# SMART CHARGING AND DISCHARGING OF EVs

## VEHICLE-GRID INTEGRATION SUMMIT

PSA GROUPE

**1994 – 2004**

1st mass production EVs in EU (**11 ku sold**)

(Saft-Sagem-Leroy Somer)

**From 2011**

MMC – Bolloré - GM Partnerships

V2G

**From 2019**

Up to 80% of portfolio (15 new vehicles) with EV or PHEV powertrain

V1G

EV B seg

PHEV C seg

**From 2025**

100% of portfolio with capacity to be EV or PHEV

V2G

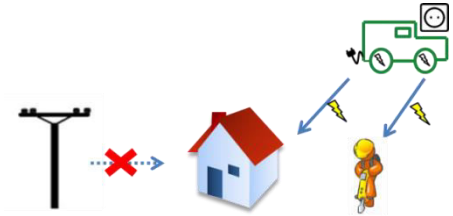
**2000** **2010** **2020** **2025**

➔ Long EVs experience with multiple partners

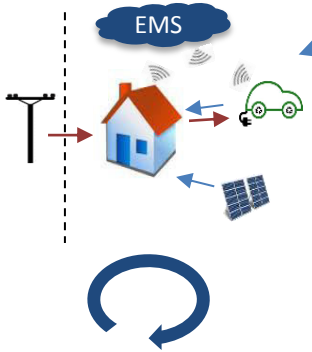
➔ V1G & V2G integration of EV available

Uninterruptible Power Source

**Vehicle-to-load (V2L/V2V)**

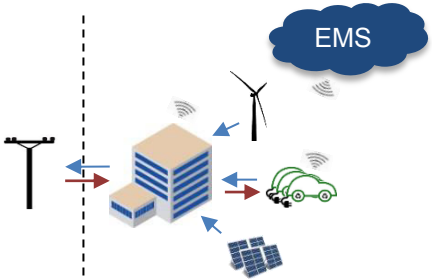


**Vehicle-to-home (V2H)**

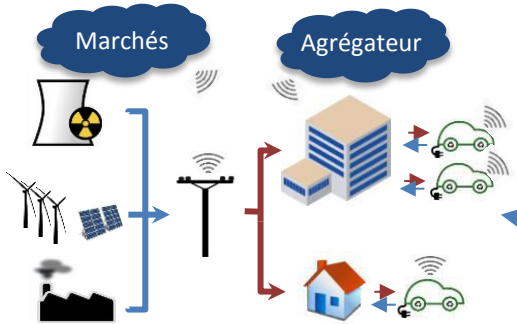



Local energy optimization
➔ -10/-15% on electricity bill

**Vehicle-to-building (V2B)**



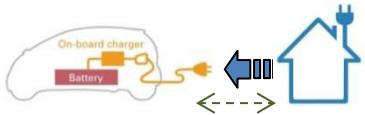
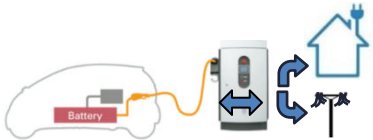
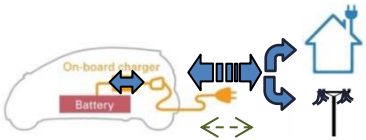

**Vehicle-to-Grid (V2G)**




Global grid services
➔ From 300 to 1400€/EV/Year

- Main customer benefits
  - TCO reduction
  - Increase EV product attractiveness

# EV TECHNICAL IMPACTS

| | Schema | Technological solutions | Functionalities |
|---|---|---|---|
| V1G<br>Smart charge |  <br>ISO/ICE 15118<br>IEC 61851 | IEC 61851<br>Over the air commands<br>ISO IEC 15118 ed 1 | Smart charging with control either done by the EV or delegating to an off board agent |
| V2G DC |  <br>CCS + ISO/ICE 15118<br>CHADEMO V2G | Bidirectional V2G DC EVSE<br><br>ISO / IEC 15118 ed2<br><br>CHAdeMO | Smart charge + bidirectional power flow in DC |
| V2G AC |  <br>ISO/ICE 15118 | Bidirectional OBC + compatible V2G AC EVSE<br>ISO IEC 15118 ed2 | Smart charge + bidirectional power flow in AC |

## Component level

V2G AC Charger exploration

Strong relation ship with EVSE vendor (V2G DC CCS and CHAdeMO)

Academic partnership

EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

## Experimental project

NIKOLA INTELLIGENT ELECTRIC VEHICLE INTEGRATION

parker

gridmotion

Relab 2nd life Project

E-Mobility-LAB Hessen

## Institutional implication

Strong activity in ISO IEC **ISO/IEC 15118-2 Ed2 design (EU CCS V2G )**

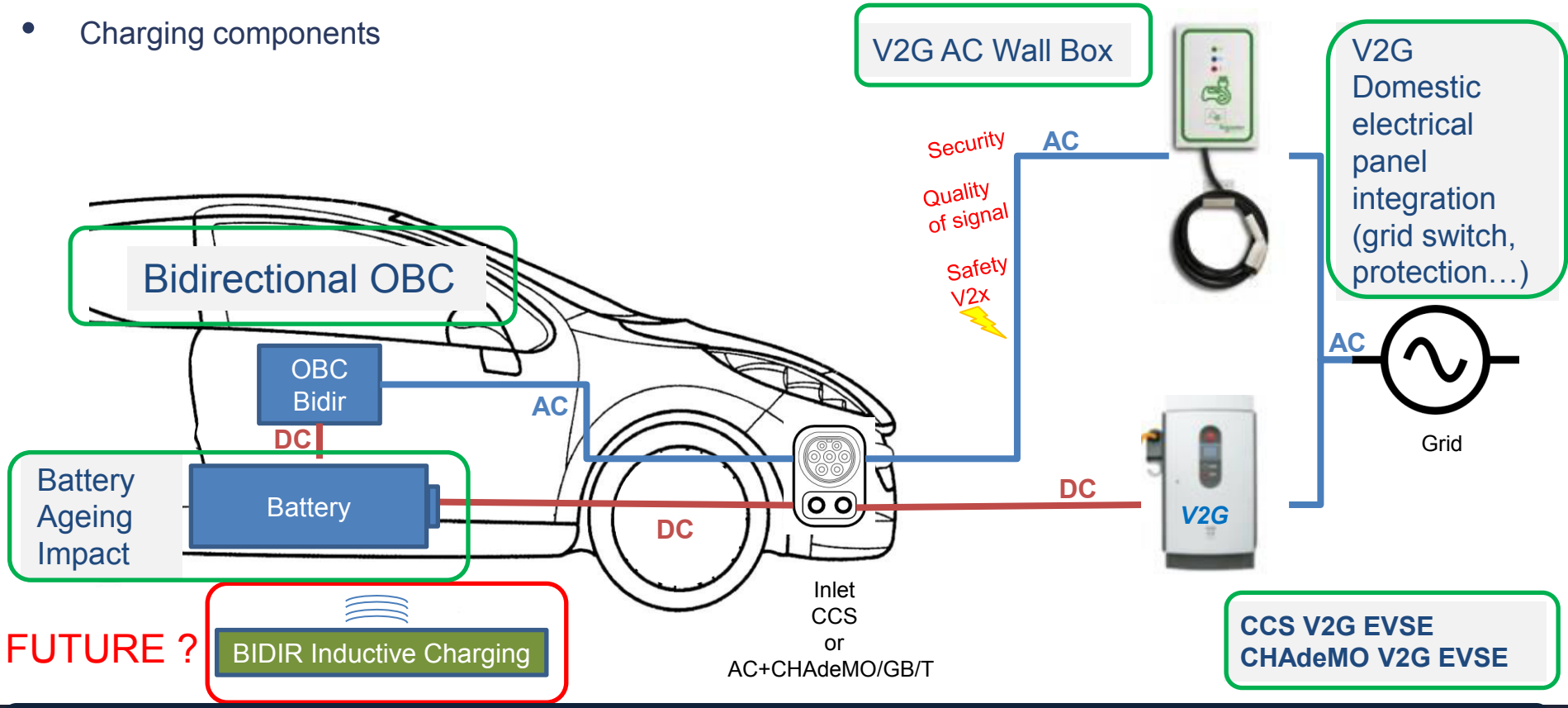
CHAdeMO

CHARIN

AVERE FRANCE

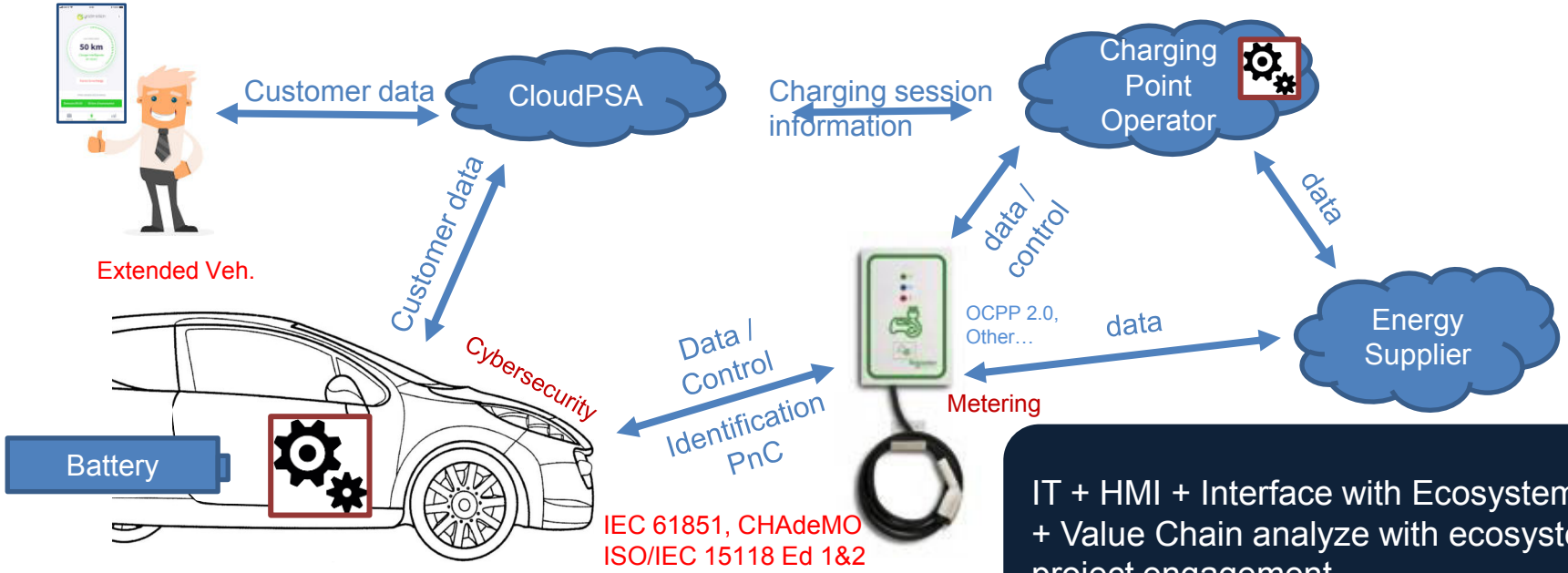
INSTITUT VEDECOM DU VÉHICULE DÉCARBONÉ ET COMMUNICANT ET DE SA MOBILITÉ

- Charging components

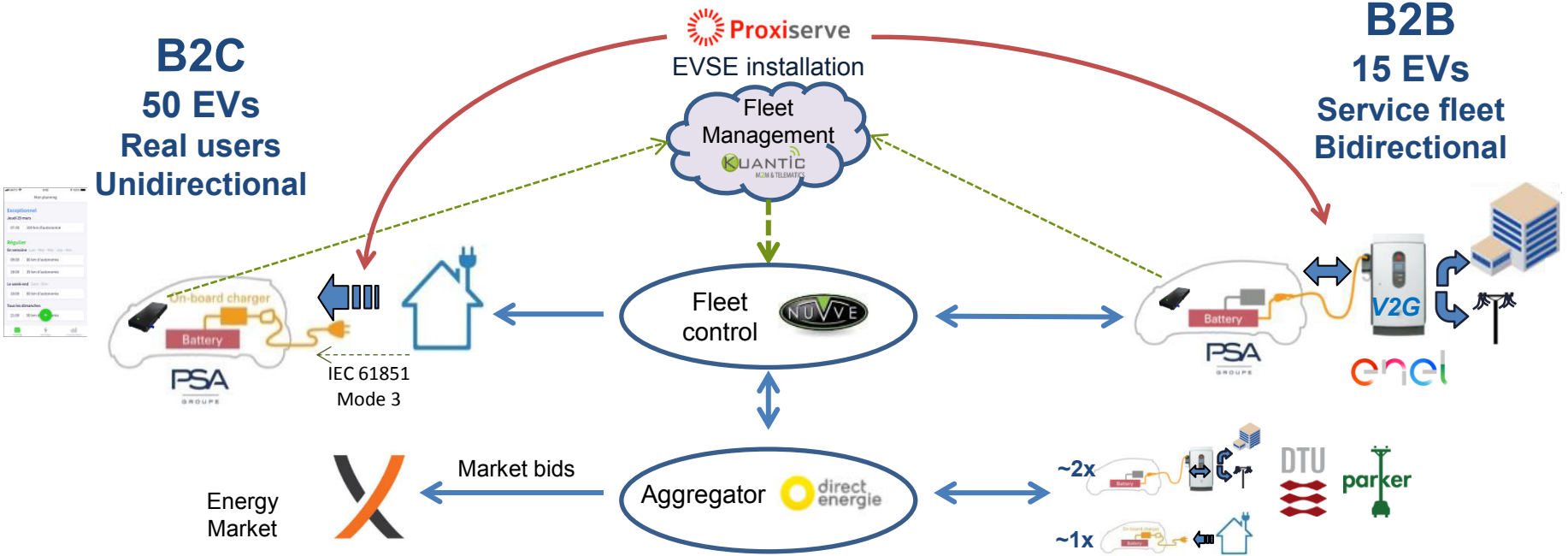



SI Smart Grid = Bidirectional On Board Charger + Wall Box + DC Charger+ Battery Ageing Impact

- The car needs to be integrated into an ecosystem to generate value
  - HMI : collect customer needs & provide feed back
  - IT Interface with secondary actors (Energy provider & CPO, …)
  - Improved communication / Embeded Algorithme



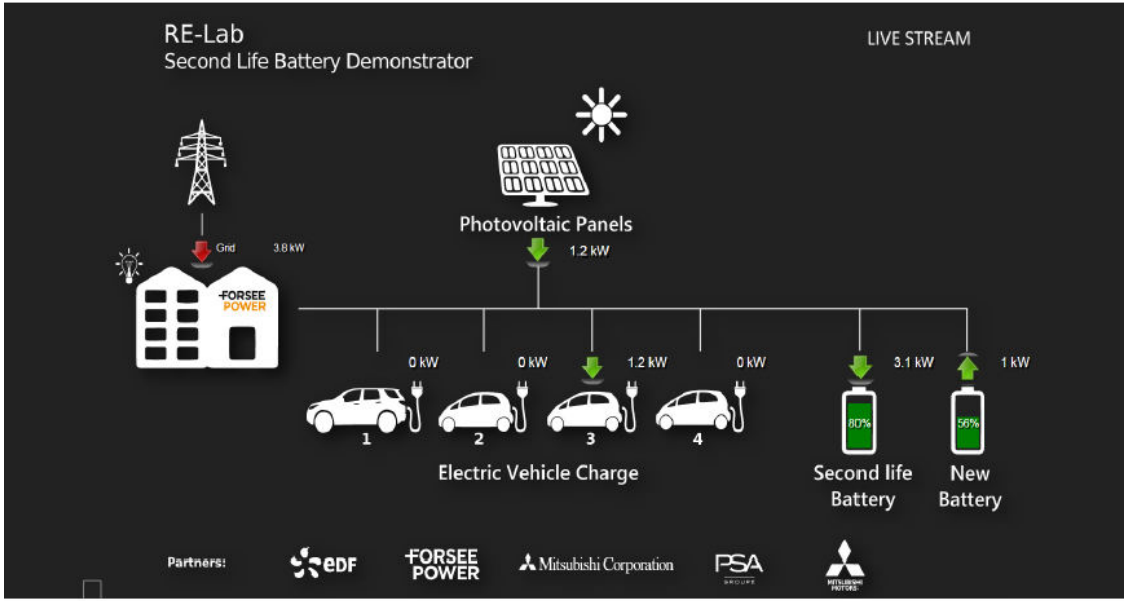

IT + HMI + Interface with Ecosystem
+ Value Chain analyze with ecosystem
project engagement




- Objectives :
  - Build the complete value chain for revenue evaluation of V1G & V2G and costumer acceptancy,
  - BM and marketing prospective,
  - First real life project in France,

FORSEE POWER

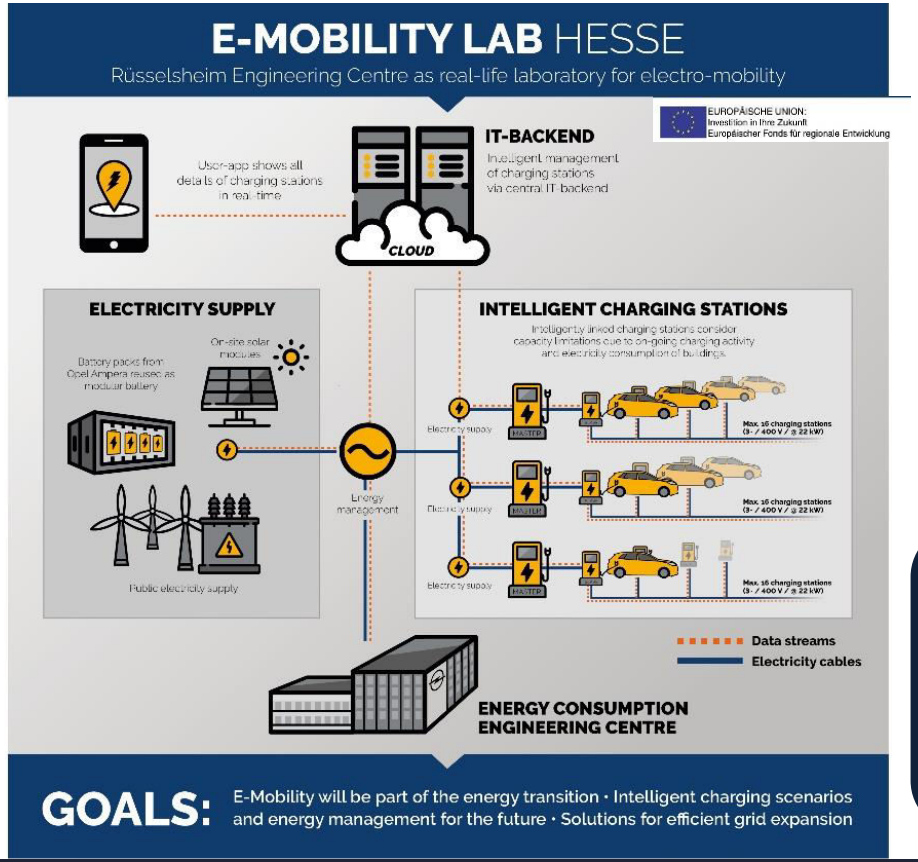
# Re-Lab
# Second-life life battery demonstrator




CHAdeMO

Integration of 2nd Life Batteries in micro grid with local EV 4 charging plugs, 12kW PVs. V2G CHAdeMO charger for cycling 2nd Life Battery.

# Example of project : E-Mobility-LAB Hessen




>160 Charging points deployed in Russelsheim R&D center (DE)
V1G with investment reduction objective, cost management
Charging profile, parking and mobility Academic survey (learning, with real life, on the field activity)

- PSA Groupe experienced V2G application with current EV Product, Paving the way to commercial deployment for next generation EV
- Different technological brick are addressed to be able to proposed adaptive solutions for User (B2C or B2B)
- Ecosystem approach is mandatory for successful service rollout
- Regulation and standards should be adapted.

- Does the revenue perspective link to energy market and taxes (substitute to fossil fuel incomes) will allow robust business model ?
- Complete valorization of battery (V2G + 2$^{nd}$ life + recycling) must be addressed.

# Questions?