FULLY CHARGED

An insight into the challenges the London taxi trade faces when switching to electric, with policy recommendations for the future

FREENOW

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CONTENTS

THE BLACK CAB TRADE:

A history of innovation

While sections of the media like to caricature the licensed taxi profession as old fashioned and backwards in its attitudes to innovation, this is unfair. In fact, the licensed taxi trade has always been at the forefront of vehicular, social and technological innovation.

The first licensed vehicles in London date back to a 1662 Act of Parliament and were regulated by the Commissioners of Scotland Yard. These early taxis were known as 'Hackney carriages', Hackney being an anglicisation of the French word 'haquenee' – the name of the type of horse that was used to pull these vehicles.

The first motorised taxis appeared in 1897 and were fully electric. Nicknamed 'Berseys' after the engineer who designed them, Walter C Bersey, only around 75 were produced. These vehicles proved expensive to operate and were not reliable and quickly disappeared from London's streets. Shortly afterwards, in 1901, the first taxis with an internal combustion engine started to appear and the French-built Prunel became the first petrol powered cab to hit the streets.

By this time, regulation of the trade has passed to the Metropolitan Police and was undertaken by the Public Carriage Office, which was originally in an annex to New Scotland Yard in Whitehall called "the Bungalow". In an effort to standardise design and passenger fares, the Public Carriage Office introduced Conditions of Fitness for all motor cabs in 1906. Among the many requirements was a turning circle of 25ft - the exact outer diameter of the roundabout in front of the famous Savoy Hotel in London. This, along with many other regulations, helped filter out less suitable machines, and ensured that only the most safe and maneuverable cabs were permitted to trade.

Taxi driver licenses
22,792

Taxi vehicle licenses:
19,183
(including 2,586 ZEC taxis)

Private hire vehicle licenses
93,257

Private hire licenses
107,953

In 1908, Mann and Overton, a successful dealership, introduced the 12/16 cab based on the Austin Model 15. It quickly became the most successful taxi in London, and by 1914, it was the only one still available. The First World War hit London's taxi fleet hard, with all manufacturers switching operations to help the war effort. Indeed, it wasn't until the 1920s that new designs started to filter back onto the Capital's streets. Even then, the trade was slow to pick up and had barely recovered before war intervened once more. After World War II, the taxi business bounced back. An urgent need for new models prompted Morris and Austin to launch new models. But while the Morris Oxford was the first to arrive in 1947, it was the 1948 Austin FX3 – built by Carbodies of Coventry – that created the template for the familiar London black cab.

Thanks to booming sales, Austin developed a 2.2-litre diesel for the FX3 and despite competition from rivals it became the machine of choice for London's growing band of cabbies. Its replacement, the FX4, arrived in 1958 and would go on to be a common sight for the best part of five decades.

When it comes to hailing a taxi, the industry has always been forward thinking. While taxi ranks and street hailing have always been a part of the trade's DNA, technological innovations have been employed too. In the 1930s, London mansion blocks and hotels started to install taxi lights, so that doormen could alert passing drivers to a guest or resident needing a taxi.

In xxxx, Londoners were able to start telephoning for taxis, with a central dispatcher using short wave radio to communicate with drivers in real time. 'Radio work' as drivers refer to it, has dried up in the internet age. The advent of the internet and smartphone technology has completely revolutionised the licensed taxi sector. The UK's first ride hailing app, Hailo, was started when three London cab drivers collaborated with three technologists. Their software enabled Londoners to hail and pay for a licensed black taxi with their smartphone, a full year before Uber launched in the UK and transformed the private hire industry in the same way.

Hailo was hugely successful and operated within 16 markets within two years of its launch. In late 2016 Hailo was absorbed by myTaxi, a German e-hailing company belonging to Daimler Financial Services, to form the largest e-hailing operator. On July 1, 2019 mytaxi was rebranded to FREE NOW serving over 100 European cities including Barcelona, Berlin, Dublin, Paris and London.

Air quality and the environment.

Vehicle pollution has been an important part of the legislative agenda for almost two decades. It is seen as an important way of achieving the UK's environmental sustainability targets. But efforts to reduce emissions have not always been successful.

In the early 2000s motorists were incentivised to switch from petrol to diesel engines under the belief they produced fewer carbon dioxide (CO2) emissions[1]. Adoption was widespread amongst consumers, public buses and the taxi industry. However, lawmakers hadn't anticipated that while diesel engines produce less greenhouse gases, its emissions were equally harmful to air quality through particulates and nitrous oxides (NO2).

The scale of this problem is vast. Toxic air produced by diesel vehicles, purchased under government incentives, is causing approximately 40,000 early deaths each year. So widespread is the adoption of diesel that many places exceed their annual legal particulate limits by January[2].

While improvements have been made in modern diesel engines, the legislative focus has shifted to reducing vehicle use and transitioning to zero emission vehicles.

In 2008, a Low Emission Zone was established in London – deterring the most polluting diesel-engine vehicles from driving through central London[3]. Now similar Low Emission Zones exist in Brighton, Glasgow, Norwich, Nottingham and Oxford[4]. Following a ruling by the Supreme Court in 2015, the Government called for Birmingham, Leeds, Southampton, Nottingham and Derby to establish similar schemes. A further 28 councils have told to produce plans to reduce NO2 levels and another 33 councils were asked to carry out "feasibility studies" to see if a CAZ was needed in their area. The result is a patchwork of uncertainty for motorists.

98%

of cabbies agree that changes to the road network has made the environment worse

In 2008, a Low Emission Zone was established in London – deterring the most polluting diesel-engine vehicles from driving through central London[3]. Now similar Low Emission Zones exist in Brighton, Glasgow, Norwich, Nottingham and Oxford[4]. Following a ruling by the Supreme Court in 2015, the Government called for Birmingham, Leeds, Southampton, Nottingham and Derby to establish similar schemes. A further 28 councils have told to produce plans to reduce NO2 levels and another 33 councils were asked to carry out "feasibility studies" to see if a CAZ was needed in their area. The result is a patchwork of uncertainty for motorists.

In London, the congestion zone evolved into an Ultra low emission zone (ULEZ), with the toll for entering the protected area as high as £100, and it is planned to expand to London's North and South Circular roads by 2021[5].

To support its clean air push, the Government has created a £225m Implementation Fund to prepare and deliver plans to improve air quality, a Clean Air Fund where local authorities can bid for additional money and £100m for retrofitting, and new low emission buses[6].

In response to the growing environmental and legislative developments, consumers are starting to switch to electric vehicles. Technology has certainly improved to support this, Tesla has made significant strides in terms of battery life and electric range, while car manufacturer Honda announced it will only sell electric and hybrid vehicles by 2022[7].

Legislation is also pushing the shift to zero emission vehicles. The Government's 2018 'Road to Zero' strategy outlines ambitious plans – aiming to have as much as 70% of new car sales to be ultra low emission by 2030, and a complete ban on combustion engines by 2040[8].

On top of that, new targets for the taxi industry were introduced by Transport For London, requiring all newly registered taxis to be able to drive a minimum range of 30 miles at zero emissions and have a maximum emissions of 50g per kilometre, to be able to operate within London.

To support this significant undertaking, the Government has created a £400m Charging Point Infrastructure investment fund, a £40m programme to develop on-street charging technology[9], and other incentives for consumers to adopt electric vehicles and build charging infrastructure in their homes. Grants are also available for taxi drivers looking to purchase low-emission vehicles, with a grant of 20% of the purchase price for LEVC TXs, up to a maximum of £7,500.

A lot is still to play for in this rapidly changing space. Adoption of electric vehicles has increased 122% in the past year10, suggesting that consumer behaviour is shifting. Whether the initiatives in place to grow EV infrastructure can cope with demand and provide sufficient coverage remains to be seen.

How long grants and incentives remain in play for consumers, taxi drivers and infrastructure companies is also unknown. Perhaps the biggest unknown is if legislative and policy frameworks in place to cope with changing driving behaviours as a result of the widespread adoption of electric vehicles.

"It's got to be a good thing to get rid of fossil fuels. It's a progression and it seems like the best way of doing it."

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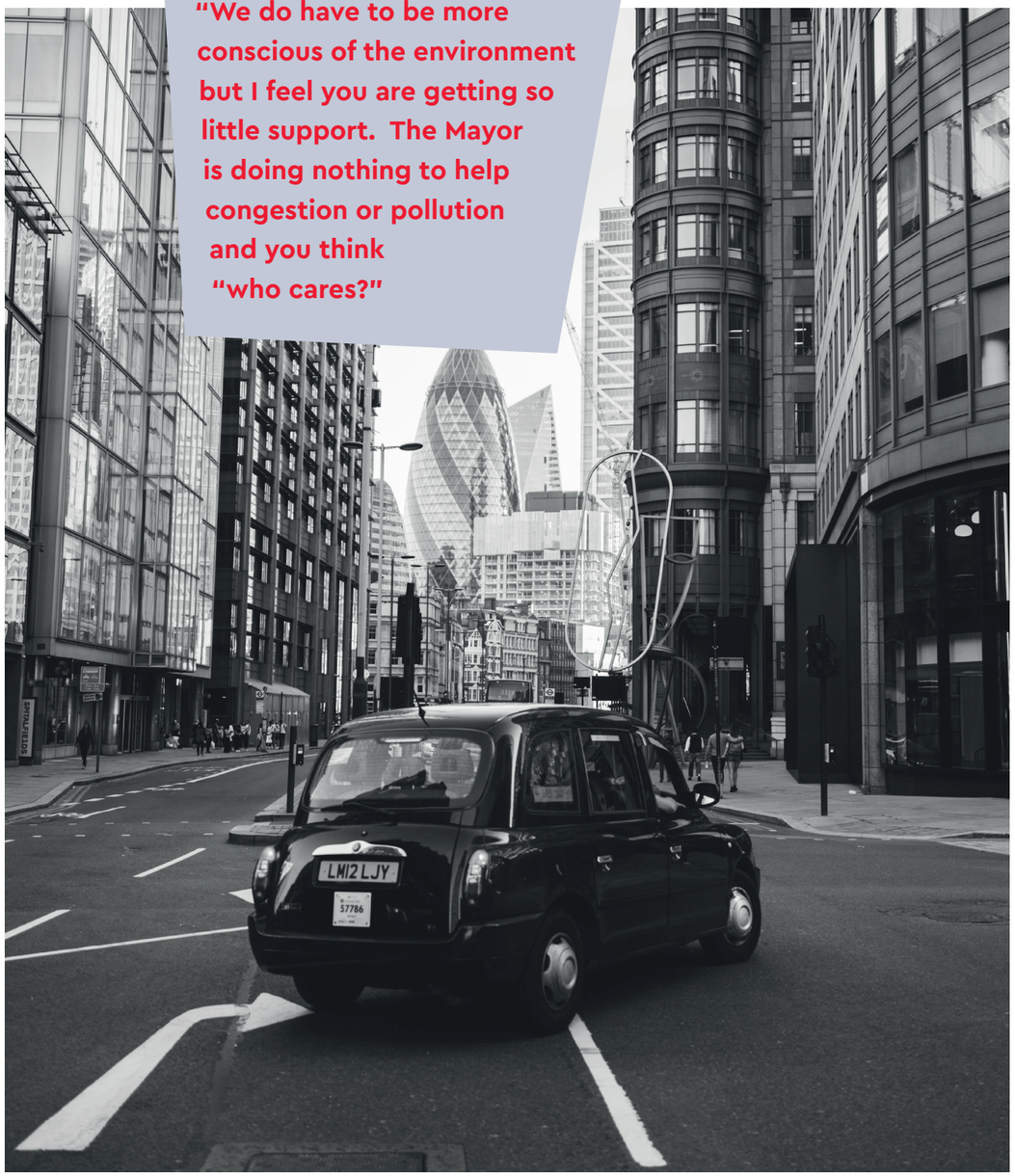
4. https://www.rac.co.uk/drive/advice/emissions/low-emission-zones-what-you-need-to-know/



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The emergence of electric taxis: LEVC and Nissan Dynamo.

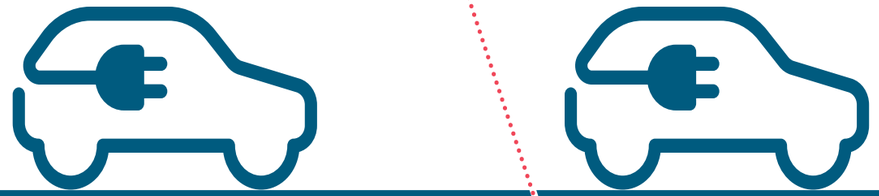
London's licensed Taxi drivers are committed to above average standards for passengers when it comes to features such as passenger space and accessibility. Majority of drivers want to include features such as space for wheelchairs, hearing loops and special grab rails.

As a result, there are two vehicle options that enable them to meet TfL's requirement for new taxis to have a minimum range of 30 miles at zero emissions, the London Electric Vehicle Company (LEVC) TX and the Dynamo Taxi.

The LEVC TX is a purpose build hackney carriage, which started production in 2017. It has been designed to hark back to the iconic London Taxi design. The TX provides drivers with 80 miles of electric range and is supported by a 1.5 litre petrol engine, giving a total range of 377 miles.

The Dynamo Taxi is a high-spec, fully electric NIssa e-NV200 people carrier that has been converted to London taxi standards. It offers a zero emission range of more than 170 miles.

CHARGE TIMES



LEVC TX

- 30 minutes with rapid charge
- 1.25 hours with wall box
- 6–8 hours using standard 3-pin socket

Nissan Dynamo Taxi

- 40–60 minutes with rapid charge
- 7.5 hours with a wall box
- 21.5 hours from a domestic three pin socket

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EMISSION COMPARISON

Emissions (CO2)

- TX4 – EUro 6 (2015+ model) 222g per km
- TX4 – Euro 5(2012–2015) 234g per km
- TX4 – Euro 4 (2006–2012) 233g per km
- TX2 – 212g per km
- TX1 – 244g per km
- LEVC TX – 29g per km
- Nissan Dynamo – 0

PRICE

The LEVC on-road price is £57,099, which includes VAT, delivery charge, registration fees and a discount of £7,500 for the low emissions grant. LEVC offers leasing and PCP packages to fund the purchase, typical price of £183 per week. It also claims to save drivers £110 per week on fuel savings.

The Nissan Dynamo has launched at an on road price of £48,045 which includes a discount of £7,500 for the low emissions grant. Dynamo is likely to add a range of leasing and funding options for drivers, but none were available at the time of producing this report.

One final consideration on pricing is servicing. The TX requires a scheduled service every 25,000 miles, while the Dynamo requires service every 18,000 miles.

ENVIRONMENTAL IMPACT

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Making the switch.

When it comes to improving the capital's green credentials, contrary to what many believe, most London cabbies (82%) do in fact agree that the taxi industry needs to become more environmentally friendly. Almost two thirds (63%) believe that energy efficient vehicles can save them money, and a further 60% believe their customers want more sustainable options.

Of the proportion of cab drivers who don't currently use hybrid or electric vehicles, 47% are considering making the switch.

82%

London cabbies agree that the taxi industry needs to be environmentally friendly

63%

London cabbies believe that energy efficient vehicles can save them money

60%

London cabbies believe their customers want more sustainable options.

47%

considering making the switch

"Sometimes we have to be forced into doing things [like accepting credit cards] otherwise we would never move on."

DRIVING FACTORS BEHIND SWITCHING TO HYBRID/ELECTRIC

The government and TFL regulating other types of vehicle e.g. diesel- meaning there is an increased pressure on drivers to switch in order to stay relevant and for their business to thrive	36%
The environmental benefits of the LEVC and Nissan Dynamo – choosing vehicles that will better air quality in the long-term, as well as vehicles that they know their customers want	34%
Wanting to invest in the best possible asset for the business – with a proportion of drivers accepting that electric and hybrid vehicles are the way forward	31%
The long-term financial benefits of the LEVC and Nissan Dynamo- easing the financial pressures as their career progresses	25%
For comfort – a proportion of drivers are considering switching for a more pleasant day-to-day driving experience	17%

"If you're renting an EV, that's £1,200 a month before I've earned anything else at all. My current cab is paid off and my only monthly cost is fuel, so for me to take on this massive financial obligation when i'm trying to move up the property ladder doesn't make much sense at all."

31%
of London drivers considering making the switch

47%
currently own nother vehicle

53%
drivers are not yet considering the move

However, making the switch overnight to a hybrid or electric is arguably easier said than done. Figures from our report show that almost a third of London drivers considering making the switch have been on the roads for 20+ years (31%), meaning they may be less inclined to change vehicles later on into their careers. Similarly, 47% currently own another vehicle, so financing the switch could pose a barrier.

And while it's almost universally agreed that moving cab drivers, among other drives, over to hybrid and electric vehicles is the long-term goal, there does appear to be a large proportion of drivers, over half in fact (53%), who are not yet considering the move.

So what's holding them back from moving over to more environmentally-friendly vehicles?

Can't switch, won't switch.

Among the taxi trade, it is clear there is an audience that feels as though it has been burned before, with the challenges surrounding the switch to diesel still fresh in their minds. The industry also feels it is being unfairly singled out disproportionately for its environmental footprint, when there are a host of factors that contribute to the emissions totals.

Despite this acknowledgement that the industry does want to improve its environmental footprint and air quality, the primary motivation for the switch to electric and hybrid vehicles leans heavily on personal and financial reasons – with drivers wanting to make financially-savvy decisions, as well as ensure their businesses thrive.

"They just pick on cab drivers. That's why they have changed our vehicles to electric and forced us to change."

"If you sit on the Euston road, the supposedly electric buses are pumping out fumes. They talk about us cab drivers but the pollution from the buses is ten times worse."

OF THE DRIVERS THAT ARE FIRMLY IN THE 'NOT SWITCHING TO ELECTRIC' CATEGORY, THERE ARE THREE MAIN CONSIDERATIONS:

The financial barrier – over half of cabbies aren't considering the switch because it is too expensive	58%
The career change barrier – over a quarter are planning on retiring or changing jobs in the next five years	25%
The charging and infrastructure barrier – a fifth believe the charging infrastructure as it currently is, is not good enough	24%

THE FINANCIAL BARRIER

While a proportion of drivers believe there are long-term financial benefits when moving over to electric and hybrid vehicles, other drivers believe the switch will be too expensive. The most recent diesel taxi, the TX4, cost drivers approximately £40,000, so the switch to electric represents a significant capital cost increase.

For drivers new to the trade, they don't really have a choice, they must choose one of the electric models. But for many of the existing drivers, they have already invested heavily in their vehicles, so switching in the short term or medium term does not make financial sense in their minds.

Many drivers in this category cite the flexibility and choice as one of the main reasons they got into the taxi trade in the first place. They feel that switching to electric robs them of this freedom, they don't get to choose when they work or take breaks, as they are beholden to the significant investment and also the range of the vehicle. Some drivers said that when it comes time to scrap their current vehicle, they will take the rebate and retire.

Finally, from a financial perspective, drivers in this category feel there are a lot of disingenuous sales claims and statistics used by lawmakers and the vehicle manufacturers. LEVC claims that it can save drivers as much as £150 each week on fuel, but most drivers would never even use this amount.

THE CAREER CHANGE BARRIER

Like other professions, many cab drivers working in the taxi trade will have been in the business for many years, with established working patterns and suitable vehicles they use day in, day out.

According to our research, a quarter of cab drivers (25%) say that they're planning on making a career change, or retiring in the next five years, meaning investing in a hybrid or electric vehicle wouldn't be financially worthwhile, and wouldn't support their current working patterns.

THE CHARGING AND INFRASTRUCTURE BARRIER

The other significant challenge, and barrier to the 'can't switch' group is the electric charging infrastructure. While a charge can be as quick as 45 minutes on an ultra fast charge station, there simply isn't enough of these charge points across the capital.

Insert quotes and stats from zapmap about charge points

Even more challenging for drivers is charging vehicles at the end of the day before their next shift. While this is the most logical time to go from zero to full, and there are incentives for drivers to install charge points at home, it's far from that simple. In fact, analysis of TFL data shows that 40% of black taxi drivers will never be able to install a charge point at home. This is because not all drivers have a driveway, let alone a fixed car park where they could install their own charge point. Many drivers live in flats and not on a ground floor, so they can't run a power cable to their car. There are also different rules and incentives for the installation of charging points.

"If you live in town, you have got it sussed, but if you can't charge on your own drive, it's hopeless. The out of town drivers need to be considered"

Furthermore, on average, a London taxi driver will drive approximately 200 miles in a day. On top of that, many drivers do not live in the inner London zones, where they secure most of their fares. Many travel in from commuter counties such as Essex, Kent and Surrey. With the LEVC's hybrid range at 370 miles and the Dynamo's 170 miles, the range of the vehicle and ability to charge can have significant impact on the drivers' ability to do their job.

As a general rule, there are several approaches to life as a taxi driver. There are the 'monetary target drivers' – who aim to earn a certain amount each day and want to reach this figure as quickly as possible. This group takes a literal approach to the phrase 'time is money', and take as few breaks as possible to maximise their number of fares.

wy have a similar mindset, except instead of a financial target, they aim to work a set number of hours each day and want as many fares as possible in that time.

The final group is more flexible, they don't work set hours, they are happy to drive and take breaks when it suits them.

FINALLY...TOO MANY UNANSWERED QUESTIONS

Many drivers unwilling to make the switch still feel burned by the switch to diesel and all the promises made about it being better for the environment, only for the science to change several years later.

They are concerned about the lack of garages capable of repairing vehicles should something go wrong, what happens for vehicles that need maintenance after the five year warranty and the cost of replacing batteries. Given the first LEVC only hit the road a few years ago, many in this category won't switch until there is some certainty around these questions.

The LEVC experience.

London's black cab drivers are often unfairly portrayed as backwards luddites – in a now notorious New York Times article, black cab drivers were caricatured as the old boys, digging in against the inevitable tide of technology and more modern ways of working.

As appealing as this simplistic caricature might be to some, it simply isn't true. On the contrary, taxi drivers are both forward thinking and pragmatic about technological change.

82%

Believe the trade needs to be more environmentally friendly

60%

Recognise that customers want to see sustainable journey options

89%

Say the trade has to adapt to new technology.

While drivers have good intentions, they are self-employed businessmen and the decisions they take must make sound financial sense.

The main factor driving adoption is not regard for the environment, nor financial but regulatory. New TfL regulations require vehicles to have a zero emissions requirement – this means having CO2 emissions of no more than 50g/km and a minimum 30-mile zero emission range. The result is that 70% of LEVC drivers state that their primary reason for acquiring an LEVC is the new regulations.

With the collapse of Metrocab, TfL regulations have effectively created a monopoly; anyone wanting to register a new taxi has no choice but to acquire an LEVC taxi. This situation will change with the release of the Nissan Dynamo, although our research has found that most drivers do not consider this vehicle a viable alternative.

This effective monopoly is a serious issue, particularly given the very high cost of a new LEVC taxi. With a retail price in excess of [xx,xxx] this is a drag on LEVC (see chapter x). Even with the various incentives and scrappage schemes available, the vehicles are a major investment, with many drivers stating that their loan repayments or leasing charges are equivalent to – if not more than – their monthly repayment costs.

"Passengers believe we have changed for environmental reasons. People say that it should be the first thing you think about when getting an EV but we didn't get a choice really."

"It's a lot of money, it's £66k and if you add interest, it is huge. My payment on my cab alone is over £1,000 a month."

Around half of the drivers we spoke to own their LEVC taxis but given the high cost of purchasing the vehicle and some of the uncertainty around servicing costs (see chapter x) leasing is an increasingly attractive option for drivers. Renting an LEVC vehicle is possible, but most renters will opt for a diesel vehicle as currently the weekly rental cost is significantly cheaper for diesel models.

Our research has identified two key trends when it comes to identifying who is driving LEVC taxis. A significant proportion of LEVC drivers tend to be newer entrants to the trade – we found that a third of LEVC drivers had been a licensed taxi driver for less than four years – this makes sense given that the regulatory situation changed in January 2018 and so for anyone passing out from The Knowledge since January 2018 their only option is an LEVC taxi.

Perhaps surprisingly, we also found that 60% of LEVC drivers are in the 45–54 age bracket. Our focus groups revealed that these drivers feel comfortable in the profession, are reasonably financially secure and have around 20 years left in the trade and are therefore prepared to make the necessary investment in an LEVC vehicle. Drivers aged 55+ tend not to drive LEVC taxis, which makes sense given that they are a major investment and one that they fear might not repay itself over what is left of their driving career.

While there are financial incentives available for drivers (see box out) to purchase an LEVC vehicle, 73% of LEVC drivers say that these are modest compared to the overall cost of the taxi. The financial incentives for drivers are well meaning, but not always well thought through. TfL are offering owners of older diesel cabs up to £10,000 to scrap their vehicle. We were told by drivers, that many of their older colleagues and fleet owners simply took the money and didn't use the payment to purchase a new zero emissions taxi.

When it comes to the running costs of the LEVC taxi, 87% of LEVC drivers said that the vehicle had the potential to save them money. That said, a slightly smaller percentage (77%) agreed that their running costs had actually reduced. We heard complaints from a few drivers that the claims made by LEVC about diesel fuel consumption were overestimated and that some electric charging points were expensive.

Only 43% of drivers say that they regularly drive using the fuel tank and most said that this was a last resort, rather than their primary means of fuelling their taxi. We heard in the focus groups that this is seen as a massive advantage of the LEVC vehicles as it means drivers can still do longer airport runs, that they say wouldn't be possible in a fully electric vehicle with a range of less than 200 miles (i.e. the Nissan Dynamo).

Charging points are an obvious point of friction for any electric vehicle driver and of course the overwhelming majority (87%) of taxi drivers that we spoke to complained about the lack of charging points. Another common gripe was that the apps for the charging points don't accurately reflect whether they are in use or out of service.

Taxi drivers all work in different ways and the flexibility of the trade is part of its appeal. Electric taxis aren't suitable for all working styles. While most drivers set themselves a financial or time-based target (or a combination of the two) for each 'shift', there are many different approaches to achieving this. Some drivers just want to plough through a shift and actively avoid taking breaks – this does not suit a vehicle that requires a charge after a set period of miles.

Some drivers insist on taking breaks and will stop for meals and to socialise with other friendly drivers – this working style lends itself well to electric or hybrid/electric vehicles that need to be charged. Other working habits, such as whether drivers choose to use taxi 'rank up' at airports, stations and tourist attractions could impact on the suitability of an electric vehicle. Airport jobs tend to be longer in distance and are a concern for any driver using a battery with a limited range. Drivers were also curious as to whether there might be scope to install charging points at some of the key ranks around central London.

That said, in our focus groups, some drivers made the point that the issue isn't charging points in central London, but the ability to

charge on their way in or out of London. Most taxi drivers live in outer London or in the home counties and so the ability to charge on the commute in or out would be an interesting option. Home charging (with a specially installed point) is all well and good for owners with a driveway, but for drivers who live in flats or terraced houses it simply isn't an option. Furthermore, councils outside of London are not always responsive to requests to install more on-street charging points.

"If you have a drive, you can charge it overnight for next to nothing, but if you haven't [got a home charger] you're not saving as much".

Range is of course a major concern for all LEVC drivers. We were told continually that after a few months the range is well below the 120 miles stated in LEVC's marketing materials. Most drivers said that range of 60–70 miles is more realistic and so this necessitates a charge at some point during a working period, if drivers are not to resort to the petrol tank.

LEVC DESIGN GRIPES

- The achievable range is much lower than stated
- The 'For Hire' light is badly positioned
- The door is too heavy, particularly for older customers
- Ineffective privacy glass means drivers and passengers can be heard

Despite the numerous issues associated with acquiring and driving an LEVC, drivers are overwhelmingly positive about them. Nearly 90% of LEVC users say they would recommend the vehicle to a fellow taxi driver. Furthermore, drivers say that customers love them and theat they are proud to be seen driving them – they all agree that the LEVC design is worthy of the black cab's status as a London icon.

"It's a nice feeling, you get people stopping and wanting to take photos of it".

RECOMMENDATION

1. *Tie scrappage schemes to purchase*
2. *Help older drivers make the switch with better financial incentives*
3. *Incentives fleet managers to scrap the older TXs that are rented*
4. *Install chargers at ranks and manage them differently*

APPENDIX

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