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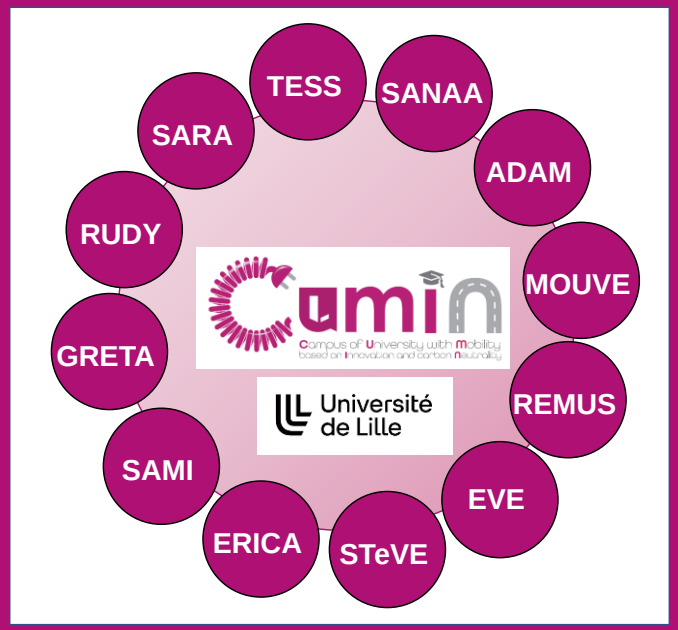

CUMIN - MOUVE

Study of a bidirectional onboard power charger

Authors : Fadwa BENFYALA
Mohamed BENIDAR
Mohamed BOUTSOUDINE

Supervisor : Mr. Philippe Delarue

Affiliation(s) : Université de Lille

Université de Lille

Outline

1. Context and objective
2. Literature review
3. Our case study
4. Conclusion and perspectives

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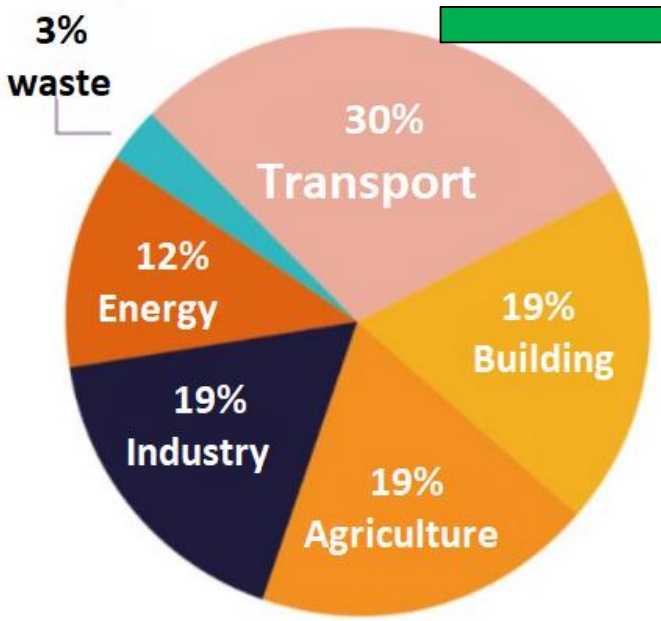
Context and objective

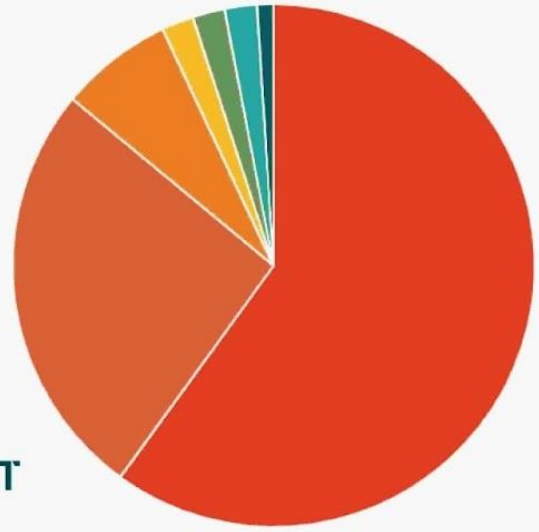
Context and objective



Greenhouse Gas Emissions sectoral distribution in France in 2019

Which mode of transportation emits the most CO2 ?

Personal Vehicle	Road Freight Transportation	Air Transportation	TRAIN	BUS	River&Maritime transport	Motorcycles
60%	26%	7%	2%	2%	2%	2%



- Personal Vehicle (Car)
- Road freight transportation
- Air transportation
- Train
- BUS
- River and maritime transport
- Motorcycles

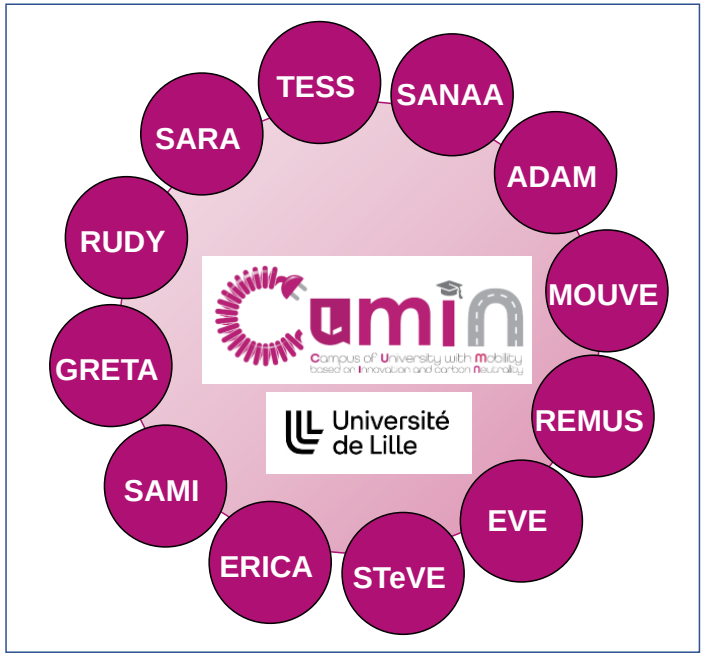
SAVE 4 PLANET
CHOISISSONS BIEN
POLLUONS MOINS

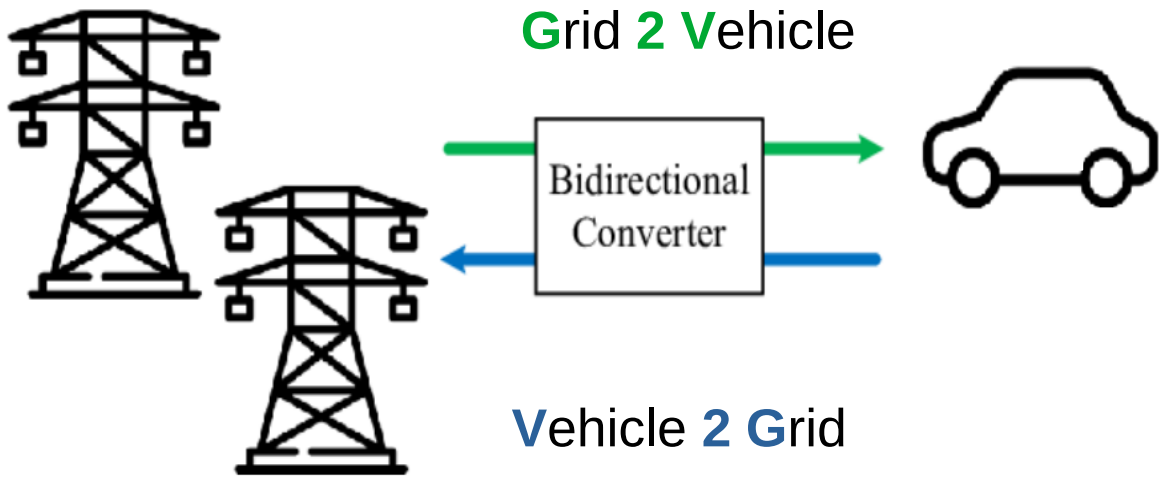
www.save4planet.com

Context and objective

Positioning in the CUMIN programme

Campus of **U**niversity with **M**obility based on **I**nnovation and carbon **N**eutral





Our project : CUMIN MOUVE

MOUVE : MObility and **U**se of electric **VE**hicles based on dedicated charging infrastructure

Objective : Determining the control of a bidirectional onboard power charger

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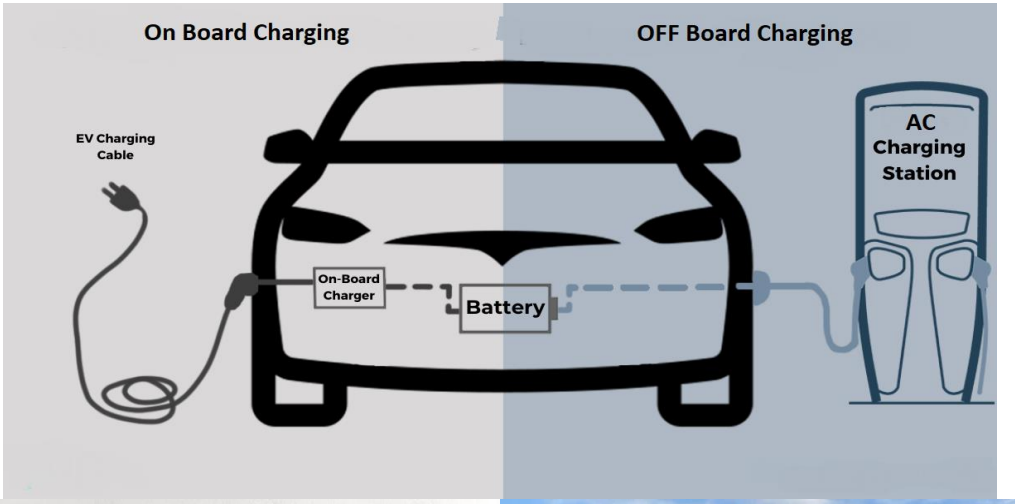
Literature review

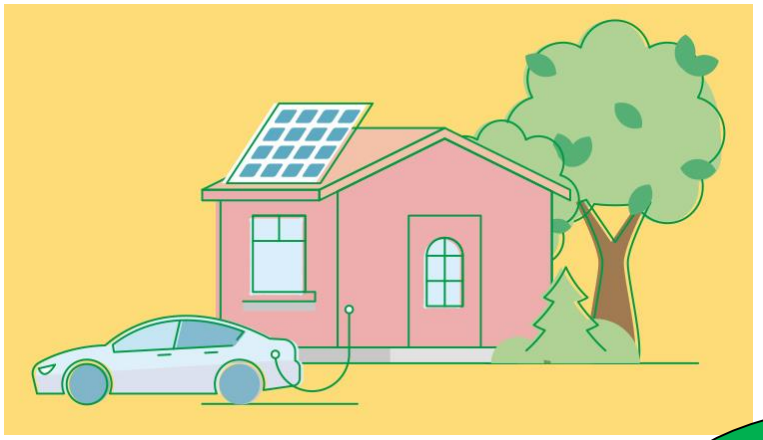
Literature review

Currently, there are two types of chargers...



Literature review

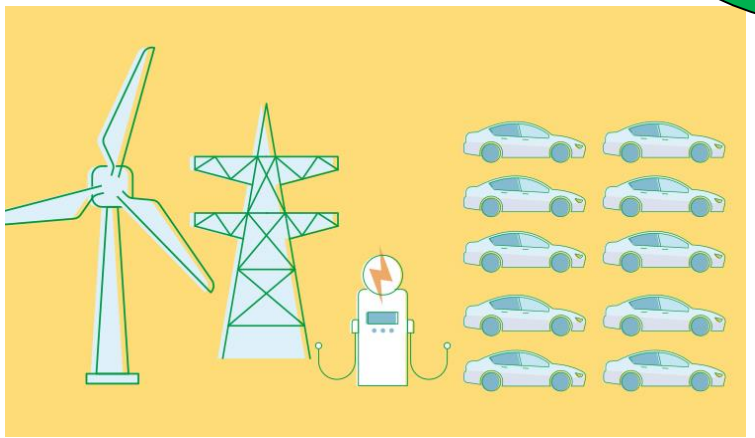
Why should we use a bidirectional OBC instead of classic charger ?



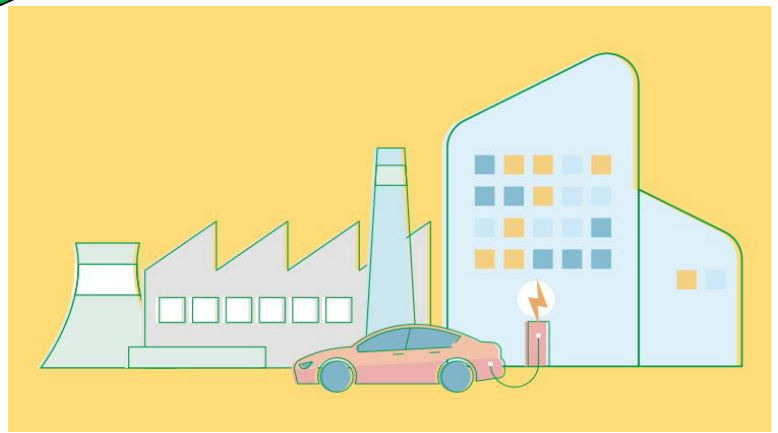
V2H (Vehicle **To H**ome**)**

Bidirectional OBC

V2L (Vehicle **To L**oad**)**



V2G (Vehicle **To G**rid**)**



V2X (Vehicle **To Everything)**

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Our case study

Our case study

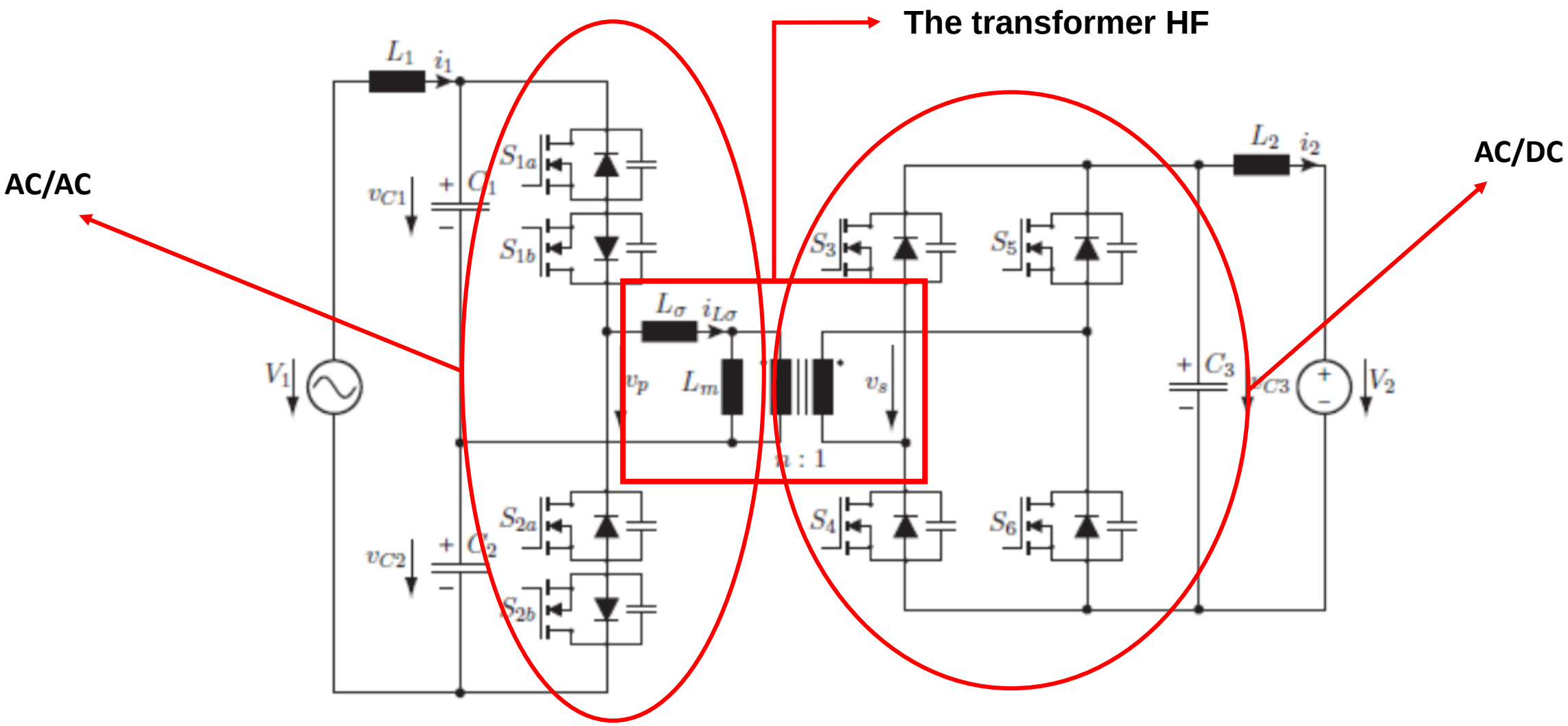
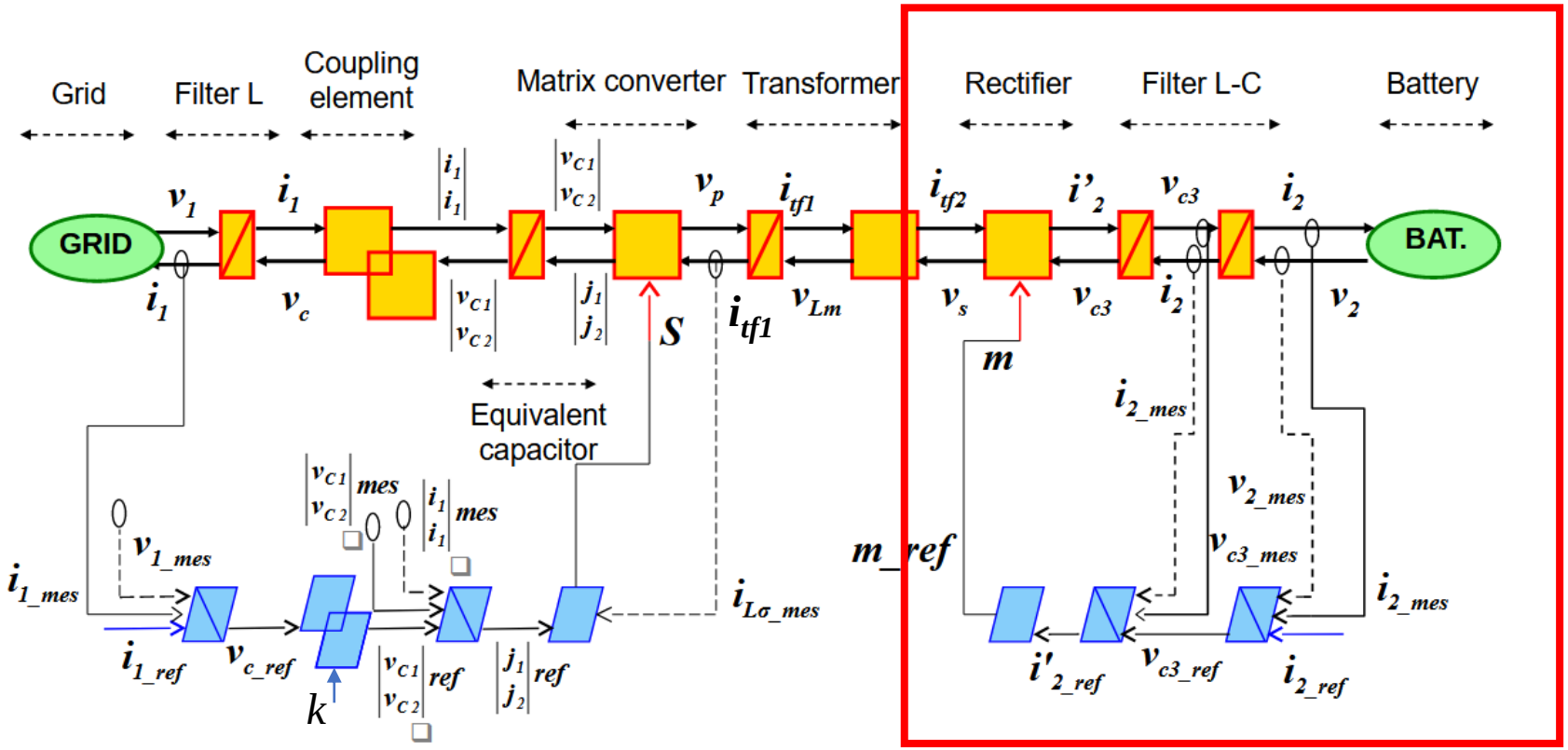


Figure : F. Jauch, J. Biela « Single-Phase Single-Stage Bidirectional Isolated ZVS AC-DC Converter with PFC »

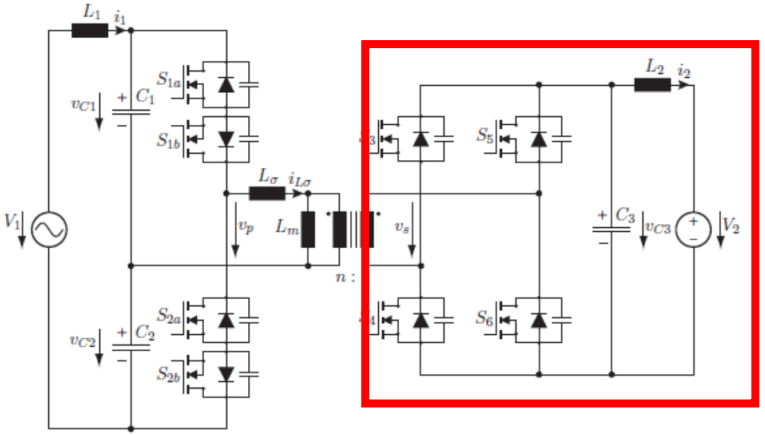
Our case study



Model and control structure by EMR

Simulation Tools

MATLAB®



EMR : **E**nergetic **M**acroscopic **R**epresentation

Objective : Determine the control of a bidirectional onboard power charger

Our case study

Grid **2** **V**ehicle

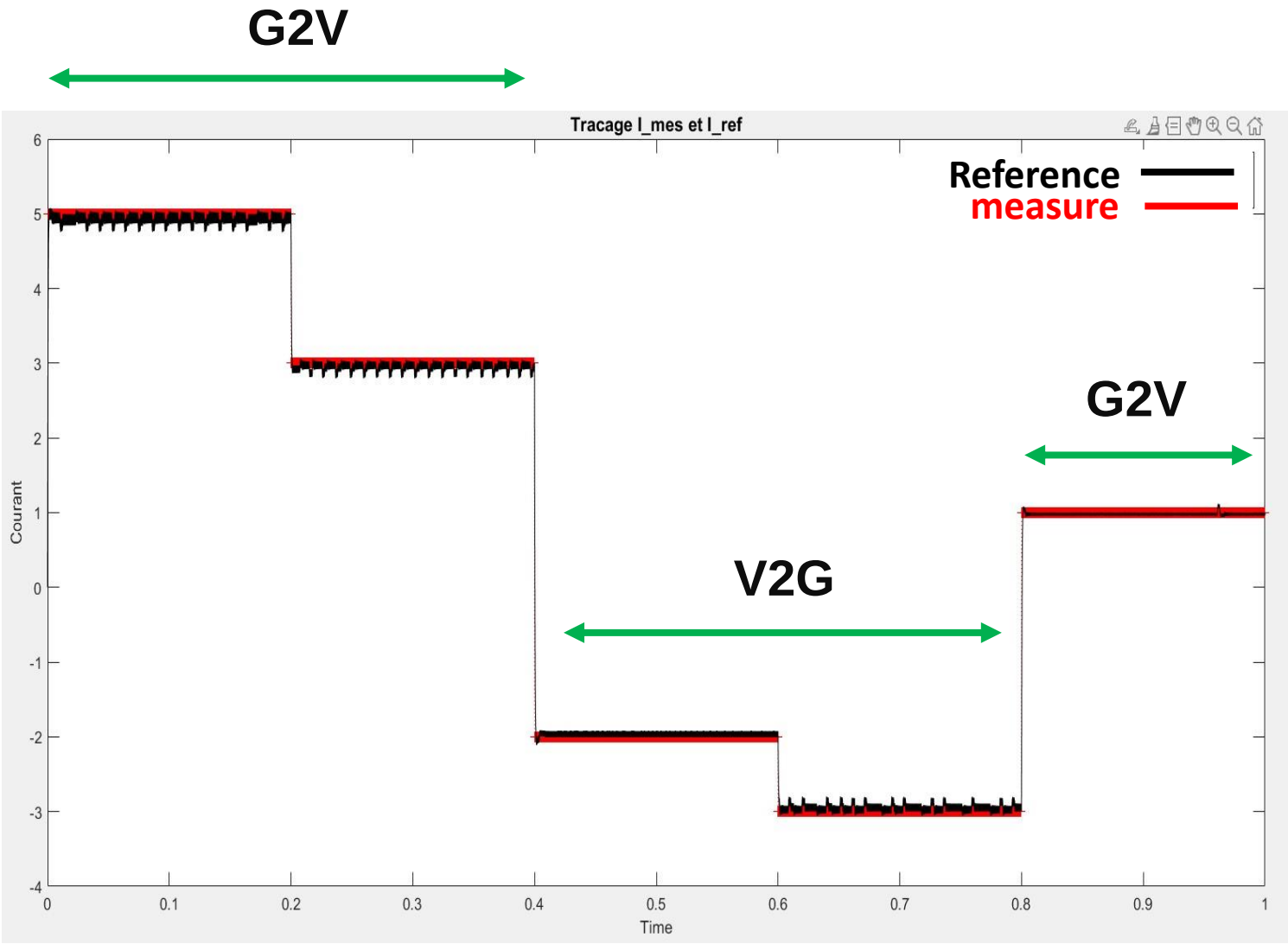
- Battery charging : Positif current
- Rectifier : AC/DC conversion

Vehicle **2** **G**rid

- Battery discharging : Negatif current
- Rectifier : Become an inverter

Objective :

Control of the battery current i_2



Evolution of the battery current

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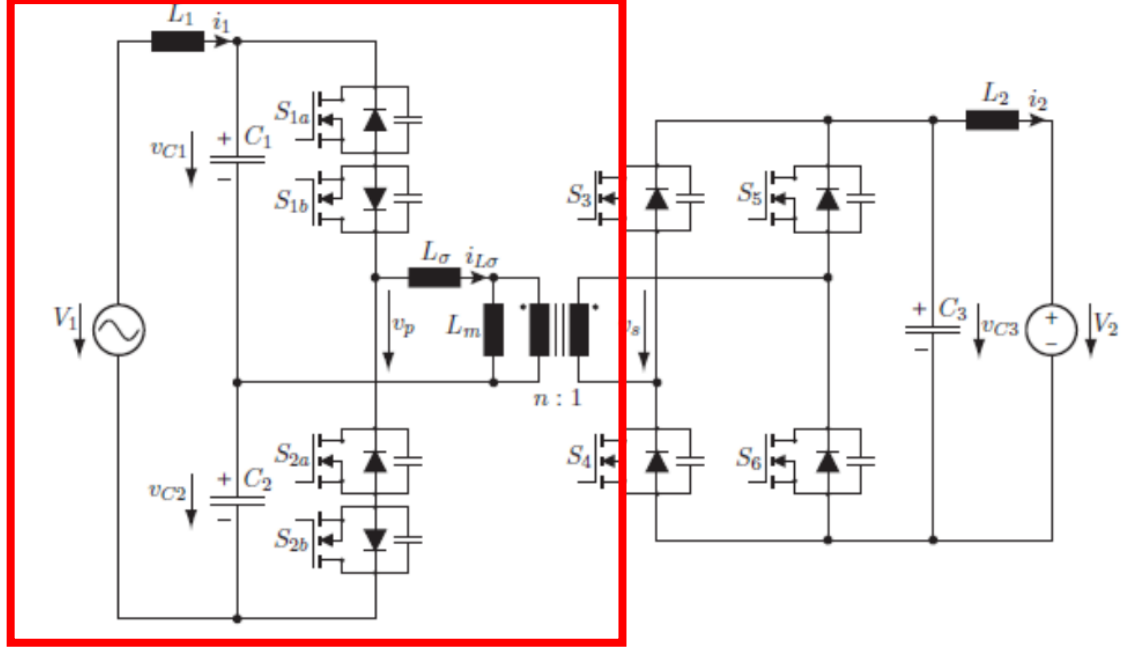
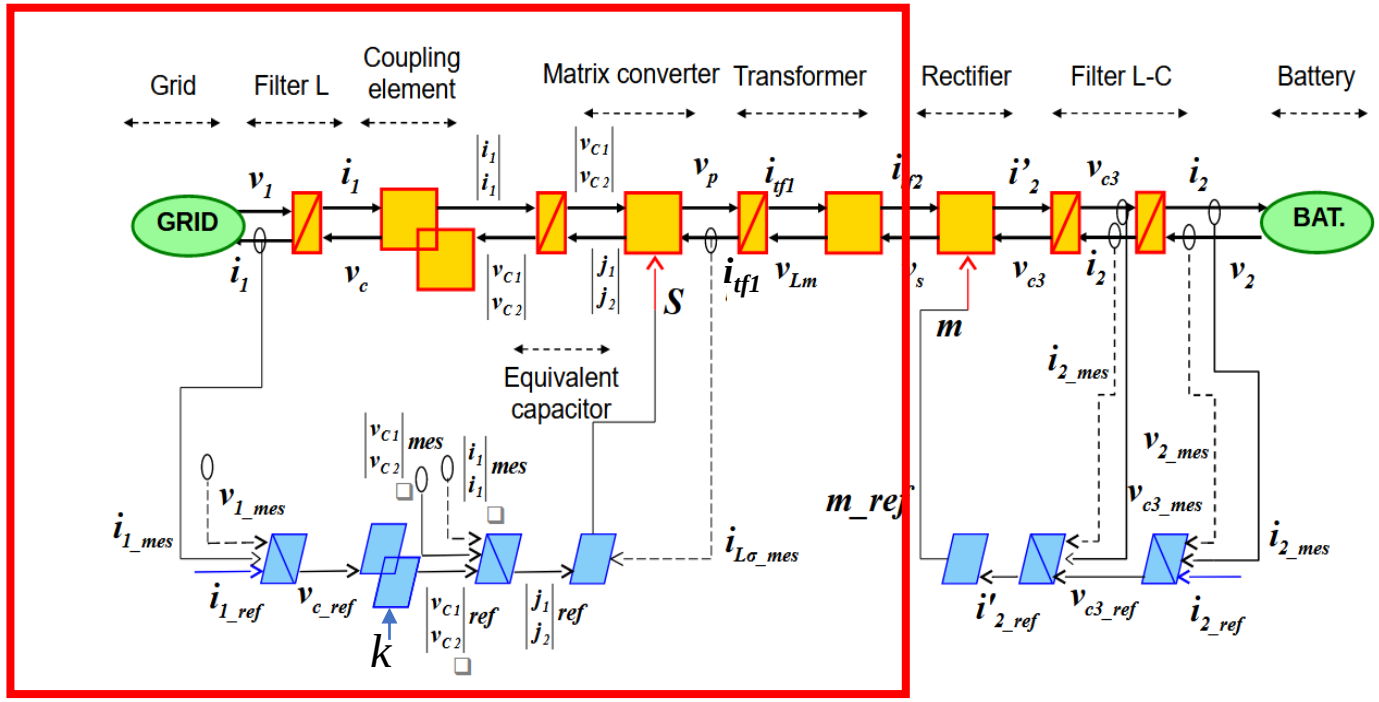
Conclusion and perspectives

Conclusion and perspectives

- **Objective :** Determine the control of a bidirectional onboard power charger.
- **Step 1 :** Inverting the first subsystem and controlling the battery current i_2
- **Step 2 :** Inverting the second subsystem and controlling the grid current i_1
- **Step 3 :** Combine the two subsystems





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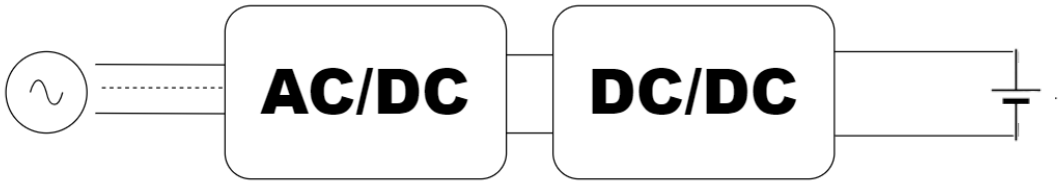
Annexe

Annexe

The different structures of a bidirectional onboard power charger

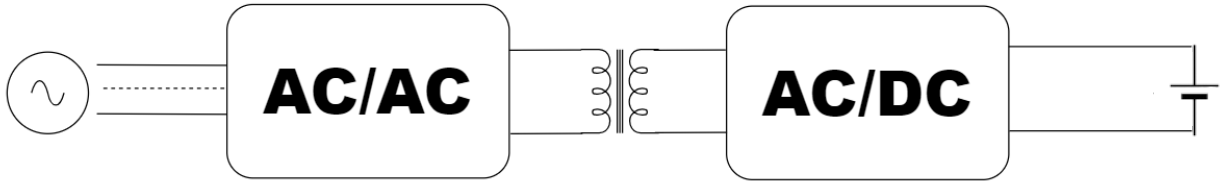
Structure of a charger **without** a **transformer**

Single stage



Two stage

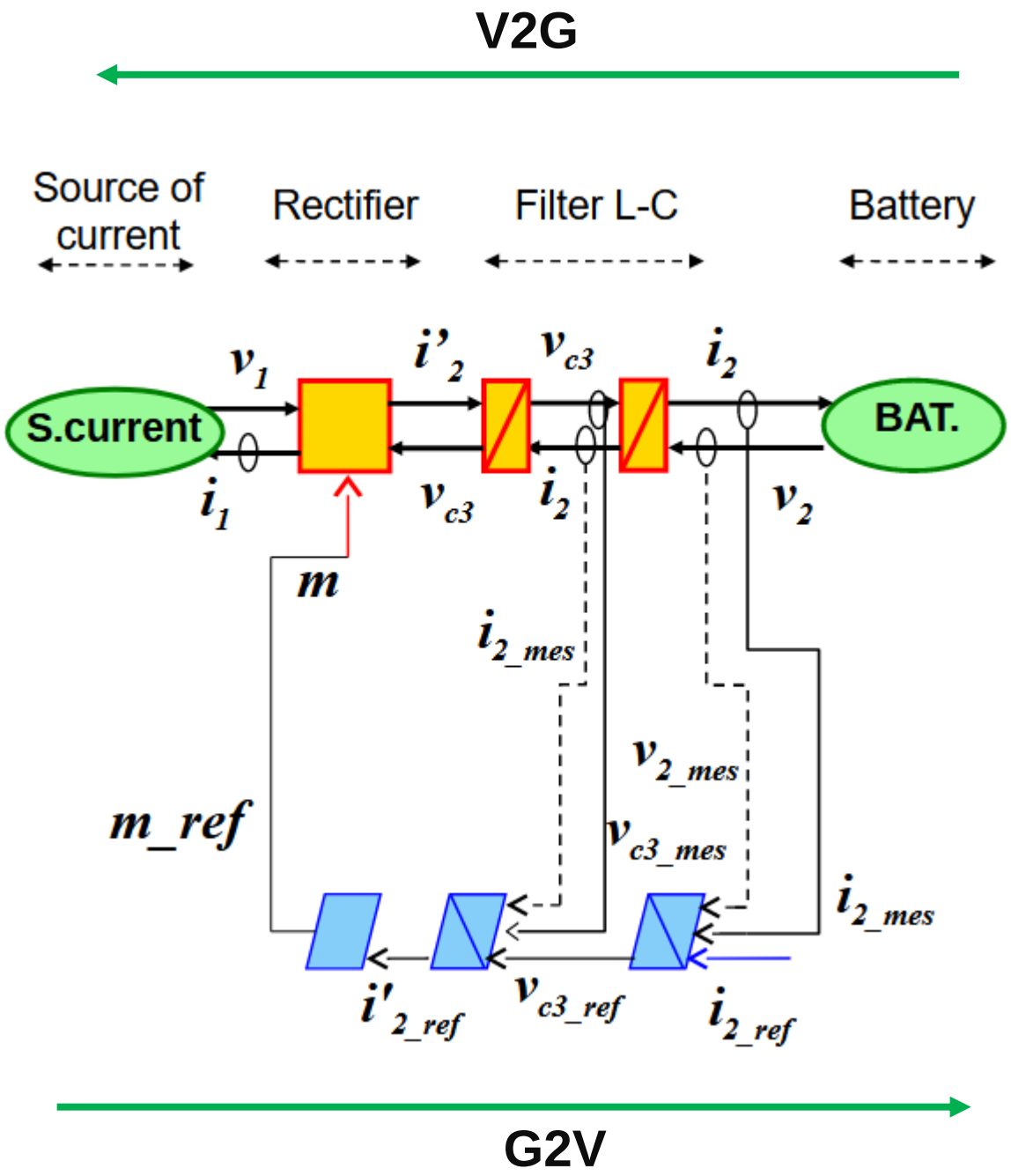
Structure of a charger **with** a **transformer**



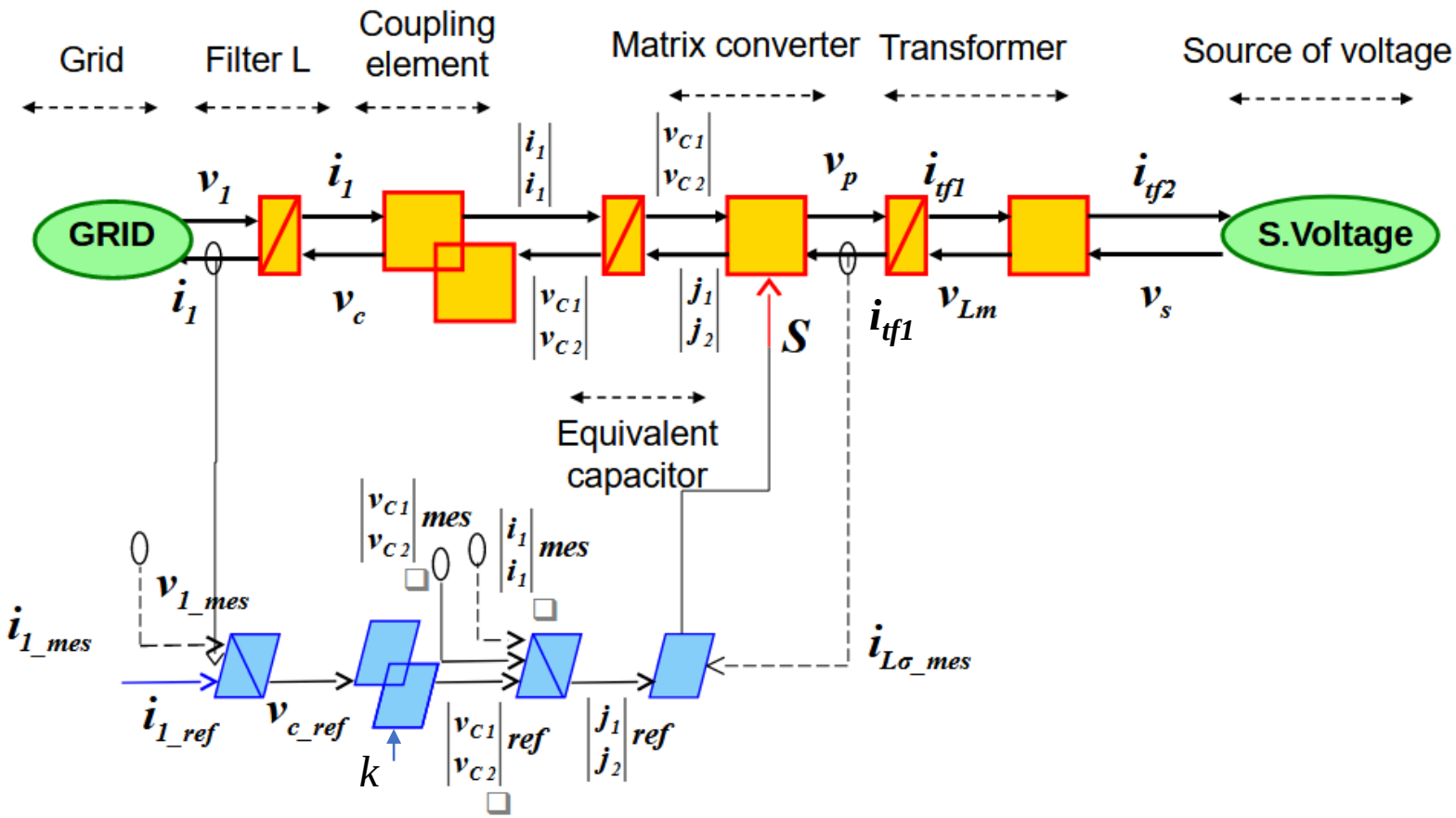
Single stage

Two stage

Annexe


V2G
Source of current
Rectifier
Filter L-C
Battery
S.current
BAT.
v_1
i'_2
v_{c3}
i_2
i_1
v_{c3}
i_2
v_2
m
i_{2_mes}
v_{2_mes}
m_ref
v_{c3_mes}
i_{2_mes}
i'_{2_ref}
v_{c3_ref}
i_{2_ref}
G2V

Annexe



Objective : Control of the grid current i_1

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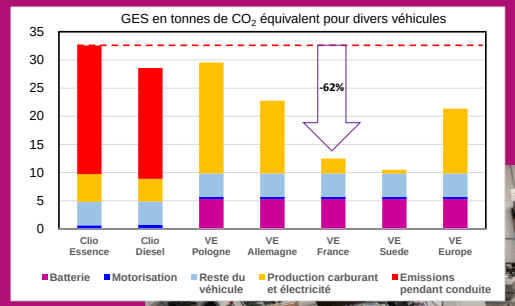

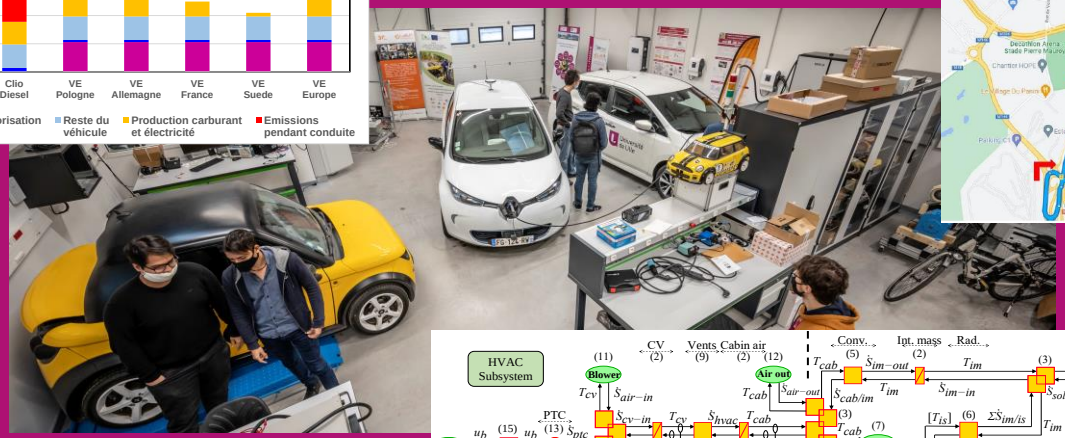

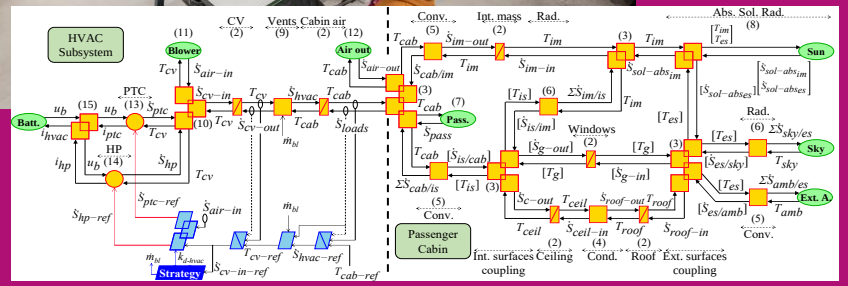

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