



## GridMotion project

Armand Peugeot Chaire Conference



1. Challenges and context
2. GridMotion Project
3. Grid Services
4. Conclusion & Next Steps

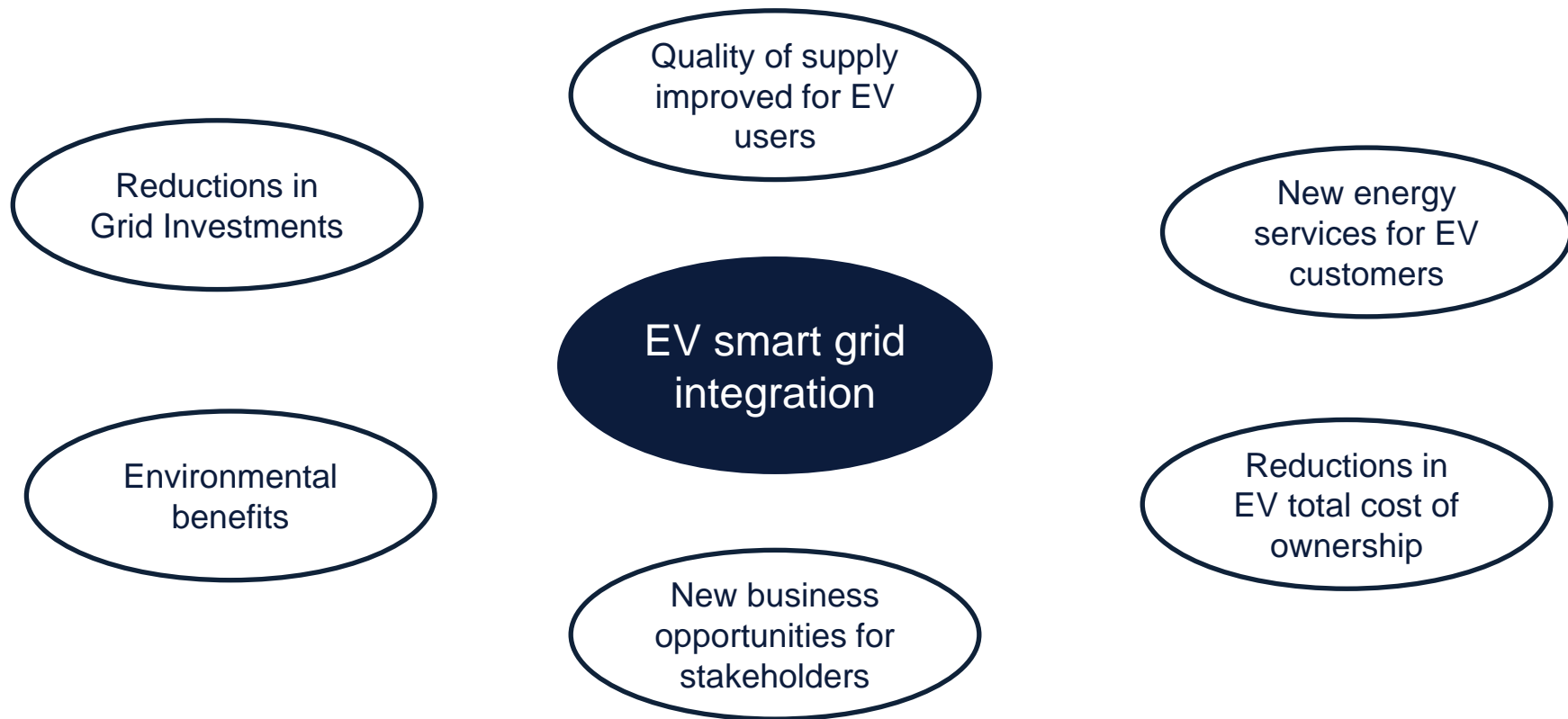
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- EV penetration rate is increasing substantially
  - Technology improvements
  - Air quality
- Critical evolutions in the power system sector
  - Renewable Energy Sources
  - Demand Side Management



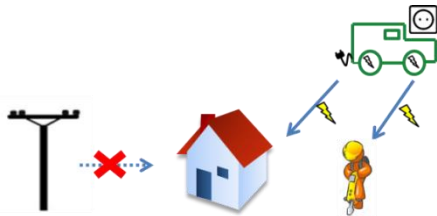
➔ EVs could induce additional stress on the grids

➔ Smart Grid integration of Electric Vehicles



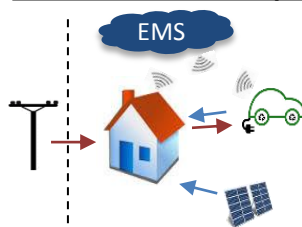
Uninterruptible Power Source

### Vehicle-to-load (V2L)



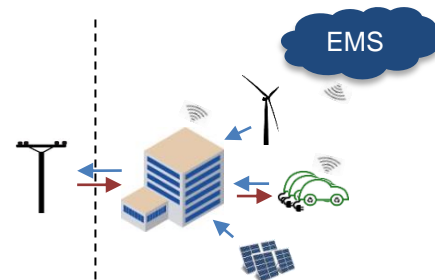
- V2G = most promising solutions, complimentary with V2H/B solutions
- V2G → use case targeted in the GridMotion project

### Vehicle-to-home (V2H)

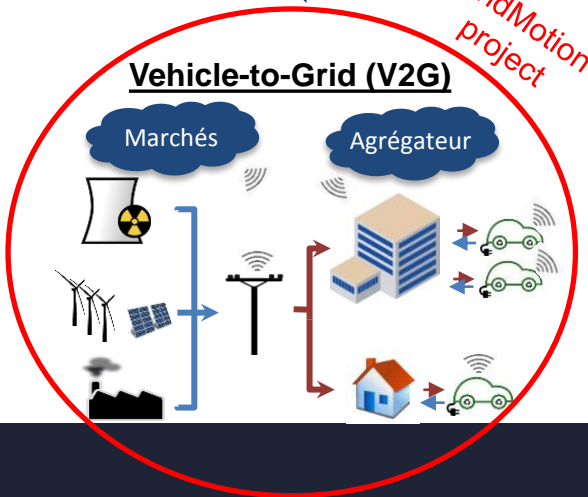


Local energy optimization  
→ -10/-15% on electricity bill

### Vehicle-to-building (V2B)

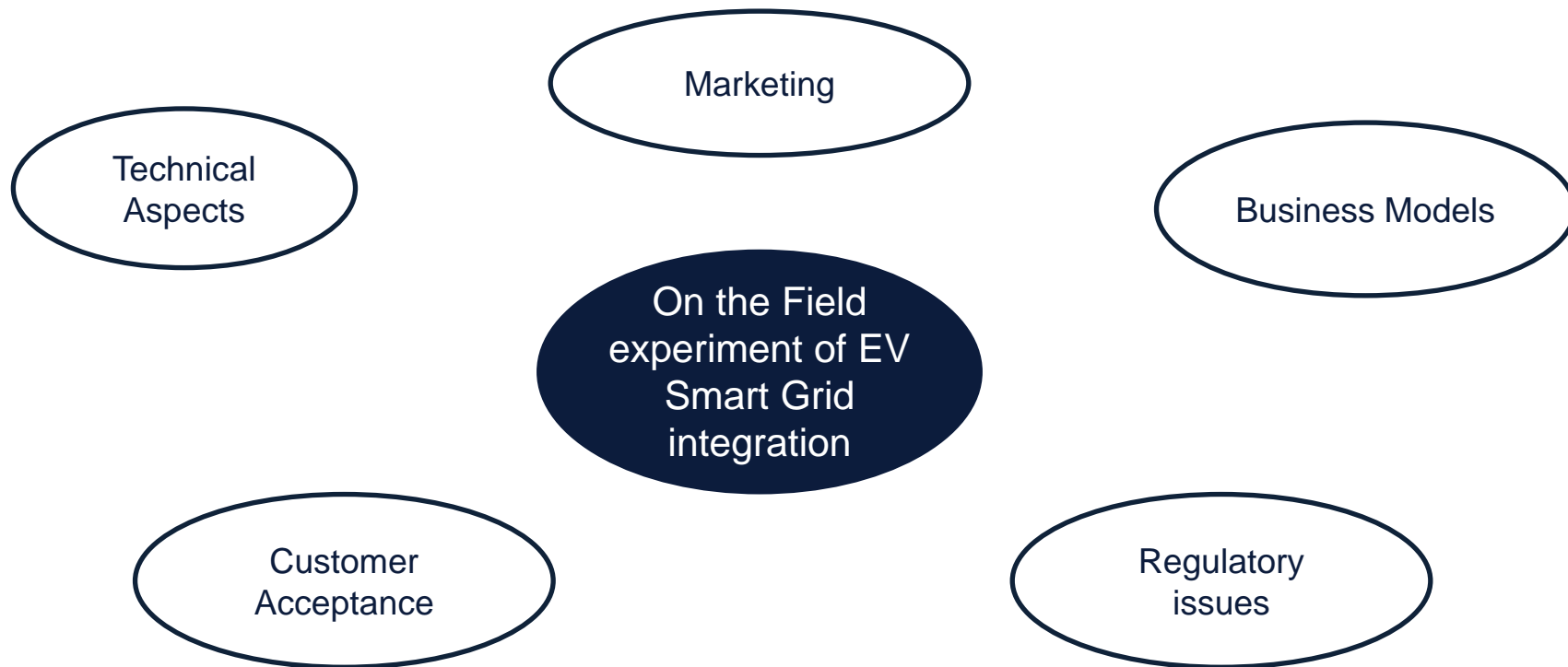


### Vehicle-to-Grid (V2G)



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

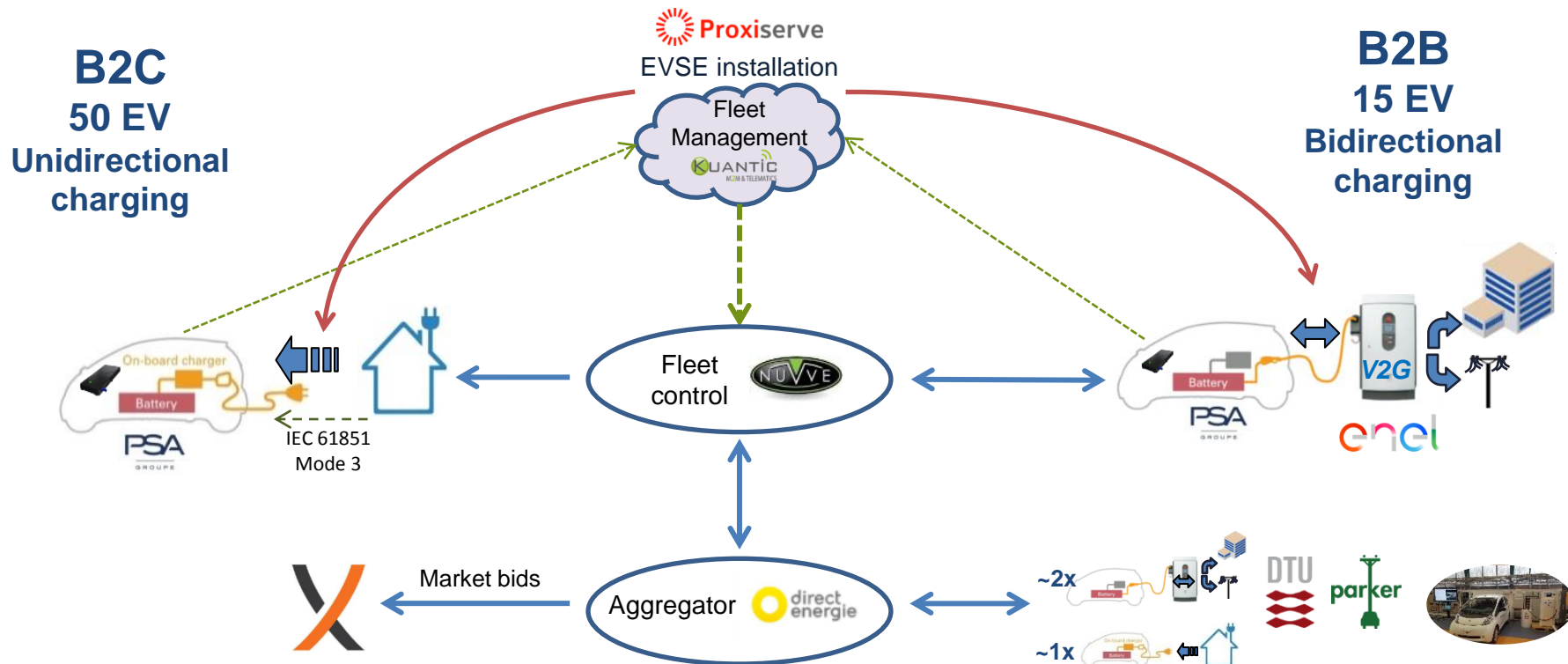
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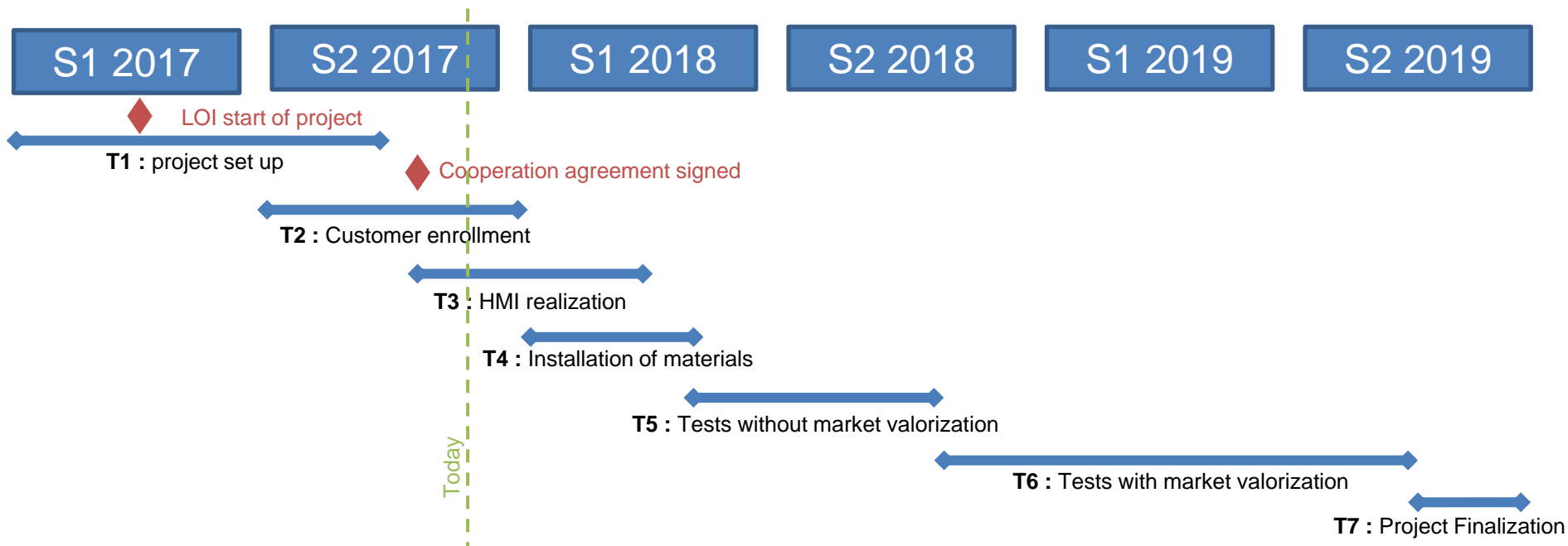






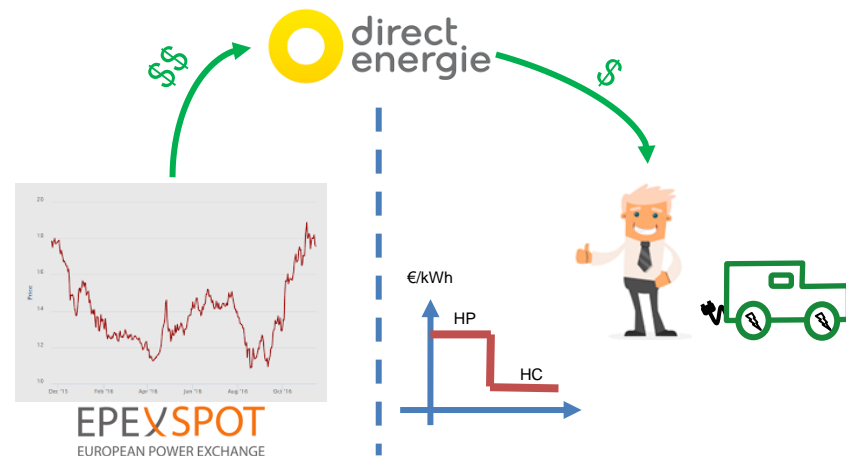
- Complete value chain
- Main international V2G experts





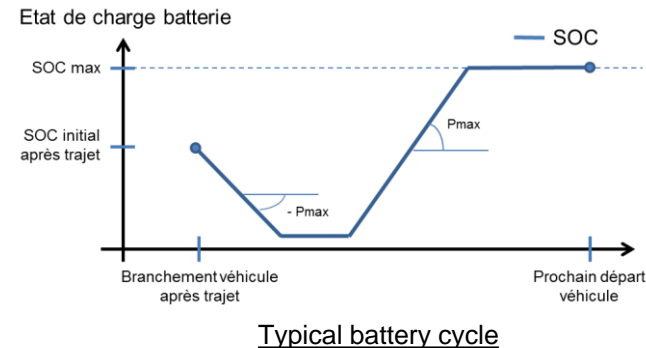
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  - A. Day ahead and intraday markets
  - B. Frequency Containment Reserves
4. Conclusion & Next Steps

- Participation mechanism
  - Offer and/or demand bids in the electricity market
  - 2 separate markets
    - Hourly day-ahead market
    - Continuous Intra-day market
- Concept
  - Charging when electricity prices are low, potentially discharging when they are high
  - Optimal bidding strategy
  - Savings for the Balance Responsible Party



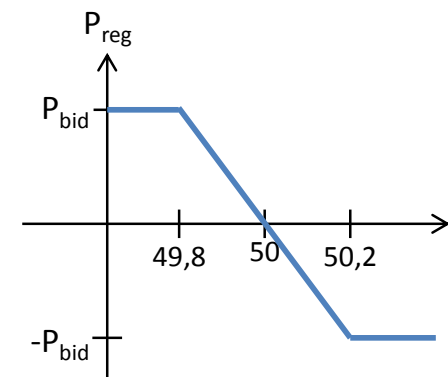
- Charging / discharging patterns controlled based on electricity prices
- The end user may benefit from the BRP's savings

- Regulatory framework
  - Minimum bid = 100kW
    - → 50 B2C EVs in the GridMotion experimentation
  - Available for consumers
  - Energy selling by end-users not possible
  - → possible today for a fleet of unidirectional EVs
- Impacts on battery ageing
  - Unidirectional
    - No impact
  - Bidirectional
    - Substantial depth-of-discharge, potential important degradation



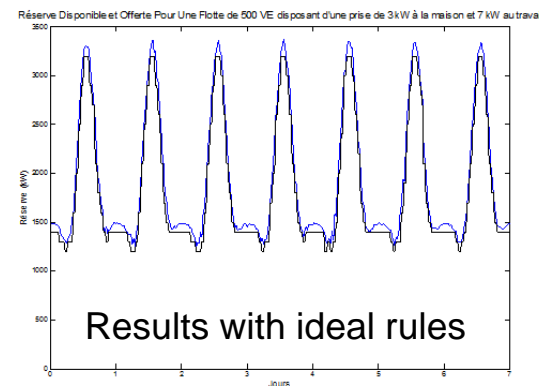
- Conclusion
  - Interesting grid service for unidirectional EV fleets
  - Bidirectional business case largely depends on electricity prices, battery degradation and regulatory framework

- Participation mechanism
  - Weekly common auctions with DE, NL, CH et BE
    - Weekly bids
    - Minimum bid = 1MW
  - Capacity-based remuneration (**€/kW**)
- Concept
  - Aggregators submit bids (price €/kW + capacity kW) and are paid based on their **availability**
- Potential earnings
  - Average 2017 price: 15,5€/MW/h → 135€/kW/an
  - Earnings depend on market rules and EV characteristics
- French reserve size ~600MW
- Impacts on State-of-charge variations
  - Low Depth-of-discharge cycles
  - → potentially low battery degradation



- Interesting business case...
- ...but limited market size

- FCR Cooperation rules:
    - Weekly offers
    - Minimum bidding amount = 1MW
    - Bid Granularity = 1MW
  - Simulations of rules' impacts: comparison with
    - Hourly market
    - Minimum bidding amount = 0,1MW
    - Bid Granularity = 0,1MW
- Project's recommendations:
    - Reduce the minimum bidding amount to 0,1MW
    - Reduce bid granularity to 0,1mW
    - Reduce bid durations to 1h (ongoing process)





- Conservative measuring rules
    - RTE rule : need to have a measurement at the site level
    - ➔ requires the installation of a specific equipment for end users at home
    - TIC information not satisfactory for RTE standards
    - Not possible to certify a communicating charging station (even if using MID meters)
  - Project's recommendations:
    - allow sub-metering by MID certified meters (as in other EU countries)
    - or create an exception for EVs (there is no consumption rebound effect with other usages)
    - If sub-measuring is not possible, then consider certifying Linky TIC (French smart meters)
- New measuring rules could foster the adoption of the technology

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- The intra-day and day-ahead markets are the only available services today for EV fleets
  - The GridMotion project will allow the partners to evaluate the financial benefits, customer acceptance and associated costs with this solution
  - Among several questions: are the costs of making bidirectional power flow possible balanced by the earnings?
  - No need to use the NEBEF mechanism
- Frequency control reserve is interesting:
  - interesting remuneration, low impact on EV SOC variations
  - Ongoing discussions with RTE to try to participate in the market
    - As of today, market rules not satisfactory
    - Possible to accommodate the rules for the project?
- In the future, new business opportunities may rise
  - Due to the penetration of renewables
  - Services for distribution grids
    - → no framework today