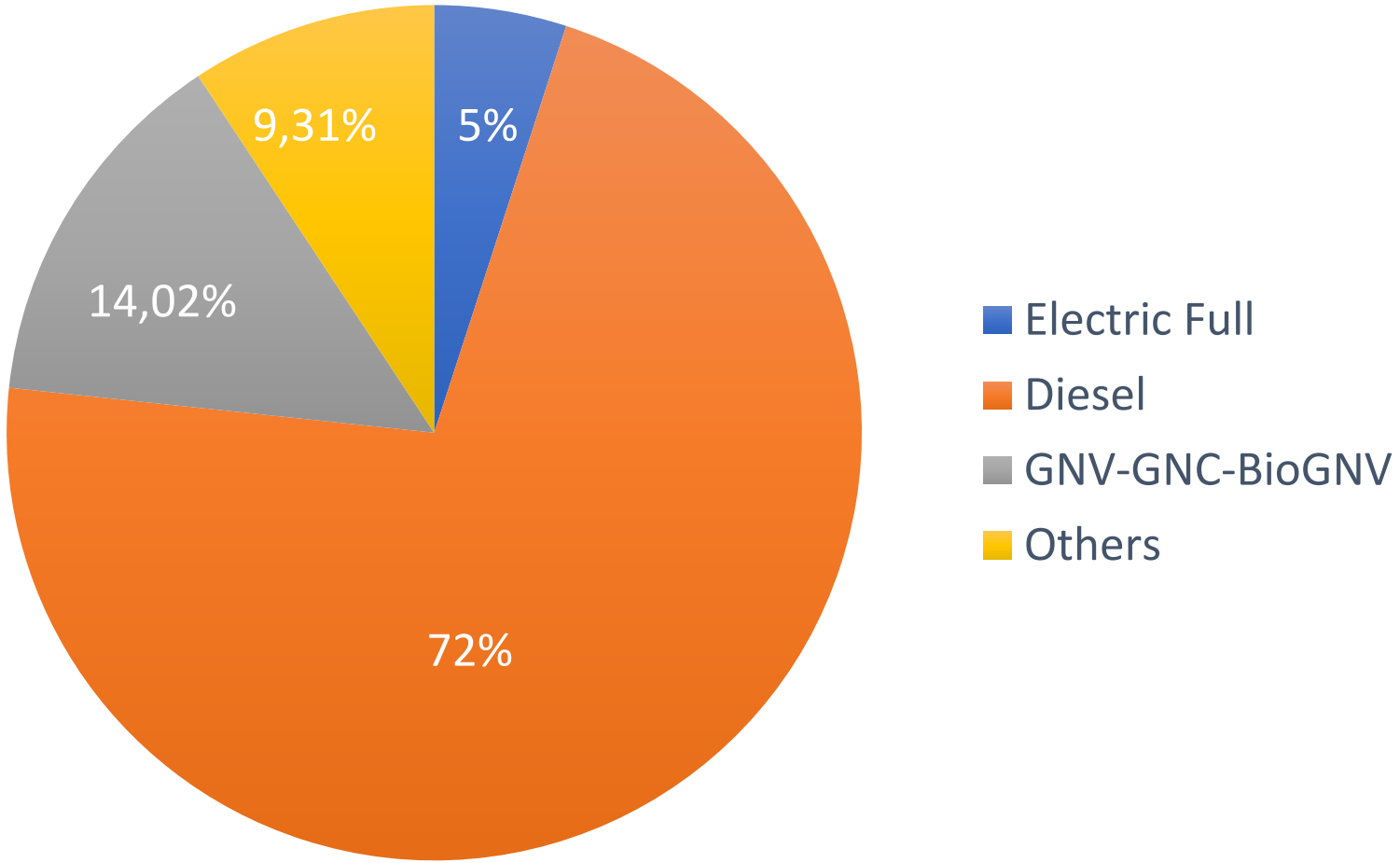
Distribution of the urban road fleet as of January 1, 2022



ADEME

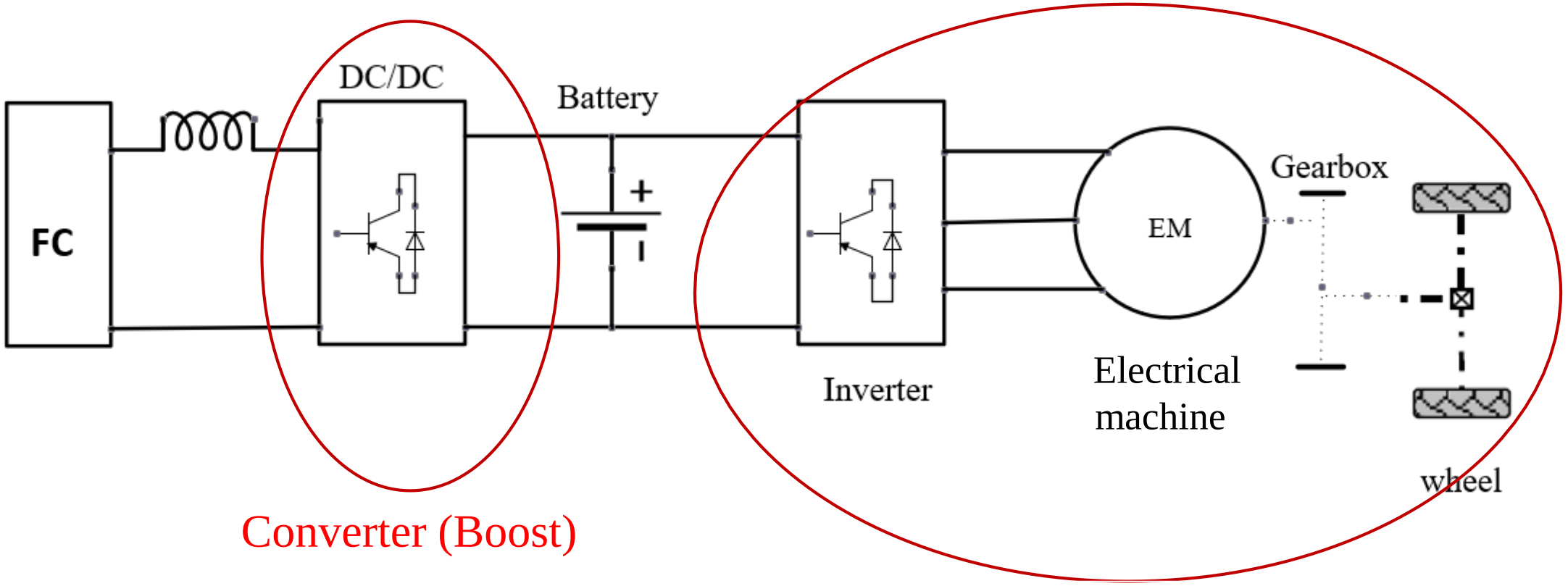
The typology of the French bus fleet

Energy distribution of the bus fleet of January 1, 2022



Studied Bus

❑Hybrid topology with a battery as secondary source



- Differents voltages between the fuel cell and the battery
- Degree of Freedom: control of the fuel cell current

Studied Bus

- Van Hool A330FC

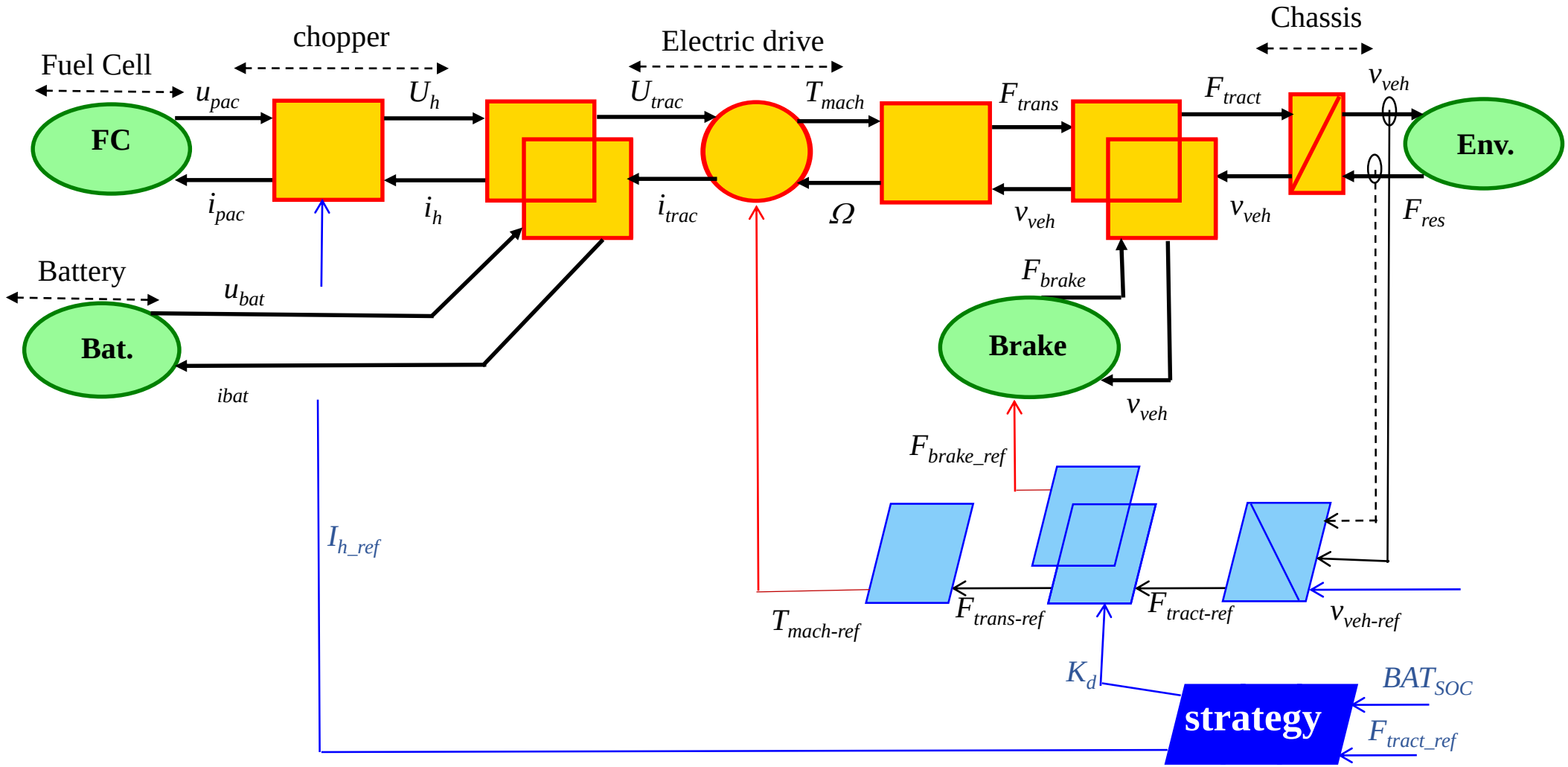
Max weight	19,8 tons
length	12,2m
Width	2,5m
Height	3,4m
Number of passengers	94
Hydrogen storage	5 tanks

Electric machine	Power : 160 kW Torque : 2500Nm Nominal current : 350 A
Fuel cell Type Ballard FC MOVE HD70	Power :70kW
	Mass: 247 kg
	1783 mm x 822mm x 415 mm
	Current : 50 A, voltage : 500V

EMR the H2bus

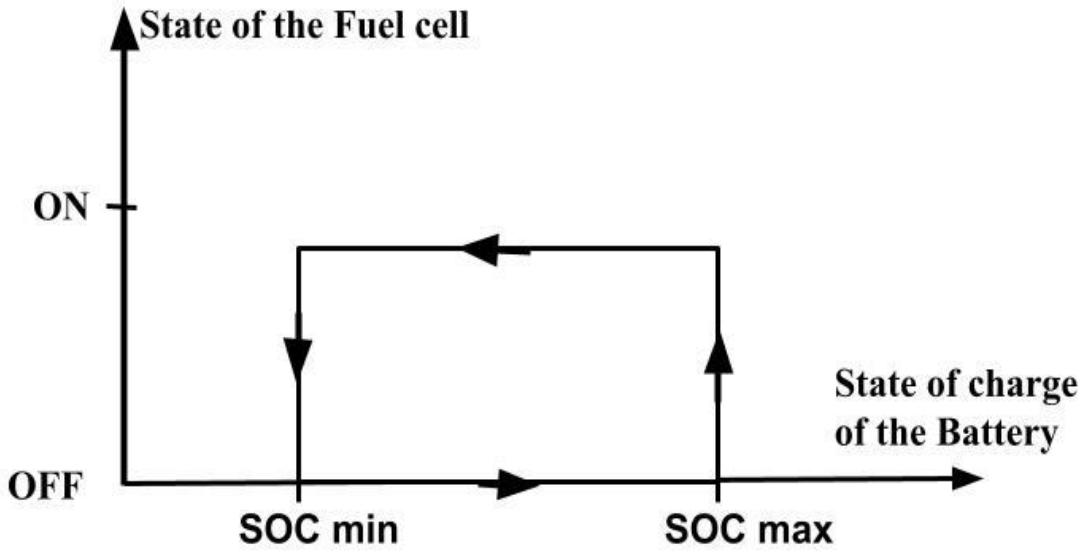
Assumptions:

- Electric drive (Static model)



Energy Management strategy

- Strategy Thermosthat



Advantages

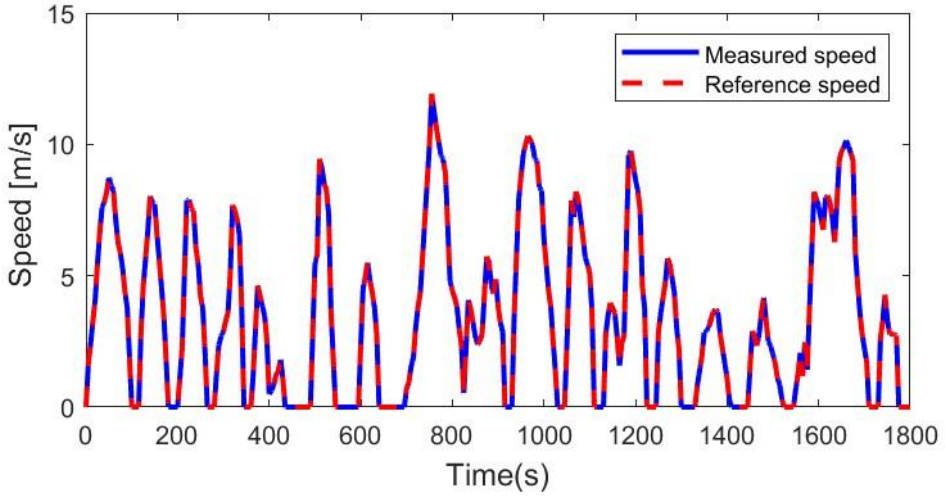
- Simple
- Targets the highest efficiency points of the fuel cell

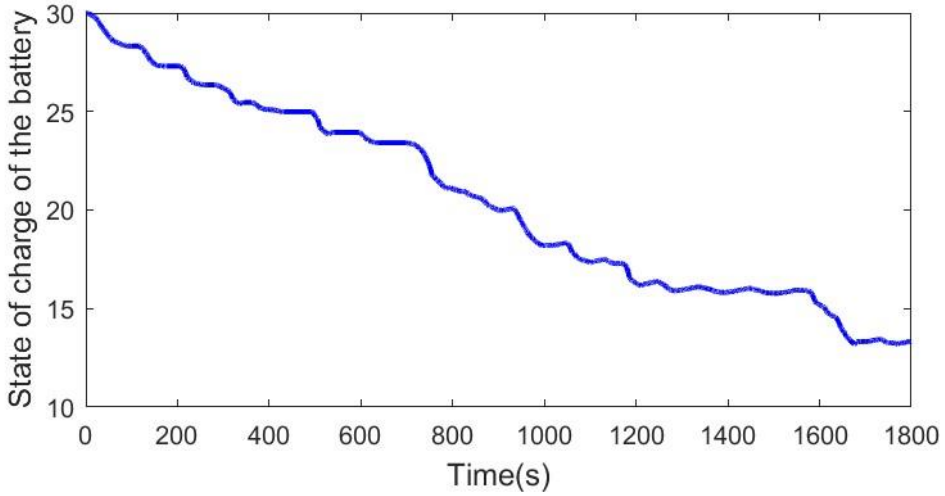
Drawbacks

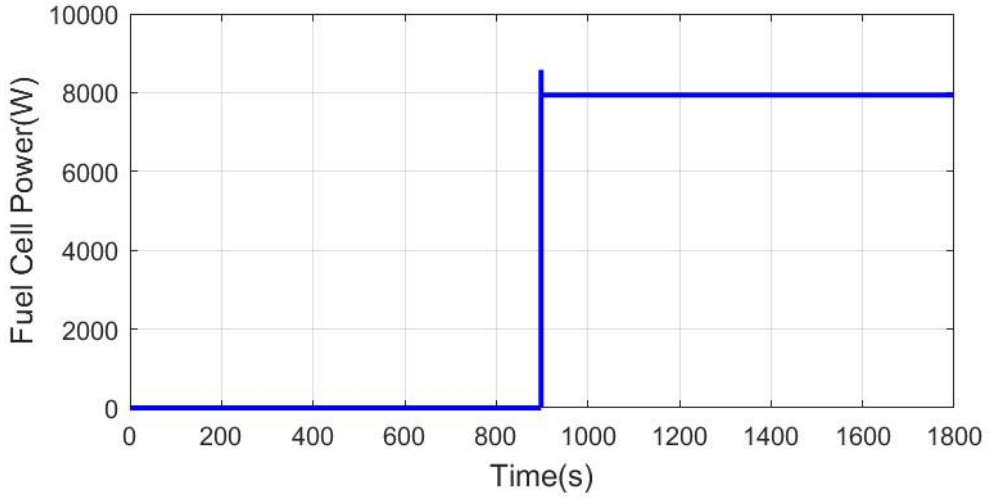
- Reduction of the fuel cell lifetime due to multiple stop/start cycles

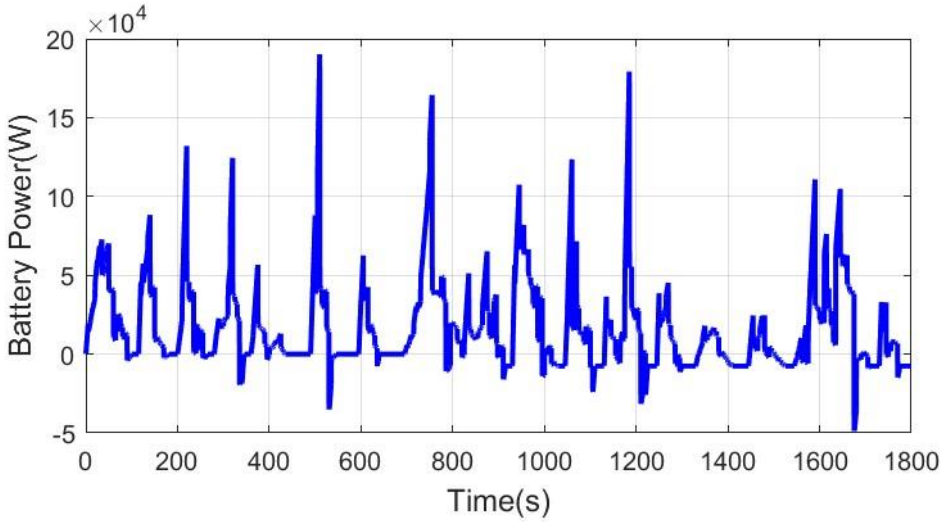
- The frequency of stops and starts of the fuel cell is determined by the width of the hysteresis of the state of charge control

Simulations and Results









Trip: Porte de Douai Lille – Moulin de Lesquin
Distance : 4 km

Conclusion and perspectives

➢ Conclusion

- For a fuel cell hybrid electric vehicle, the distribution of energy between the power sources is complex

➢ Perspectives

- Implementation of a better strategy such as low pass filter

- Quantification of hydrogen consumption on an adapted driving cycle

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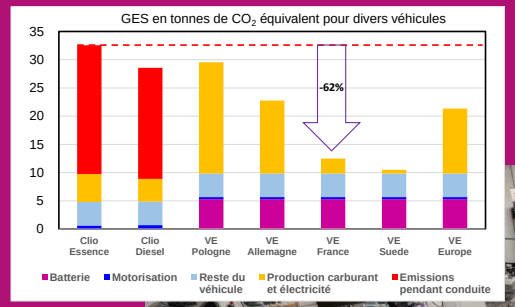

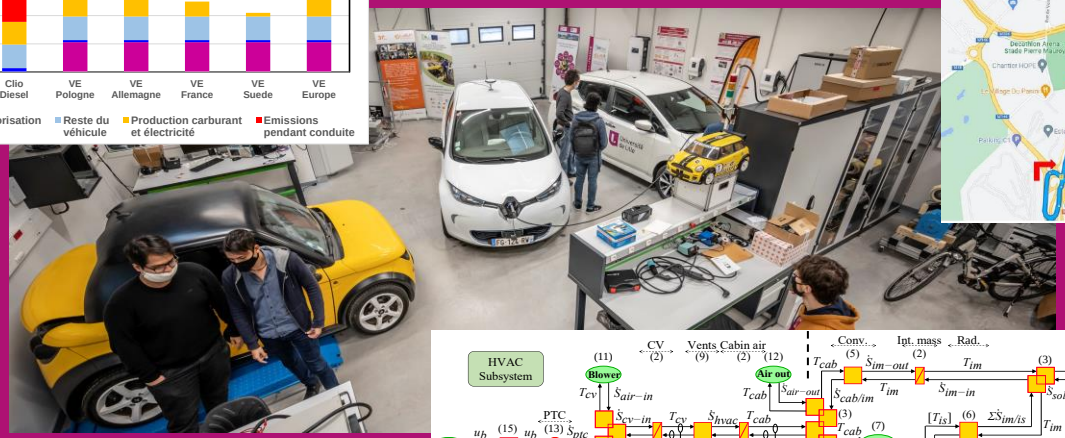

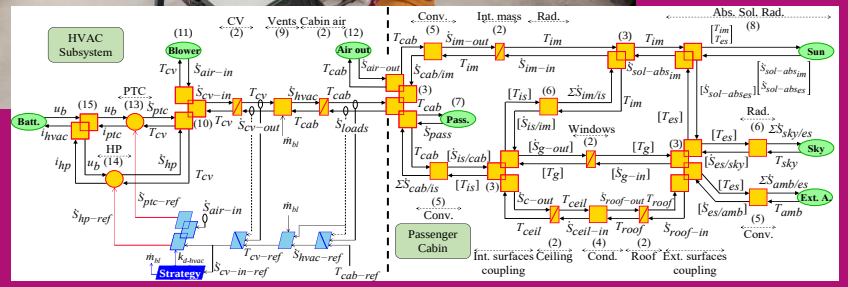

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