MAYOR OF LONDON

Mayor of London / Gnewt Cargo Electric Vehicle Trial

Key Barriers Report

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CONTENTS

Executive Summary

The Mayor of London / Gnewt Cargo trial project (July 2017 to December 2019), examines the performance of a set of innovative electrical vehicles (EVs) used for delivery and logistics purposes in London.

The project is divided up into the following reports:

- Baseline Report
- Operational Costs and Environmental Benefits
- **Key Barriers Report**
- Charging Infrastructure Grid Report
- Q1 Environmental Update Report
- Q2 Environmental Update Report
- Q3 Environmental Update Report
- Q4 Environmental Update Report
- Q5 Environmental Update Report
- Q6 Environmental Update Report
- Q7 Environmental Update Report
- Operational Costs and Environmental Benefits refresh
- Charging Infrastructure Grid Report refresh
- Final Data Analysis Report
- Final Report

This report addresses the key barriers to wider adoption of electric vans, with many of the views and solutions expressed herein obtained from stakeholders through direct engagement.

There are two main barriers to the widespread adoption of electric vans within London identified. One of these main barriers is the lack of availability. Relative to vans powered by internal combustion engines, very few electric vans are currently being made available to the UK market.

Vehicle manufacturers in Europe are balancing demands for their electric vans from different countries. Countries that offer attractive incentives to EV take-up are seeing higher allocations of available electric vehicles. Operators in those countries receiving lower allocations are seeking alternative solutions to the shortfall such as conversions. In addition to the absolute shortage of numbers, there is also a shortage of available models and variants.

The other main barrier is cost. Original electric vans are currently more expensive than their diesel counterparts. This disparity in cost is changing and it is hoped that an equilibrium will be reached in the near future.

Other barriers include charging infrastructure, energy cost, legislation/policy and range anxiety as detailed in this report. Solutions to some of the barriers, such as dedicated loading spaces for commercial EVs and installing charge points at self-employed drivers' private properties were discussed during the Advisory Group meetings and are detailed in this report.

Throughout this trial the main takeaway theme has been collaboration. It requires the effective partnership and collaborative working approach from manufacturers, leasing companies, financial backers, operators, infrastructure & technology companies, regulators and government bodies to overcome current barriers to drive future improvements for the electric vans market in the UK.

Introduction

Gnewt Cargo specialises in the delivery of goods using electric vehicles (EVs). At present, commercial EV fleets engaged in logistics activity within London tend to comprise purpose-built small cars and vans (maximum capacity 4.2 m^3) with a limited uptake of larger (minimum capacity 8 m^3) electric vans.

This trial was designed to understand the operational and commercial implications, charging infrastructure options, impacts on the electrical network and avoided emissions associated with a transition to a fleet of larger EVs. Gnewt Cargo trialled 15 Nissan Voltia eNV200s, 7 Nissan eNV200s modified by Vic Young and 4 BD eDucatos to deliver goods in conjunction with their existing EV fleet of 4 Nissan eNV200s and 39 Renault Kangoo light goods vehicles (LGVs).

highlights the EV types assessed in this trial.

Table 1 Trial and current fleet EV comparison table.

Vehicle Information		**Trial larger EV**		**Current smaller EV**	
	BD eDucato	**Nissan – Vic Young modified eNV200**	**Nissan - Voltia eNV200**	**Renault Kangoo**	**Nissan eNV200**
					
Make	BD	Nissan – Vic Young	Nissan - Voltia	Renault	Nissan
Model	eDucato Cargo	eNV200 (Vic Young modified)	eNV200 (Voltia modified)	Kangoo Z.E.	eNV200
Overall dimensions – length / width / height (mm)	5998 / 2050 / 2522	5195 / 1800 / 2400	5030 / 1760 / 2420	4282 / 2138 / 1844	4560 / 1755 / 1858
Gross weight (kg)	3500	2220	2000	2146	2220
Payload volume (m^3)	13	7.5	8.0	3.4	4.2

Battery Size (kWh)	62	40	40	33	40

This report evaluates the key barriers which face the increased adoption of electric vans.

We are very grateful to the stakeholders who contributed to this report through their attendance and input at quarterly Advisory Group meetings. This report includes comments, opinions and facts shared by the stakeholders (see Appendix A for a list of the stakeholders involved).

Background

The Mayor of London / Gnewt Cargo electric vehicle (EV) trial project, which runs from July 2017 to December 2019, examines the impact of electric vans used for delivery and logistics purposes in London using a range of logistical, environmental and economic performance factors.

At present EV fleets tend to comprise purpose built small cars and small vans (capacity maximum 4.2 m^3). There is a limited production and uptake of larger electric vans (minimum capacity 8 m^3). Put another way, there are currently few EV equivalents to the Mercedes Sprinter (capacity 8.5 m^3/ payload 1,035 kg). This is in part due to the low production/demand loop. A reaction to this shortfall is the customised build of EVs but these vehicles can be expensive to produce and purchase. This project examines the benefits/disbenefits of the introduction of larger EVs to London's road and power networks.

The new EVs, which are the subject of this trial, are the Nissan Voltia eNV200 (capacity 8m^3), the Nissan eNV200 which was modified by Vic Young (capacity 7.5m^3) and the BD eDucato (capacity 13m^3). To evaluate the performance of these new larger electric vans they were compared with Gnewt Cargo's EV fleet.

The trial of the larger electric vans began in November 2017 with 15 Nissan Voltia eNV200s, in January 2018 4 BD eDucatos were added and in April 2019 an additional 7 Nissan eNV200s converted by Vic Young commenced operations. These vehicles were operated under trial conditions until the end of September 2019. All trial vehicles were fitted with the Fleetcarma fleet telematic system.

Alongside these trial vehicles, smart charging infrastructure provided by EO Charging was installed at Gnewt Cargo's depots in January 2018.

Key Barriers

Availability and Cost of electric vans

Through engagement with a cross-section of industry stakeholders the **availability** of commercial EVs and **outright purchase cost** were perceived as the two leading barriers impacting the uptake of commercial EVs across the logistics sector.

Availability

One of the major limiting factors to increasing uptake of electric vans in London is the restricted size options available on the market. Currently, operators are turning to conversions (conversion of either an original diesel model into a fully electric vehicle or an existing EV into a model with increased capacity) to address the shortage of available original manufacturer produced models. EVs above minimum capacity 8 m^3 (2.5t to 3.5t) tend to be custom built with a lead time of >6 months[1]. At present many of the larger EVs (such as the Nissan Voltia eNV200) are manufactured by multiple stakeholders (original manufacturer & fabricator/converter) dispersed across multiple countries. This geographic spread can also add delay caused by additional administrative overhead. It is unknown how long conversions will remain prevalent or at what point original manufacturers supply will meet demand.

Some of the Freight Transport Association's (FTA) members have experienced lead times of nine months for commercial EVs from original manufacturers (against a few days to a couple of weeks for a diesel model) and additional delays relating to the registration process and turnaround times.

Mercedes and Volkswagen are due to release their eSprinter and eCrafter models, respectively, before the end of 2019[2]. However, there remains uncertainty in the sector that sufficient volume will be available to the UK market to satisfy demand. As an illustration of this, an industry stakeholder reported that a leading manufacturer allocated just 12 of their new EV model vans to the UK market in 2019.

Political factors and government schemes across Europe have had a direct impact on the availability of electric vans in the UK.

[1] Based on the experience from this trial

[2] https://www.parkers.co.uk/vans-pickups/news/2018/mercedes-benz-esprinter-2019-review/ & https://www.autocar.co.uk/car-review/volkswagen/e-crafter

One leading manufacturer for a European market directs volume of new electric vans where it is most commercially advantageous. Countries that offer enticing EV subsidies (Norway) or that specifically promote the use of EVs (Germany, Netherlands) see a greater share of the available vehicles diverted to their market. Whilst manufacturers state that they remain committed to increasing the volume of freight EVs in the UK year on year, this may not be sufficient to meet demand and manufacturers must balance other factors, such as battery availability.

As the global demand for alternatively fuelled vehicles increases so does demand for the batteries needed to power them. Most cell production for these batteries is currently based in China and the US[3].

At the time of writing the situation around US-based battery production is uncertain and dependent on the outcome of the current US Administration's decision regarding the removal of incentives for EV adoption.

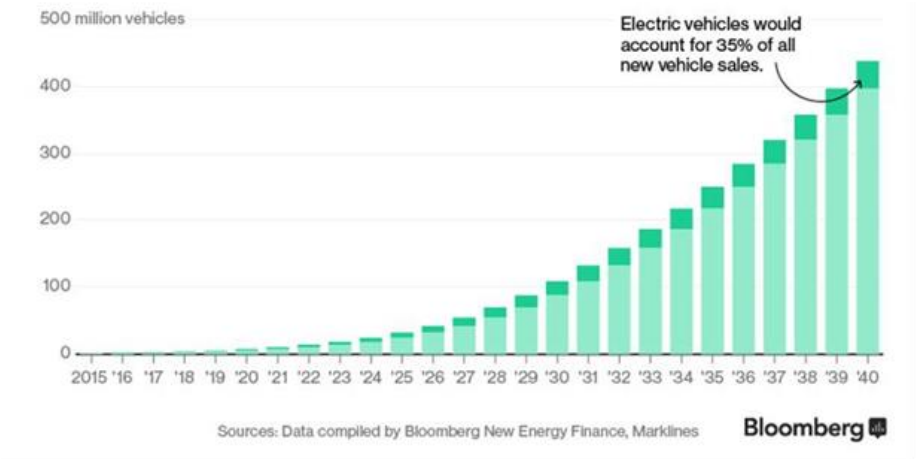
The desire from vehicle manufacturers and associated suppliers to benefit from the forecast surge in plug-in vehicle uptake means this may only be a temporary fluctuation. Any slow-down in US cell production will shift European demand to the Far East and may subsequently drive up battery prices.

The graph below shows the expected sales growth of EVs which has a direct relation to battery demand.

[3] https://www.forbes.com/sites/rrapier/2019/08/04/why-china-is-dominating-lithium-ion-battery-production/#3c9845037867

[4]

Graph 2: Predicted Sales growth of EVs



There are plans to increase battery cell production in Europe (as shown in the recent news below) and these may improve the conditions needed to support broader EV adoption in the UK.

European carmakers are working hard to bring battery supply closer to home. Germany has earmarked €1 billion (£860 million) to support a consortium looking to produce EV battery cells. There are also plans to fund a research facility to develop next-generation solid-state batteries. More than 30 companies have applied, including BMW and the Volkswagen Group.[5]

The second-hand market for commercial EVs is currently very small, with around 400 new registrations in 2015[6]. Due to the high vehicle reliability and lengthy Return On Investment (ROI) period required (because of low margins in the logistics sector) coupled with a small original market, very few second-hand commercial EVs are currently available.

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[4] Bloomberg New Energy Finance

[5] Fleet News 02/04/19

[6] Industry stakeholder at Advisory Group meeting

Cost

The two routes to obtaining larger commercial EVs (outright purchase or leasing) both entail challenges.

- High outright purchase cost – As an example the Renault Master diesel costs from £26,350 in comparison to the fully electric version Renault Master Z.E. which costs from £57,300[7]. A discrepancy of over £30,950 for a vehicle with no greater range or capacity.

- Leasing – Traditional Leasing companies lack substantial experience of leasing commercial EVs. Consequently, many leasing companies are still cautious about entering the market, thereby reducing the options to potential customers. There are specialist electric vehicle leasing companies, such as Drive-Electric, which do have experience in this market.

Currently, the outright purchase cost of a commercial EV is higher than the equivalent diesel. However, the gap is closing with companies, such as Arrival, working to deliver an electric model that is closer[8] in price to a diesel model.

The typical leasing period for commercial vehicles of 5 years is also an area that industry stakeholders believe requires review in relation to EVs. The 5-year timeframe is historic and based on the reliability of diesel vehicles, where they typically experience greater likelihood of developing problems at this point and are sold. However, EVs have greater reliability at the 5-year point. Therefore, the potential to offer a 7-year lease or options to extend the standard 5-year lease were raised at an Advisory Group meeting by stakeholders as needing consideration by leasing companies.

Industry stakeholders believe the comparable cost to a diesel equivalent means that drivers, especially those who are self-employed owner-drivers, are reluctant to invest in a new electric van.

[7] www.Renault.co.uk (correct as at 02/09/19)

[8] 'Closer' is not quantified as price details were not available at the time of this report

Solutions

One potential solution discussed with stakeholders is for leasing companies to offer interested operators a 2-month trial of an EV as a ‘taster’.

Education and nudge behaviour could be used to provide general information to self-employed van drivers about EVs and promote their lower running costs and environmental benefits – through reduced leasing and running costs, for example.

Uptake levels could be increased further using marketing campaigns to highlight what action fleet operators have taken to move from diesel vans to adopting EVs.

Another tactic would be targeted engagement with customers of delivery companies to create a bottom-up demand for delivery service providers to use EVs in their fleets.

Charging Infrastructure and Energy costs

Gnewt Cargo’s EVs are currently charged at their depot and there is no requirement to disrupt the delivery schedule. Gnewt Cargo’s energy is bought in bulk each year, so the energy cost is linear with the number of EV in their fleet. Any unused energy is credited back to Gnewt Cargo at the end of the contracted term, conversely if the energy consumption exceeds the amount purchased then there is a unit rate apportioned per kWh. The unit rate Gnewt Cargo pay is approximately 9.8p per kWh plus a daily fixed charge taking overall costs close to 10p per kWh.

For other fleet operators, without a depot where charging points could be installed, the challenge of how, when and where to charge may be an obstacle to the uptake of larger EVs. For fleet operators with different operating models such as utility companies and express couriers, EVs are often be charged at the depot/home where costs are lowest. For food deliveries however, power requirements are increased by the need for refrigeration. The energy use of the vehicles will be higher when driving due to the refrigeration units operating to cool the loads which will reduce range. Refrigerated trucks could be plugged into the mains at the depot to avoid drawing energy from the traction battery pack.

The following sections will examine the options for charging commercial electric vans.

On-street charging

Public charging infrastructure offers the potential for EV operators to top up their batteries. The rise of private EV sales has led to an increase in the deployment and use of public EV charging points (as of August 2019, there are an estimated 3,500 public EV charging connectors available in Greater London[9]). EV charge points need to be sited as conveniently as possible. This is a difficult challenge to overcome for Local Authorities (LAs) as there would need to be multiple charge points on every street to make it convenient for all EV users. In addition, it has been widely identified by our stakeholders over the duration of this project that there are not enough on-street charge points accessible to vans (including in residential areas as many self-employed drivers will take vans home).

There are higher costs associated with installing on-street charging due to the high land value for parking spaces which further increases the cost of charging on top of the costs of energy at these points. When combined with the issue of downtime during charging, regular use of on-street parking could quickly become financially unsustainable for small EV fleets and self-employed drivers

One concern raised at the stakeholder forum was that for larger operators (both delivery companies and their clients, the retailers themselves) there are some concerns over the impact to their brand if potential customers are inconvenienced by a branded (logo) vehicle charging on street.

The increased number of cables on streets to meet an increased demand for on-street parking would also introduce a safety concern. Whilst wireless or induction chargers could solve this issue, these are currently expensive, slower to charge and still in early phases of deployment.

In addition to the direct and indirect increased costs of charging at an on-street parking facility, planning policy is also an issue. LAs do not have a requirement to allocate land for charge points and there are no incentives or subsidies for LAs to provide them.

Finally, an increased provision of charge points would be futile without a proportionate energy supply to meet the demand. UKPN are through their ‘Recharge the Future’ programme reviewing the required investment and predicted impact on the grid of EV

[9] Zap Map: https://www.zap-map.com/statistics/

adoption rates to meet the UK Government's Road to Zero strategy (R2Z). This strategy aims to see 50% of all new vehicles to be ultra-low emission by 2030.

One of the challenges facing Distribution Network Operators is knowing where and when to make upgrades to the grid, with the gap between identification and implementation taking 2-3 years.[10]

Using Existing Infrastructure

Utilising spaces for parking cars or refuelling them could be an option to mitigate against some of the main issues of on-street parking. Converting petrol stations (or a proportion of them) into EV hubs would create a space specifically used for charging EVs, a concept that is already included in the Automated and Electric Vehicles Act 2018. Here, the Mayor of London has been given powers to require fuel retailers to provide charge points.

The need for petrol and diesel petrol stations will remain for years to come meaning this replacement will be a slow process.

Solutions

Installing charge points within public car parks which are empty at night and situated near residential areas is thought by stakeholders to be a viable option; though even a short walk to charge up would potentially be too far for some when they can currently park outside their homes. Without associated effort applied to change behaviour the possibility remains that such charge points may not be used.

Private Charging Infrastructure

For many delivery company fleets, installing EV charging infrastructure in a private depot allows the most control over charge times and energy costs. However, there are high installation costs associated and a significant amount of space is required to house both the vehicles and the charging infrastructure if the fleet changes from having drivers take their diesel vehicles home.

Where land is leased by the delivery company, there are likely to be issues for tenants looking to install charging infrastructure given the potential costs of both infrastructure dilapidation and restoration costs at end of lease.

[10] UKPN presentation 2019

Solutions

It has been suggested by the stakeholders that government policy direction should encourage landlords to see power upgrade as a benefit to leased land and regulation should stipulate that the connection cannot be downgraded. In London, this is currently being investigated by the Mayor's EV Taskforce, formed in 2018.

Another idea discussed was installing home charge points at employees' properties and recompensing them for energy used to charge the vehicle.

Infrastructure summary

There is no single answer for the location of charging infrastructure as the operations of different courier companies varies greatly. It is likely that a mix of hubs, at home, depot and on-street charging will be required to allow choice, flexibility and to provide the required infrastructure in the future for a range of businesses. Subsidies for a large number of charging points and infrastructure (not just for depot and home) are needed to support this growth (this will be explored further in the Charging Infrastructure and Network Analysis Report scheduled for October 2019).

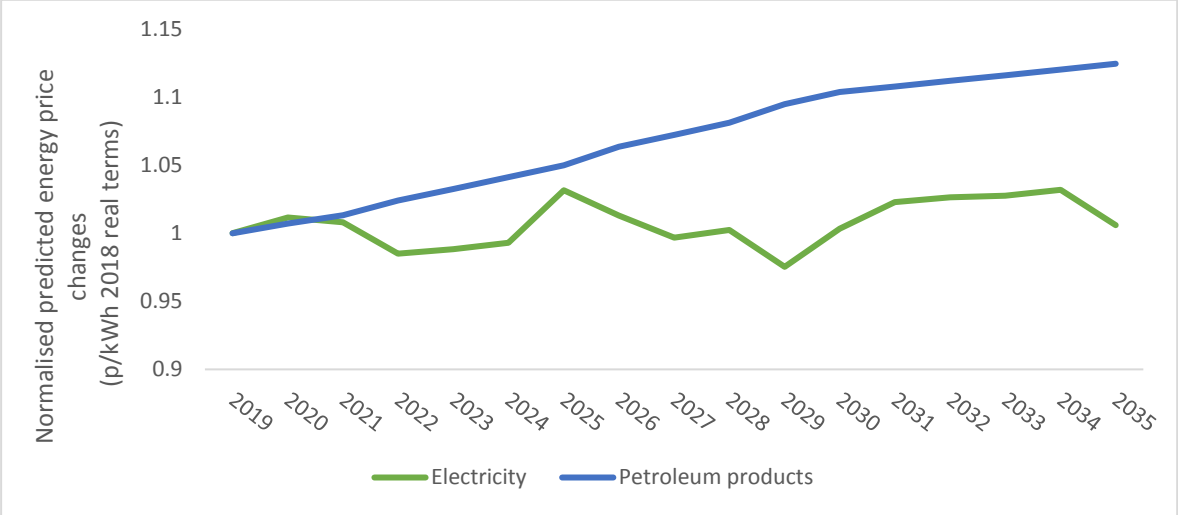
As the range of EVs extends and battery sizes increase, there will also be a reduction in the required charge frequency. However, an increase in charging power will be required to fully charge batteries in a reasonable time.

In the future, with batteries which will store more energy, it may be enough to charge a vehicle once weekly. Therefore, it is important to plan future infrastructure growth with the ability to upgrade to ensure charge points being installed now are not made redundant by fast-paced technology changes.

Energy costs

Stakeholders reported that some freight vehicle operators are fearful that electricity costs will increase significantly in the future. However as can be seen from the graph below these fears are not supported by Government predictions with the cost of electricity predicted to change very little over the next 18 years.

Graph 2: Predicted energy price changes[11]



Solutions

Smaller businesses (including self-employed drivers) may wish to use time-based tariffs to optimise their energy costs.

Regulation, Legislation and Industry bodies

There is some inability to access charge points between network providers (interoperability issues) and calls have been made for UK Government to intervene. The UK Government has the power to intercede through enabling legislation (Electric Vehicles – standardised recharging Bill 2017-19) but has not yet acted. The EU regulations Alternative Fuels Directive 2014 requires member states to create laws that comply with the Directive.

The Office for Low Emission Vehicles (OLEV) is reviewing this matter and looking at consumer experience watchpoints.

[11] https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2018

Some stakeholders called for a Code of practice for vehicle charging and energy use. This could cover standardised costs for installation and grid connections and guidance on how people in a small area use their grid networks.

The Mayor of London launched a scrappage scheme for micro-businesses, sole traders and charities whose vehicles do not meet the Ultra-Low Emission Zone standards.

There remains little onus on retailers to utilise EVs as part of their home delivery strategies. Stakeholders believe that if the British Retail Consortium were to encourage their members to switch to EVs for deliveries, then these retailers could in turn apply pressure to their delivery partners (including self-employed drivers) to switch to EVs.

Whilst companies like Ikea will be driving the EV market due to their own sustainability targets, a better steer by Government is needed to ensure compliance by retailers across the UK, not just London.

Policy suggestions

Some policy suggestions to help increase EV adoption rates discussed with industry stakeholders at Advisory Group meetings were:

- Higher incentives or tax breaks to purchase new EVs
- Greater clarity from Government, particularly on Clean Air Zones, or a longer-term commitment of incentives from Government, such as commitment to long-term Plug-In Grants
- Guidance for Local Authorities and fleets installing charging infrastructure through the Energy Savings Trust
- Ensuring interoperability of charging points – using powers from the new Electric Vehicles (Standardised Recharging) Bill 2017-19
- Transparency of costs associated with upgrading a connection to the energy grid
- Dedicating loading spaces for EVs
- Permitting EVs to use bus lanes which could improve journey time reliability and service levels
- Free parking

Some of these have been used with success in Oslo which has a low number of charge points.

Other barriers

Range anxiety

There remains a perception of limited EV range which can be a barrier, especially to small freight companies and self-employed drivers. This perception, coupled with the relatively high costs associated with buying/leasing new EVs, can deter them from taking what they consider to be an unnecessary risk.

Whilst the mileage range for EVs has improved, with new models coming to market or battery upgrades being made to existing models, there is still a limited understanding of how EVs operate in urban environments. For example, the stop-start nature of operations, potential traffic congestion and varied driving distances all contribute to continued 'range anxiety'.

Range anxiety is linked to a driver's concerns over the stem mileage (distance from origin to area of delivery and from end of delivery back to end destination) and ability to complete the required deliveries without needing downtime to recharge. Despite a Massachusetts Institute of Technology (MIT)[12] study finding that the energy requirements of 87% of vehicle-days could be met by an existing, affordable electric vehicle, if the perception of limited range remains then it is likely to stop people from investing in EV technology.

Solution

One solution to range anxiety for urban use is to publish more data about true operations, such as the one featured in this trial, to dispel these concerns.

[12] Needel. Z, McNerney. J, Chang. M. T, and Trancik. J. E. 2016. 'Potential for widespread electrification of personal vehicle travel in the United States'. *Nature Energy*. Vol 1.

Conclusion

Based on the information gathered as part of this trial through data collection, operational discussions and quarterly Advisory Group meetings (with stakeholders) there are some key barriers to a wider adoption of commercial EV which will take time and actions to overcome.

Despite a commercially viable Total Cost of Ownership (TCO) model, **availability** and purchase/lease **cost** of commercial EVs are perceived by stakeholders as the two leading barriers to increasing their adoption in London.

This trial has shown that even taking an innovative approach (vehicle conversions to address availability issues) has its challenges and is extremely difficult to manage without multi-party collaboration. The parties range from vehicle manufacturer, fabricator, leasing company, charging infrastructure provider, fleet telematics provider to the owner/operator and financiers. It should be acknowledged, however, that when tackled in a collaborative fashion it has proved feasible to successfully operate a substantial fleet of larger electric vans EVs in London.

Regarding availability, anecdotally, demand in the UK exists but EV production is still limited and the bulk of vehicles produced are directed to other countries where incentives more explicitly reward or promote the operation of EVs.

The results from this trial should also serve to alleviate some concerns and dispel lingering misconceptions. There is hope that demand will increase where the perceptions of operational disadvantages can be overcome. An even greater demand will fuel an increase in the supply of EVs of comparable size, payload and operational capabilities as the most popular diesel vehicles, such as the Mercedes Sprinter.

Whilst predictions for costs of EVs across Europe are expected to fall as new manufacturers enter the sector and battery costs decrease further, securing adequate vehicle supply to the UK market is key to adoption.

Appendix A

List of external stakeholders who attended one or more Quarterly EV Trial Advisory Group Meetings between April 2018 and July 2019 (excluding GLA, Arup and Gnewt):

- Simon Scarfe, Transport for London
- James Smith, Transport for London
- Thomas Newby, The Phoenix Works
- Thanos Zarogiannis, UKPN
- Jack Wilkinson, UKPN
- Steve Forster, Engenie
- Jeremy Littman, Engenie
- Graham Tunks, Engenie
- Charlie Jardine, EO Charging
- Toddington Harper, Gridserve
- Carl Lomas, Institute of Couriers
- Denise Beedell, Freight Transport Association
- Cristina Miclea, C40
- Mike Potter, Drive Electric
- Glenn Saint, Arrival
- Alex Hanson, OLEV
- Andy Wilson, TNT
- Winston Gordon, ZE Cargo

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