V2VNY Phase 2 Final Report

V2X Innovation programme: bi-directional charging demonstrations

Hangar19 Ltd 2026

Authors/Acknowledgements

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Summary

The V2VNY project was funded as part of the V2X Innovation programme: bi-directional charging demonstrations, which was part of the Net Zero Innovation Portfolio. The programme was run by Innovate UK on behalf of the Department for Energy Security and Net Zero. The funded project demonstrations concluded in September 2025.

Project Overview

V2VNY Phase 2 delivers the demonstration of a unique AC-V2G (Vehicle to Grid) solution, targeted at the non-domestic customer market, which utilises a multi-socket charger design which enables potential of V2G, V2B (Vehicle to Building) and V2V (Vehicle to Vehicle) applications. It builds on the Phase 1 feasibility study and development project, which has proved the viability with a range of vehicle types, including MG, Kia and Hyundai. These vehicles were chosen as the basis of this project based on the vehicle V2X functionality, with testing undertaken at sites where they were deployed. Other makes and models were tested when they became available. The charger, developed in the UK by Hangar19, is the first multi-socket V2X (Vehicle to Everything) charger on the market and utilises either the V2L (Vehicle to Load) functions for those which are not grid-tied (grid synchronised) on the vehicle or is capable of safely enabling AC-V2X from any vehicle with onboard capability.

Hardware Delivery

During development, the hardware design evolved significantly. Initial designs were adapted and optimised based on stakeholder feedback, resulting in a two-socket configuration with tethered cables, addressing safety, compliance and consistent bidirectional communication. This ensured regulatory compliance with UK electrical standards, including fuse requirements and environmental resilience, while maintaining reliable performance across diverse site conditions. The overall unit design transitioned from a large single enclosure containing all power electronics to a two-part solution, comprising a compact charger pillar near vehicles and a separate feeder cabinet for switchgear. This approach enhanced site flexibility, reduced installation constraints, and made the product more commercially attractive. Chargers were also developed as “V2X ready”, allowing customers to upgrade to bidirectional functionality immediately or in the future, offering cost savings and market adaptability. The final installed design can be seen in Figure 1.

Figure 1. Final V2VNY 'V2X ready' pillar and bidirectional cabinet



Trial Overview

The trial has provided a comprehensive assessment of V2X charging technology, its capabilities, and its potential value across a range of operational contexts. Over the course of the project, thirty-five chargers were successfully deployed across fourteen organisations, encompassing fleet depots, office sites, and public destinations. These sites were carefully selected to reflect a variety of use cases, including fleet-owned vehicles, staff charging and public destination charging. Fleet sites, often linked to consortium partners such as Hangar19, Drive Electric, Jaguar Land Rover and Oxfordshire County Council, provided an opportunity to explore optimisation strategies within controlled organisational environments, while public sites, such as Adrenaline Alley, offered insight into more open, user-driven scenarios. Testing at these sites captured a wide spectrum of real-world conditions, including variations in vehicle types, charging behaviours, site occupancy, and operational constraints.

Control groups were incorporated to benchmark outcomes and isolate the effects of the V2X technology. These comparisons included historical site data, unscheduled charging, smart charging without optimisation, and contrasts between sites with and without V2G enabled chargers. This approach enabled evaluation of both technical performance and human behaviour impacts, highlighting how user interaction, scheduling and site-specific conditions influence value creation. The trial revealed that site-level optimisation can deliver meaningful benefits in terms of energy cost savings, carbon reduction, and grid service participation, particularly when paired with advanced scheduling and real-time data monitoring.

Trial Results

Vehicle testing revealed consistent performance from the Hyundai Kona and Kia EV6, both of which supported seamless V2X functionality and automated discharge once V2G mode was activated on the charger. The MG4, while also V2X-capable, required manual activation within the vehicle, demonstrating the importance of automation and user-friendly design to unlock the full benefits of V2G systems. Testing also identified the complexities arising from OEM-specific interpretations of ISO 15118 standards, which required bespoke software adaptations to ensure reliable bidirectional communication and highlighted the ongoing need for harmonisation across vehicle and charger manufacturers.

Despite these successes, the trial faced a number of limitations and challenges. The closure of CrowdCharge, which had been intended to provide full optimisation control, restricted live testing of some advanced features. Site-specific challenges, including DNO-related power interruptions, planning restrictions and installation delays affected testing schedules at several locations. Funding and time constraints limited the trial to approximately six months of active testing, and the seasonal variability of electricity demand and vehicle usage further constrained results. Recruitment of sites relied on a combination of consortium networks, consultative engagement, promotional campaigns, PR coverage, and participation at industry events such as the Cenex Show, V2X Showcases, and Fully Charged exhibitions. Approximately 120 potential sites were evaluated, ultimately resulting in 35 participating locations, each of which provided informed consent for both site-level and individual driver participation, ensuring clarity on trial expectations, data use, and operational responsibilities.

The trial also highlighted several key technical insights. Chargers demonstrated rapid response times suitable for a range of grid services, with OCPP-controlled chargers transitioning from idle to charging in under 30 seconds and minimal latency added by control layers. However, participation in fast-response services such as Dynamic Containment remains challenging due to regulatory and technical constraints, particularly the 1-second activation requirement. V2X systems performed well in markets with less stringent data and response requirements, such as the Capacity Market and Static Firm Frequency Response, providing early evidence of revenue potential and grid service contribution. Simulation and modelling further demonstrated that V2X-enabled fleets could generate meaningful flexibility, with potential monetisation through frequency response and capacity schemes, highlighting the value of scaling deployments to achieve market thresholds.

The trial demonstrated that the V2G chargers delivered strong and reliable performance, with core charging operating at high uptime. Bidirectional operation also proved effective, though significant variation was observed across different OEM vehicles, requiring technical refinements to ensure consistent performance. Once implemented, these measures enabled stable and dependable discharge across varied durations and power levels, supported by built-in risk management that safeguarded against overheating. Alongside this, firmware upgrades improved overall functionality, resolved data-recording issues and enhanced reporting accuracy, providing valuable learning to strengthen compatibility, reliability, and user

confidence for future deployments. It is expected that a twin-outlet V2X ready charger can retail for £2500 with the bidirectional box at £1700-2000, both reducing at scale.

The post-trial feedback showed that the project significantly increased participants' knowledge of V2G and its potential benefits, shifting perceptions from charging as a cost to viewing vehicles as active contributors to smart energy systems. Customers recognised the potential for financial and environmental value, particularly when integrated with solar PV and storage, and councils highlighted how V2G supports climate targets and enhances their leadership role. The chargers themselves were praised for reliable performance and ease of use, with minimal disruption to vehicle availability, though a key limitation was identified in MG vehicles requiring drivers to manually press an in-car button to enable export, highlighting the need for full automation and co-operation between OEMs and charger providers. Wider benefits such as site resilience, reduced reliance on the grid, and reputational gains were also emphasised, with enthusiasm for V2G as part of broader energy strategies. At the same time, the trial underlined the importance of clear communication, careful site planning, and building local installer capacity to address rural challenges. Overall, participants reported growing confidence in the technology, recognising both its practicality and potential, while also noting the areas, particularly vehicle compatibility and usability, that require refinement for V2G to succeed at scale.

The trial demonstrated the strong potential of AC V2G but also highlighted a series of barriers that must be overcome for large-scale deployment. A key challenge is vehicle compatibility, with only limited models supporting bidirectional charging and notable inconsistencies even within the same range. Progress depends on closer collaboration with manufacturers and the adoption of open standards such as ISO 15118-20. Linked to this, standardisation remains limited, with differing interpretations across OEMs and equipment suppliers creating unnecessary complexity and cost. Greater alignment is needed to ensure interoperability and simplify deployment.

On the delivery side, installer knowledge and skills emerged as a limiting factor. Many contractors remain unfamiliar with V2G commissioning and requirements, leading to inflated pricing and inconsistent quality. Targeted training, clear guidance, and local capacity building are vital to reduce these barriers. In parallel, grid connection and DNO processes continue to slow down progress, with long approval times, export limitations, and costly reinforcement requirements making some rural sites unviable. Streamlined approvals, early engagement, and regulatory changes to unlock access to grid services markets would significantly strengthen the business case for V2G.

Supply chain and manufacturing readiness presented difficulties in the trial, with shortages, manual subassemblies, and firmware delays lengthening build times. Scaling production, stabilising component sourcing, and strengthening UK-based supply chains will be essential to reduce costs and increase competitiveness. Together, these findings demonstrate that while the technology itself is proving reliable and effective, coordinated action across vehicles, standards, skills, regulation, and manufacturing is required to ensure V2G can achieve its full potential.

V2VNY has shown that AC V2G technology is technically feasible and increasingly reliable, but its large-scale deployment would accelerate with resolution of structural barriers around regulation, standards, and market design. Access to grid services remains a major limitation, as existing frameworks are designed for large generators and exclude smaller distributed assets such as individual vehicles or small fleets. Metering and settlement arrangements also add unnecessary complexity and cost, while limited vehicle compatibility constrains the addressable market. A stronger policy signal, such as mandating bidirectionality on all new EVs would provide certainty to both consumers and infrastructure providers. Simplified metering rules, reform of grid service thresholds, and standardisation of communication protocols would collectively unlock greater value and accelerate adoption.

Policy changes can help to overcome economic and practical challenges that SMEs face in developing and manufacturing V2G solutions, with high costs, supply chain risks, and limited economies of scale. Policy support for innovation funding, supply chain development, and domestic inverter production would strengthen the UK's leadership in this area. Similarly, a clear focus on installer training is essential to reduce costs and improve deployment quality, particularly in rural areas. Government can play a catalytic role by embedding V2G into public sector fleet decarbonisation programmes and the Local Electric Vehicle Infrastructure (LEVI) scheme, creating early demand and building confidence for the wider market. Addressing these barriers through targeted policy reform will not only strengthen the business case for V2G but also deliver wider benefits in grid resilience, carbon reduction, and consumer value.

Conclusion

Overall, the trial confirmed the strong potential of V2X charging technology to enhance energy system flexibility, support renewable integration, and deliver financial benefits to participating organisations and drivers. It demonstrated that fleet, staff, and public use cases each offer distinct opportunities for optimisation and value creation, while also underlining the importance of system automation, standardised protocols, and robust operational processes. The insights gained from this trial provide a solid foundation for future deployments, informing best practices for site selection, vehicle and charger compatibility, optimisation strategies, and engagement with regulatory and market frameworks. By addressing the remaining technical and operational challenges, V2X technology has the potential to play a transformative role in the UK's transition to a more flexible, sustainable, and efficient energy system.

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