

Vehicle-to-Grid Service Valuation, Fleet Constraints, and Market Regulatory Conditions: A Systematic Literature Review

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Extended Abstract

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Abstract Summary

Vehicle-to-grid (V2G) technology allows electric vehicles to discharge electricity back to the grid while parked, transforming them into distributed flexibility resources. It is increasingly recognised as a promising solution for grid flexibility, renewable integration, and new revenue streams for electric vehicle (EV) owners. Some progress has been made towards commercialisation, but deployment remains limited. Designing viable business models requires knowing the value of the services that can be provided, the behaviour of the customers or fleets involved, and the regulatory market conditions they face. The literature addressing these three dimensions, service valuation, fleet operational constraints, and market regulatory conditions, remains fragmented. Most studies focus on one or two aspects, such as economic valuation or technical feasibility, while frameworks that jointly address all three are rare.

Results suggest that economic analyses often overestimate potential revenues from ancillary services when idealised assumptions about vehicle availability are used.

- Services: frequency reserves are the most studied; arbitrage revenues appear thin in most European markets; service stacking is theorised but rarely quantified empirically for EVs specifically.
- Fleets: commercial and captive fleets dominate pilots; passenger-car availability uncertainty remains largely unresolved; behavioural constraints are empirically undermodelled.
- Markets: European regulatory heterogeneity, minimum bid sizes, double-charging rules, and aggregator access conditions are rarely compared systematically across jurisdictions.

The most critical gap is the lack of studies that jointly synthesise these three dimensions. The original equipment manufacturer (OEM) product design perspective is particularly absent from the literature. Neglecting any one dimension can dramatically alter

conclusions about viability or profitability, which limits the ability to make robust investment or product decisions.

More integrative models and empirical studies are needed. In particular, the absence of a joint framework covering service valuation, fleet constraints, and regulatory conditions from a product strategy perspective represents a significant gap.

Presenting Author Biography

Matthieu Chazal is a first-year PhD candidate at the Laboratoire de Génie Industriel, CentraleSupélec, Université Paris-Saclay. His research focuses on Vehicle-to-Grid strategy in partnership with the automotive manufacturing corporation Stellantis. He holds a double degree from CentraleSupélec, a Master's in Energy Efficiency Engineering and a Master's in Energy, Environment and Transport Economics. Before his PhD, he gained international research experience at the Institute of Energy Economics, Japan (IEEJ) in Tokyo, where he worked on hydrogen market modelling and energy policy. His broader expertise spans techno-economic analysis, quantitative modelling, and energy market design.