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## Role of Vehicle-to-X Energy Technologies in a Net Zero Energy System - A call for evidence

October 2021

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### Introduction

- Decarbonising our transport sector is one of the most significant challenges the UK faces on the way to net-zero by 2050. Emissions from transport contribute 28% of UK domestic emissions in 2018 and are 4% higher than in 2013. Road transport is the largest emitter of the overall percentage, with cars contributing 55% of domestic transport emissions.<sup>1</sup> The Government outlined in its Decarbonisation of Transport Plan, its strategy for removing all emissions from road transport. Electric Vehicles will play an important role in this transition. The Government has noted that there were almost 400,000 plug-in electric vehicles in the UK by the end of last year and that nearly one in seven cars sold in 2021 had a plug.<sup>2</sup> There are also expected to be 15 million electric vehicles on the road by 2030. This uptake in electric cars and vans could mean an increase in electricity demand by approx. 30TWh in 2030 and by 65-100TWh in 2050.<sup>3</sup>
- This increase in electricity demand in the next decade and on the way to net-zero will mean that the grid would need to be smarter and more flexible. BEIS has suggested that due to lower systems costs, smart vehicle charging will result in lower bills for energy customers. By exporting electricity back to the energy system would help reduce energy consumption, provide EV owners with the opportunity to utilise another revenue form and could help reduce systems costs.<sup>4</sup>
- Figure 1 outlined in the consultation, based on modelling of the potential impact of V2X technologies on energy demand from National Grid's Future Energy Scenarios, highlights a reduction in energy demand starting towards the beginning of 2035. There is a sharp decline in demand between 2035 – 2040. This is particularly important as there is expected to be an increase in electricity demand as we try and decarbonise other sectors of the economy during a similar timeframe. For example, the Government has committed to 600,000 heat pump installations per year by 2028, an increase from 30,000 a year, with the aim of bringing forward regulations to support this ambition.<sup>5</sup> The use of V2X technologies would help make the grid more manageable to accommodate the electricity demand alongside the increase use of EVs – making EVs both an energy user and an energy producer.<sup>6</sup>

### V2X business models

- We are of the view that the behind-the-meter business model outlined in the consultation, will help deliver the potential savings and revenues that could come from the commercial use of V2X. This business model could help reduce cost for customers by managing home

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<sup>1</sup> Department for Transport (2020). Decarbonising Transport – Setting the Challenge.

<sup>2</sup> Department for Transport (2021) Decarbonising Transport – A Better, Greener Britain.

<sup>3</sup> BEIS (2021). Smart Systems and Flexibility Plan 2021.

<sup>4</sup> BEIS (2021). Role of Vehicle-to-X Energy Technologies in a Net Zero Energy System - A call for evidence.

<sup>5</sup> HM Government (2020). The ten point plan for a green industrial revolution.

<sup>6</sup> BEIS (2021). Role of Vehicle-to-X Energy Technologies in a Net Zero Energy System - A call for evidence.

energy and EV charging based on grid pricing. Additionally, EVs with V2X technologies can provide frequency & reserve services without needing to export, this is likely to be the business model for many EV aggregation projects.

- In order to unlock the flexibility needed to meet net zero, market design needs to allow non-dedicated assets to provide system / balancing services (to ESO and DNOs), rather than designing markets assuming that the assets are being built for the sole focus of balancing services.
- Within the Government's business model for V2X, the ESO and DNOs need to design flexibility services and markets that work for domestic aggregation, which V2X falls into. DNOs also need to have efficient connections processes in place ahead of the mass uptake of EVs (and heat pumps which follow the same process).
- The business model for V2X will rely on aggregators being able to access and stack revenues from multiple markets. BEIS recognises the importance improved access to flexibility markets and of stacking revenues across multiple sources of value in its Smart Systems and Flexibility Plan vision for the mid-2020s.
- The industry is currently facing significant barriers to the aggregation of flexibility from smart energy appliances in the home – including EV charging infrastructure – foreclosing markets to residential DSR. For example, the National Grid Electricity System Operator (NG ESO) is limiting aggregation of assets for its entire suite of new frequency response and reserve products to within a small geographic area, known as the Grid Supply Point (GSP) level, making it near impossible to aggregate enough domestic flexibility in each GSP level to reach the minimum needed for participation. This is just one example of the technical requirements facing domestic flexibility that will make it hard for NG ESO to deliver on its 2025 ambition of an electricity system that can operate carbon free and frustrate the UK's overall transition to net zero.
- Additionally, better interoperability across charging networks is needed to increase consumer confidence in charging infrastructure and increase EV uptake. Providing common standards of interoperability would help address EV charging complexity, maximising convenience and adding value for EV drivers.<sup>7</sup> Interoperability would in turn help improve consumer confidence in V2X.
- While the V2X market is still in early stages of development, pilot projects in Denmark, USA and UK have generated significant revenue from aggregation of EVs for participating in system services. The electricity markets and other factors do vary for each region, but this does indicate the potential of V2G to play an integral role in future energy systems if the right mechanisms are developed.

### **Engaging customers**

- Alongside providing customers with businesses cases that works for them, the Government needs to educate customers on the co-benefits of V2X technologies. The consultation states that realising the potential value of V2X technology to customers including businesses, is key

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<sup>7</sup> Transport Committee (2021). Charging Infrastructure.

to enabling the widescale deployment of the technology. The current information barrier around V2X technologies also speaks to the wider issue of bringing the customers along the transition to net-zero. It is widely agreed that reaching net-zero will not be possible without public engagement and buy in.

- One of the key learnings from different V2X studies has been that the complexity (including perceived complexity) of V2X can make it difficult to convince customers on the benefits of V2G. Customers value simplification. Hence it is essential that an easy and compelling customer proposition is developed, which can include bundling V2X along with other services and making customers aware of the benefits to them rather than the underlying technology.
- Conclusions from Cenex's work on V2G, suggests that it is important that grid services are accessible as additional revenue streams and that without this the upfront costs of V2G would negate the potential savings that could come from using V2G. Furthermore, there is also a need to improve EV plug-in rates as this is a key driver of V2G service revenue, EVs are currently plugged-in 30% of the time.<sup>8</sup>
- In addition to removing the information barrier of V2X for customers, the high cost of bi-directional chargers (AC-DC) also needs to be addressed. These costs make it harder to generate positive net revenues.<sup>9</sup> The charger costs are expected to reduce by more than 80% for a 7kW V2G charger by 2030, assuming a similar trend to PV inverters given the similarities in the components.
- Furthermore, the complexity of the V2X charging protocols as outlined in the consultation is also a clear barrier to V2X technologies uptake. This barrier, alongside the other technical and information barriers around charging infrastructure will need to be addressed to encourage the wider adoption of V2X technologies.

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<sup>8</sup> Cenex (2019). Understanding the True Value of V2G – an analysis of the customers and value streams for V2G in the UK.

<sup>9</sup> Element Energy (2019). Vehicle to Grid Britain.