

A US perspective on Vehicle-to-Grid (V2G) technology

The right monetization strategies
will be the key to success



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Introduction

Vehicle-to-Grid (V2G) plays a crucial role for decarbonization, sustainability and EV “electric vehicles” affordability. Simon-Kucher points out monetization challenges and delivers key insights into a promising business opportunity.

- V2G poses several challenges – monetization is one of the key success factors.
- Price transparency, optimized Total Cost of Ownership (TCO), and smart incentive strategies are key to drive adoption.
- Smart contracts enable safe and reliable communication between participants.

New York, June 2025 – EVs play a crucial role in the worldwide transition towards carbon neutrality and energy efficiency. Some estimates project 33 million EVs on the road in the US by 2030, with 28 million EV charging ports to offer supporting infrastructure.¹

Simon-Kucher’s [2024 Global Automotive Study](#) highlights shifts in consumer confidence and purchasing decisions while uncovering the opportunities emerging technologies offer for consumers and OEMs (Original Equipment Manufacturer) alike. In this paper, we assess one such technology with noteworthy potential: vehicle-to-grid technology and its impact on the American mobility and energy markets.

OEMs, consumers, and governments play critical roles in the EV ecosystem at a national and global level. However, increasing competition from foreign manufacturers² and unequal access to energy grids across the US³ have created cost pressures for American OEMs and high volatility for energy providers. Further, the increasing shift towards renewable sources of energy and surging peak energy demands on existing electric grid infrastructure have created high demand fluctuations for energy providers across the US.

Additionally, consumers are growing increasingly price conscious on car purchases, with many opting for downsized options or used cars.⁴ Prices on new EVs dropped 15% relative to two years ago, while prices on used EVs dropped 42% YoY.⁵ Monetizing the energy stored in electric vehicle batteries by transferring it back to the grid when it is not in use (commonly known as “Vehicle-to-Grid”, aka, V2G), is a potential solution that serves the interests of OEMs, consumers, and energy providers by increasing EV affordability, reducing electric grid volatility and maintaining a stable power supply system.

1 <https://www.energy.gov/eere/evgrid-assist-charts-and-figures#:~:text=By%202030%2C%20the%20U.S.%20Will,be%20needed%20to%20support%20them.>

2 <https://www.wsj.com/business/autos/the-withering-dream-of-a-cheap-american-electric-car-ad7e1113>

3 <https://www.reuters.com/investigates/special-report/usa-renewables-electric-grid/>

4 <https://www.wsj.com/business/autos/after-years-of-going-big-american-car-buyers-are-downsizing-801a81b8>

5 <https://www.cbsnews.com/news/electric-vehicle-prices-falling-2024-ev-tax-credit/>

V2G is a technology where EVs currently not in use are connected to the grid and act as a power storage in peak supply situations, or power supplier in peak demand settings. Next-generation electric vehicles are increasingly equipped with the technology to enable bi-directional communication and flow of energy with the power grid.

Simon-Kucher's Global Automotive Study in 2024 found that while only about half of the world's automotive consumers are aware of V2G technology, opinions on the technology are largely optimistic about its potential to unlock sustainability and offer real value to EV owners. Our upcoming 2025 Global Automotive Study will offer more up-to-date and detailed insights into shifts in consumer mindsets and the various headwinds and tailwinds that all stakeholders in the automotive industry must be cognizant of.

For consumers, monetizing the flexibility of battery through charging-discharging cycles to optimize grid system cost by selling unneeded energy stored in their electric vehicle batteries in times of peak demand back to the electric grid serves as a recurring source of revenue over the lifetime of the vehicle. Some estimates claim up to 14% reduction in charging costs⁶ and up to 11% reduction in TCO for individual owners and fleet managers.⁷ The benefits of incorporating V2G capabilities, however, are not limited to EV owners alone.

According to the International Energy Agency (IEA), by 2030 a total of 230 gigawatts (GW) of electricity demand can be moved to off-peak hours by using V2G⁸. Additionally, equipping only 5% of EVs in key global markets with V2G technology by 2030 could already deliver up to 600 GW of peak demand. Over the course of one year, 1 GW can power over 830,000 households in the United States⁹. Some solution-providers have further accelerated progress in bidirectional charging by leveraging AI-supported algorithms to identify optimal energy trading strategies and enable real-time trading decisions in energy markets. Such moves push solution-providers, like the Mobility House, towards a future where mobility and energy requirements are met with zero emissions at zero costs.¹⁰

Not all regions in the US carry equal infrastructural capabilities to both handle peak energy demands and incorporate V2G capabilities. Traditionally, underserved or rural US regions lack sufficient infrastructure to handle these grid demands. V2G offers an opportunity to plug this gap and creates a strong business case to both, offering greater supply reliability to meet local energy demand and makes energy and EV ownership more affordable for residents.

There are a number of promising initiatives and start-ups in the global V2G environment. OEMs and the wider transportation industry have realized the potential electric mobility, and V2G in particular, offers for reaching CO2 emission targets. As a result, governments have made investments in research and development to fund pilot projects exploring

6 <https://www.mdpi.com/2032-6653/12/4/236>

7 https://ctl.mit.edu/sites/default/files/IEEE_2012_DeLosRios_Goentzel_Nordstrom_Siebert.pdf

8 Global EV Outlook 2020 from the IEA, based on the IEA Sustainable Development Scenario

9 Based on the household consumption of 10,500kWh/year, Source: U.S. Energy Information Administration

10 https://www.mobilityhouse.com/int_en/our-company/newsroom/article/the-mobility-house-repositions-for-achieving-zero-emissions-at-zero-cost

the potentials of V2G technology. California's Public Utilities Commission granted Pacific Gas & Electric (PG&E) \$11.7M in funding to pilot three V2G integration projects, including residential and commercial applications.¹¹ PG&E has further partnered with Ford¹² and Zum¹³ to test vehicle hardware for its bi-directional grid charging capabilities in consumer and fleet vehicles, respectively. Test runs are not isolated to California, however, with the U.S. Department of Energy awarding Baltimore Gas & Energy in Maryland with funding to launch experimental programs with Ford F-150 Lightning trucks¹⁴ and Xcel Energy initiating studies in Colorado using Nissan Leaf EVs¹⁵. Some energy and mobility solution providers, like GM Energy, already market EVs as a source of backup power in vehicle-to-home applications.¹⁶

Additionally, several privately funded start-ups and some established companies exist in the V2G landscape, most of them with a focus on AI-based platforms for V2G processing, connecting private and commercial EV users with energy suppliers. However, companies are still nascent. Nuvve, one of the biggest players in the V2G industry, only had around 29MW under management in Q3 2024¹⁷. Companies like Sunrun, that provide energy storage solutions, provide installation services that are crucial to enable wider EV V2G adoption and scalability.

Ford is among the legacy American manufacturers leading US OEMs in implementing V2G technology and participating in multiple pilot projects across the country. However, American OEMs still trail foreign counterparts like Nissan, Mitsubishi, Peugeot, and Citroen in offering mass-market V2G capabilities among their EV lines. For example, a range of Nissan vehicles will come equipped with more affordable V2G technology as early as 2026 – offering consumers access to modern EV and V2G solutions without breaking the bank.¹⁸

11 <https://www.utilitydive.com/news/california-approves-117m-vehicle-to-grid-pilots-in-pge-footprint/621393/>

12 <https://www.forbes.com/sites/billrobertson/2023/11/28/pge-teams-with-ford-for-v2h-two-way-charging-pilot-program/>

13 <https://electrek.co/2024/08/19/oakland-is-now-first-in-the-us-to-have-a-100-electric-school-bus-fleet-and-its-v2g/>

14 <https://www.utilitydive.com/news/sunrun-bge-launch-first-us-vehicle-to-home-ev-charging-program/722367/>

15 <https://www.utilitydive.com/news/fermata-xcel-energy-launch-v2x-bidirectional-charging-pilot/717321/>

16 <https://gmenergy.gm.com/vehicle-to-home>

17 <https://investors.nuvve.com/news-releases/news-release-details/nuvve-provides-third-quarter-2024-financial-update>

18 <https://uk.nissannews.com/en-GB/releases/nissan-to-launch-affordable-vehicle-to-grid-technology-from-2026>

Several challenges for a successful implementation in the future – monetization is key

Generally, current V2G pilot projects are conducted with only a small number of EVs and/or chargers. Additionally, privately owned companies are not yet publishing large-scale financial and usage numbers to the public. Apart from small testing environments, initiatives are mainly focusing on technical aspects like load shifting and frequency regulation. Economic viability studies play a subordinate role, as commercial opportunities are often neglected or deprioritized.

For V2G to really take-off, the following three key challenges must be overcome:

1. Implementation and infrastructure

Profitability of V2G is reliant on efficiency of power transmission. Here, chargers and other used equipment need high quality and maturity, which come with increased investment costs. Thus, effective monetization is a key lever for creating profits. Additionally, most EVs are not yet equipped with V2G technology. Some manufacturers like Kia or BYD offer models with the less powerful Vehicle-to-Load (V2L) technology, but widespread implementation of this technology is yet to come.

To participate in the energy market itself, a certain minimum amount of electric capacity needs to be offered. So called “aggregators” gather multiple EV users and act as a mediator between users and the market. Here, the technical complexity lies in providing smart algorithms for an optimal collection and trading of electricity and the accompanied data security concerns when exchanging information with multiple players.

Moreover, V2G technology best displays its benefits in scaled implementation, as only then can desired effects on grid stability be observed. The entire V2G ecosystem (including OEMs, utility companies, grid operators, and V2G integration solution providers) must move in tandem for a successful and seamless implementation for consumers, who are moving from relatively effortless Internal Combustion Engine (ICE) or EV settings. Such a coordinated move, however, is not unprecedented for the industry. Large-scale implementation of home wall box set-ups for EVs required a coordinated move from numerous stakeholders and generated significant opportunities for smaller players, such as QMerit, the US’ largest EV charger installation company, to build strong relationships with consumers and larger OEMs.

2. Legislation and standardization

As V2G requires a high adoption rate for its viability, standardized communication protocols for EVs and the related electric vehicle supply equipment (EVSE) are needed to enable scalability.

The energy market is highly regulated, which consequently also requires clear regulation for the participation of aggregators in the market. Without clear and unified regulatory frameworks, uncertainty remains high, threatening the profitable introduction of V2G. In the beginning of January 2023, GM, Ford, and solar energy producers have announced a cooperation on virtual power plants (VPPs), that combine V2G capable EVs on a large scale with clean energy sources¹⁹. The involved players are collaborating to create standards for the use of the technologies and shape policies to allow for more affordable decarbonization solutions.

3. Monetization

The implementation of V2G in a free-market environment only makes sense if the return on the significant technical investments is adequately high for all stakeholders. Fortunately, the financial upside for energy suppliers, OEMs, and EV owners from a comprehensive adoption of V2G can be substantial.

However, scale is crucial for all players in the ecosystem to generate meaningful returns from the needed investment. One major hurdle for OEMs is building a strong value proposition for consumers to invest in V2G-enabled EVs. Communication programs must be championed by OEMs to drive consumers past the early inertia of the transition from regular EVs or ICE vehicles to V2G-enabled EVs. OEMs must develop a strong, well-articulated value proposition into their monetization strategy that incorporates the reduced TCO over the EV's lifetime into its program communications for wider buy-in.

From a monetization strategy perspective, this manifests in three ways. First, OEMs must identify winning value drivers across target segments and package the right suite of features and product offerings for each segment's differentiated needs. Second, OEMs must pinpoint the right price model and level based on the quantified utility of features on offer across its V2G product line. Third, OEMs must identify the sales approach and channels that best serve its target segments' preferences to drive responsiveness and engagement to program communication.

¹⁹ <https://www.reuters.com/business/energy/gm-ford-google-partner-promote-virtual-power-plants-2023-01-10/>

How smart monetization strategies will be the key driver of V2G business

Experience with EVs and the wider automotive industry shows that end-consumers will only make investments or adopt a new technology if there is a clear use case and meaningful added value. As a result, utility and financial gain for each participant must be clearly identified.

Based on Simon-Kucher research and project experience, annual savings per vehicle of up to \$1,700 can be expected. However, maximum value is only derived if users routinely discharge battery energy during peak demand hours and charge their vehicles during off-peak hours. For some consumers, this poses an additional adoption challenge as they must now pay closer attention to energy rates. Such required changes to usage habits must be factored into the monetization equation so that fleet and private customers are offered the right incentives to invest in V2G.

Let's take a closer look at a few different monetization aspects:

1. Smart monetization strategies for charging equipment and V2G in vehicles

Expensive equipment poses an important challenge for private users. To gain a large user base, aggregators can equip early users for free and later scale this investment by leveraging the larger user base that can now attest to V2G's benefits and provide crucial usage data to incorporate into subsequent product messaging. An alternative approach is to develop payment methods such as pay-per-use or subscription models. In such an arrangement, the aggregator does not charge upfront costs and cash flow is generated through regular payments based on usage. This approach also offers lower downside and greater flexibility for customers. Such incentivization solutions minimize entry barriers for the first wave of adopters and pave the way for wider adoption over time.

2. Incentivization strategy and smart user engagement

V2G creates the most value when all players are actively participating. Hence, incentivizing customer engagement directly drives profitability. When incentivizing potential customers to engage in V2G, the value proposition needs to be very clear. Incentives can be monetary, through time-of-use pricing or free/subsidized public charging, and non-monetary, through access to special parking spots, priority charging in restricted periods or even extended battery warranty if users engage in V2G.

Finally, front-end design of V2G applications must be as simple as possible. For example, users may be able to simply set a desired battery status for a given time and leave all decisions to AI-driven algorithms optimizing the related charging and discharging activities. For this, it is important to build trust between users and platform operators. Engagement could be further increased by offering real-time insights into the user's participation in V2G. Doing so would drive immediate understanding and satisfaction while incorporating gamification and rewards may keep users engaged in the long run.

3. Smart energy contracts and dynamic pricing algorithms

The monetization of V2G is also highly dependent on the contractual arrangements between the various parties involved. These agreements can be highly complex due to several factors, such as:

- The number of involved parties (e.g. EV owner, utilities, car manufacturers, or third-party aggregators)
- Specific terms of V2G transactions such as agreed-upon usage restrictions
- Increased numbers of transactions based on the charging and discharging of the EVs

To consider all these factors, a viable solution is to introduce specific smart contracts based on blockchain technology. Smart contracts are self-executing contracts with the terms of the agreement between various parties being directly written into lines of code. They automatically execute when certain conditions are met (e.g. market-price-thresholds, remaining charge of the EV, etc.), without the need for intermediaries.

By combining such smart contracts with dynamic pricing algorithms, the V2G transactions can become more efficient and economically viable for every party involved. The dynamic pricing algorithms provide real-time price adjustments based on the actual market conditions to identify the optimal time for charging and discharging the EV. The smart contracts, on the other hand, guarantee that the transaction is only executed when all the predefined conditions, set by the EV owner as well as the car manufacturers, are met. Thus, providing the flexibility of dynamic pricing while maintaining price transparency with consumers allowing them to fully understand the impact of V2G on their lifestyle and EV TCO.

Additionally, the automation of the payment process across several entities further increases the economic viability of the V2G transaction. Overall, such a combination provides a more accurate reflection of the value of V2G services, making them a more attractive option for EV owners, energy companies, car manufacturers and potential third-party aggregators.

However, as mentioned before, the introduction of dynamic pricing algorithms, as well as smart contracts for V2G transaction, requires a unified regulatory framework to facilitate the best monetization opportunities for all involved parties.

In addition, a number of general golden rules for monetizing platforms and two-sided markets can be derived from our cross-industry experience and applied here.

1. **“Know your users”** – Understanding usage and customer value pattern is key for monetization strategies tailored to the needs of a heterogenous user base. While private EV users are more sensitive to financial investments, business customers with high-capacity fleets have greater flexibility with capital expenditures. Additionally, operators need to address a broad range of users and use cases to achieve diversity in segments.
2. **“Communicate benefits clearly”** – Communication strategies need to be focused on value gains for users by clearly educating about advantages of usage. At the same time, especially in electric mobility and V2G, concerns and misunderstanding are widespread. Range anxiety, fears of battery degradation, and general data security concerns need to be addressed.
3. **“Convince a critical mass quickly”** – This chicken-and-egg problem is commonly known in platform-related business models, as users and providers are dependent on one another and platform operators need to attract both parties equally.

Roles and responsibilities in V2G can still be defined – mastering monetization will define who wins the race

The playing field of the V2G market is not yet defined. There is no clear allocation of roles in place already, leaving the opportunity for new players to enter the market, as well as existing players to gain early mover advantage by investing in V2G with purpose.

For OEMs to compete for increasingly price sensitive consumers, TCO is the critical price metric to communicate the impact V2G has on EV affordability and energy reliability. For energy providers, additional supply sources to meet peak demand can be crucial. V2G alleviates pain points for multiple stakeholders in the EV ecosystem.

OEMs should start thinking about monetization as early as possible to enable profitable V2G businesses and make their contributions to a more sustainable future for consumers and all participants in the EV ecosystem.

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About Simon-Kucher

Simon-Kucher is a global consultancy with more than 2,000 employees in 30+ countries. Our sole focus is on unlocking better growth that drives measurable revenue and profit for our clients. We achieve this by optimizing every lever of their commercial strategy – product, price, innovation, marketing, and sales – based on deep insights into what customers want and value. With 40 years of experience in monetization topics of all kinds, we are regarded as the world's leading pricing and growth specialist.

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