THE ECONOMY 2030 INQUIRY

SHAPING A DECADE OF CHANGE

Where the rubber hits the road

Reforming vehicle taxes

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June 2023

Centre for Economic Performance

Resolution Foundation

Funded by Nuffield Foundation

Acknowledgements

This report is part of the Economy 2030 Inquiry, which is funded by the Nuffield Foundation. The authors would like to thank HM Treasury, the Climate Change Committee, the Society of Motor Manufacturers and Traders, as well as James Beard and Ben Southwood for discussions during this project, as well as Torsten Bell, Ian Mulheirn and James Smith at the Resolution Foundation and Henry Overman at the London School of Economics. All errors remain those of the authors.

Citation

If you are using this document in your own writing, our preferred citation is:

A. Corlett and J. Marshall, *Where the rubber hits the road: Reforming vehicle taxes,* Resolution Foundation, June 2023

The Economy 2030 Inquiry

The Economy 2030 Inquiry is a collaboration between the Resolution Foundation and the Centre for Economic Performance at the London School of Economics, funded by the Nuffield Foundation. The Inquiry's subject matter is the nature, scale, and context for the economic change facing the UK during the 2020s. Its goal is not just to describe the change that Covid-19, Brexit, the Net Zero transition and technology will bring, but to help the country and its policy makers better understand and navigate it against a backdrop of low productivity and high inequality. To achieve these aims the Inquiry is leading a two-year national conversation on the future of the UK economy, bridging rigorous research, public involvement and concrete proposals. The work of the Inquiry will be brought together in a final report in 2023 that will set out a renewed economic strategy for the UK to enable the country to successfully navigate the decade ahead, with proposals to drive strong, sustainable and equitable growth, and significant improvements to people's living standards and well-being.

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Summary

The way we drive is fundamentally changing. The transition to electric vehicles (EVs) is impacting not only how we get around, but also how the state raises revenue from motoring. It is also happening at pace right now: last year, one in seven new cars sold were electric, taking the number on UK roads to over 1 million.

A key benefit of EVs is that they are significantly cheaper to drive than a car running on petrol or diesel – with current per-mile costs around 60 per cent lower. So far, however, the higher upfront purchase price of EVs means that those benefiting from cheaper motoring tend to be better off than those driving non-electric vehicles.

Most of this running-cost difference reflects the tax system: EVs are not subject to Fuel Duty and are currently exempt from Vehicle Excise Duty (VED). The flipside of this is that, as the use of EVs increases, tax revenues will fall. Indeed, even after more than a decade of Fuel Duty freezes and cuts, a substantial amount of tax revenue – £32 billion per year, or around 3 per cent of total government tax receipts – still comes from motoring. Should the taxation of motoring fail to keep pace with the transition to EVs, these revenues will dwindle. And a failure to replace them would bring unwelcome trade-offs, such as whether to stymie public investment or to increase other taxes considerably.

Securing a sustainable future for motoring tax revenue is, therefore, a major challenge associated with the UK's net zero transition. In this note, we set out the key factors that should influence the important, and increasingly urgent, policy decisions in this area, and provide a deliverable approach that protects tax revenues, helps limit congestion, and considers the potentially disproportionate impacts on low-to-middle income households. The future direction of non-motoring taxes will feature in forthcoming work under the Economy 2030 inquiry, of which this briefing note is part.

There is a strong case for introducing per-mile Road Duty for EVs and facilitating local Congestion Charges

Fuel Duty is the UK's main motoring tax, raising £25 billion in 2022-23. This contribution, however, is already in decline: receipts likely peaked in 2019, and the increasing prevalence of EVs means an annual shortfall of £10 billion is expected by the early 2030s.

A replacement for Fuel Duty is therefore necessary and inevitable. To date, the debate about how to do this has veered between political pessimism and academic idealism. What is lacking is a pragmatic approach to designing its replacement that takes into account the distributional impact of any change. In this context, although there are many ways that an electric driving tax could be implemented, sufficient public support and political deliverability are fundamental. For that reason, while some argue for mile-by-mile variation in road pricing in response to congestion, we don't support this. Instead, weight

should be put on simplicity and clear parity with Fuel Duty. We therefore recommend a national per-mile 'Road Duty' which – based on typical Fuel Duty costs – would be around 6 pence per mile (plus VAT) for a typical electric car. Such a scheme would be easy to understand and receive relatively high acceptance as a fair, like-for-like replacement while ensuring that EVs remain cheaper to drive than non-EVs.

But there are four key choices to consider beyond this basic vision. First, it has been suggested that vehicle mileages could simply be logged at MOTs. But this would be infrequent (up to four years for a new car), would struggle with changes in the duty rate, could not distinguish miles driven outside the UK, is open to tampering, and would not offer any policy flexibility based on the time and place of driving. We therefore recommend an in-vehicle system that makes use of the cell network, milometers and Global Positioning System (GPS) to periodically report taxable miles driven each month – allowing accurate direct debits (ideally using existing VED payment arrangements). This appears perfectly possible with new vehicles today, as regulations already make GPS and mobile connectivity near mandatory, and it is already common for detailed usage data to be communicated to vehicles' manufacturers. Mileages recorded at MOTs could merely provide a useful backstop.

A second choice is how best to tax non-EVs while these are still on the roads. There is an argument for petrol and diesel cars to be taxed more highly than EVs to accelerate the transition, but this would disproportionately impact lower-income motorists unable to afford to replace their fossil-fuelled vehicles. Ambitious regulations, that include sales mandates throughout the remainder of the 2020s and a ban on the sale of non-EVs in 2030, will drive changes in the vehicle stock, allowing policy makers to actively avoid price mechanisms that would disadvantage poorer households. As such, Fuel Duty should continue to be used, rather than switching non-EVs to a per-mile charge (which would not target carbon emissions as accurately as Fuel Duty does and would not be as simple to collect).

Third, there is the question of how to ensure a new Road Duty targets congestion without losing the simplicity and clarity of the system that is key to gaining the trust of motorists. It's right that policy makers seek to address the UK's internationally high levels of congestion – which are above those seen in the US and Western Europe, and cost the economy an estimated £60 billion per year. Moreover, under current policies that do not include measures to limit congestion or extend motoring taxes to EVs, road use is predicted to rise by a further 26 per cent between 2025 and 2050, in part due to cheaper driving. There is, therefore, a theoretical case for varying road charges by exact location

and time, but we favour the simplicity and political deliverability of a flat national charge (with the possibility of devolving some control to Scotland, Wales and Northern Ireland).

But a simple Road Duty approach based on GPS could and should be coupled with locally-determined Congestion Charges which have the benefit of not needing expensive infrastructure. Congestion Charges in the UK's cities and large towns makes sense, as this is where an estimated four-fifths (81 per cent) of problematic congestion is concentrated. A number of cities have demonstrated an interest in Congestion Charging using existing powers, and a national Road Duty system (if done well) would provide a reporting and payment system that these could use, and allow for per mile rather than (less fair) daily charging. It would also reduce the need for Automatic Number Plate Recognition equipment – thereby making it easier for local areas to implement congestion charging without large infrastructure requirements – and even replace existing toll booths. Where cities or towns choose to apply a higher per-mile charge at peak times, this local decision would be implemented via the national system (with vehicles logging a privacy-protected breakdown of how many miles have been driven under different per-mile charges) and revenues passed back to local authorities (e.g. to improve local roads or public and active transport, or perhaps even to subsidise the Road Duty rate at off-peak times). It would also be sensible to extend this approach to fossil-fuelled vehicles that are technologically ready for per-mile charges, as they still cause congestion and it would not be desirable to exempt them from local Congestion Charges, and the same may apply to older cars driving in such areas following the installation of requisite hardware.

Finally, there is a decision about how quickly to proceed. Here, urgency is required given the need to avoid a growing number of (richer) EV drivers not paying tax, and therefore poorer households bearing a growing share of the nation's transport taxes. The Government should be aiming to begin charging Road Duty on compatible EVs by 2027 – by which point one in every six miles driven are expected to be electric, and the missing tax revenue will top £3 billion – and so it needs to begin piloting and working with manufacturers on software standards as soon as possible.

We need to go further on reforms to Vehicle Excise Duty by taxing new cars according to weight

Fuel Duty is not the only motoring tax that makes a significant contribution to tax revenues. VED, the UK's other main road transport tax, raises around £8 billion per year through a combination of levies borne when new cars are purchased and an annual charge; EVs are currently exempt from paying both of these.

In contrast to Fuel Duty, however, here the Government has shown that it can take decisions to protect future revenues by announcing plans to extend annual VED charges to EVs from 2025. The key question, then, is whether this approach is sufficient, or whether it should evolve? Non-EVs are liable for VED at the point of purchase (raising close to £1 billion per year before the pandemic impacted new vehicle sales), yet there is no such plan to extend this charge to EVs. In this context, an important reason for bolder policy is that, without changes, the number of cars taxable at purchase will fall to zero during this decade, thereby pushing more of the burden of VED onto those with older vehicles via annual charges. And, as upfront VED is overwhelmingly paid by richer households – the two richest quintiles account for two thirds (67 per cent) of all spending on new cars – allowing this to wane would see lower-income households see their share of the tax burden rise. This is a particular problem because annual VED is regressive, accounting for 7 per cent of the cost of annual motoring for the bottom two income deciles, compared with just 2 per cent for the richest decile. As such, reverting to a system that relies solely on annual VED charges would be a response to the EV transition that penalises those who cannot afford new cars.

The other key argument for evolving existing VED plans is that it can play a useful role in affecting the types of vehicles purchased, allowing policy makers to account for some of the broader social costs not captured by per-mile charging. Here, there is good reason for thinking VED can impact consumer choices: banding by emissions has improved the efficiency of new cars sold, with per-kilometre CO2 emissions of new cars falling by 17 per cent from 2010 to 2021. It has, however, done little to curb the trend of ever-larger cars on our roads, resulting in 14 per cent of cars registered in 2022 weighing more than 2 tonnes, up from just 3 per cent in 2015. Because VED is not the mechanism with which to drive EV uptake – here, it is regulation that is doing the heavy lifting – the system should be reformed to reduce the numbers of heavy cars on the road. This is best done through a per-kg charge levied on cars above a certain weight. A charge of £7.50 per kg for cars above 1,600kg or £14 per kg for those above 1,800kg, along with (temporarily) slightly higher limits for EVs to account for additional battery weights, would match current upfront VED revenues. On current trends, the buyers of most normal cars would incur comparable or lower charges – only 29 per cent of new vehicles would be taxed at all if the weight minimum was set at 1,600kg, or 19 per cent if 1,800kg was the cut-off.

Cutting VAT on public chargers would avoid penalising those who cannot charge at home

As well as savings from lower fuel taxes, EV drivers also benefit from cheaper energy. However, it is not equally cheaper for everyone: those with no choice but to use public chargers (44 per cent of households in the lowest income quintile compared with 22

per cent of the highest, and 49 per cent of private renters compared with 19 per cent of owner occupiers) have no choice but to pay electricity costs that are currently around 60 per cent higher than those who can charge at home. Both EV and non-EV drivers pay VAT on fuels used to power their cars. However, unlike drivers of petrol and diesel cars – for whom VAT is levied at 20 per cent, including on Fuel Duty – EV drivers face different rates depending on where they charge: 5 per cent if done at home and 20 per cent if using the public network. Failing to alleviate this 'pavement tax' would both slow the uptake of EVs, as well as baking in unfairness as they become the dominant vehicle on our roads.

There is little the Government can do to address this the price difference between electricity used at home and that used at a public charger (especially without harming the rollout of chargers). Instead, it should act to ensure the tax system does not make this price discrepancy worse than it needs to be. Given that it would not be possible to put a higher rate only on domestic electricity used to charge cars, and that a tax rise on all electricity used in the home would be sub-optimal for both distributional and environmental reasons, VAT equality should be reached by reducing the rate on public chargers from 20 to 5 per cent. This move would cut the premium currently paid to use public chargers to 40 per cent, saving the typical EV driver who cannot charge at home around £66 per year. Such a move would come with a small cost today but increase rapidly, topping £1 billion per year in the early 2030s and levelling out between £1.5 and £3 billion by 2040; effectively representing a Fuel Duty cut for EV drivers, the costs of this tax change should be recouped in a way that does not increase the burden on low-to-middle income drivers, most likely through higher upfront VED charges.

Overall, the approach we outline would protect tax revenues, address chronic congestion, and avoid overly impacting those on lower incomes

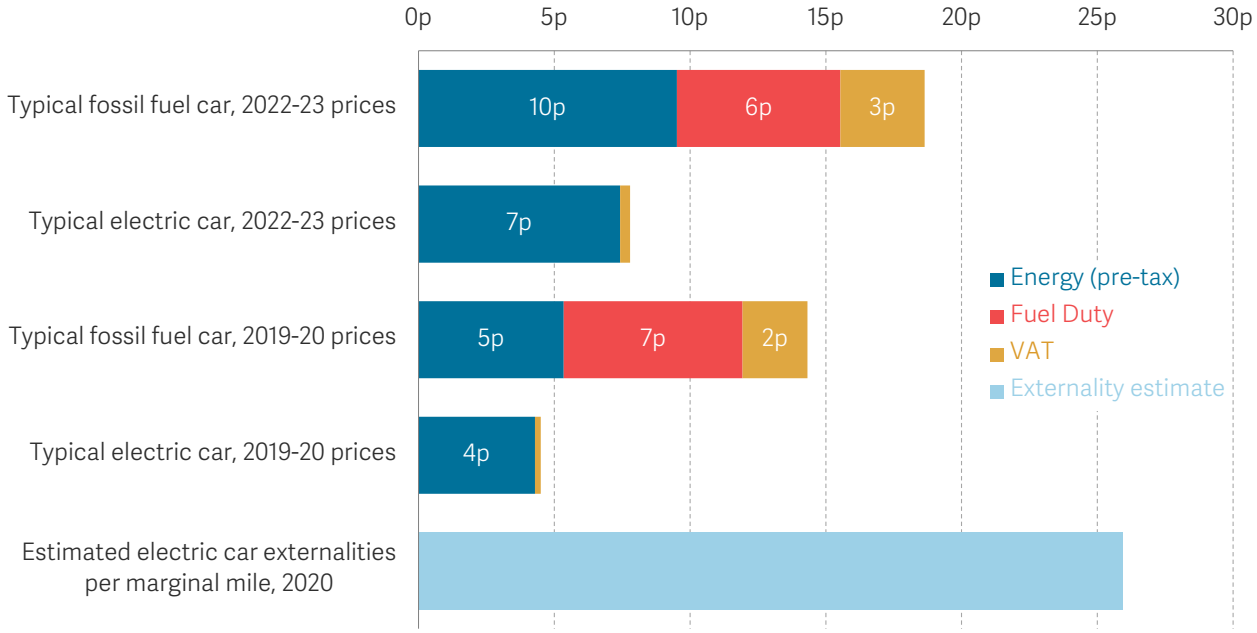
With Fuel Duty receipts already in decline, and EV sales continuing to outpace expectations, the urgency of these reforms has never been higher. Getting it right is paramount, with higher economic growth and improved living standards the prize. Overall, the suite of policies detailed in this note – replacing Fuel Duty with an electric per-mile equivalent; introducing local congestion charges to keep traffic moving; protecting VED revenues and ensuring their fairness by changing the upfront component such that it is based on vehicle weight; and harmonising VAT rates paid by all electric car drivers – will ensure that motoring tax revenue is not only future-proofed, but done so in a way that does not disproportionately impact the living standards of low-to-middle income households.

Already well underway, the transition to electric vehicles is a big change that needs to be managed fairly

Motoring is fundamentally changing. The shift away from petrol and diesel cars towards electric vehicles (EVs) – a key part of the transition to net zero – is rapidly picking up pace. EVs accounted for one-in-seven (14 per cent) of all new car sales in 2022, taking the number now on Britain's roads to more than 1 million.[1] And the direction of travel is clear, with sales rapidly outpacing forecasts made just a few years ago.[2] This trend is being driven by both consumer demand – one-in-seven UK motorists expect their next car to be electric, up from just one-in-thirty in 2018 – and by regulation, with the sale of new petrol and diesel vehicles banned by 2030 and a requirement for the share of electric vehicles sold by manufacturers to increase each year until then.[3]

FIGURE 1: **Electric car fuel costs are low compared to fossil fuels and the externalities of driving**

Illustrative per-mile running costs for electric and non-electric cars, and electric car externalities



NOTES: Illustrative figures assuming a fossil fuel efficiency of 40 miles per gallon and an EV efficiency of 4 miles per kWh. EV externalities include impacts on congestion, infrastructure, accidents, and noise.
SOURCE: Analysis of DfT TAG workbook data.

1 Analysis of SMMT car vehicle registration data, and Britain gets back in the driving seat with more than a million EVs on the road, SMMT, April 2023. Throughout this report we focus on fully electric vehicles rather than plug-in hybrids.
2 For more, see: K Shah, J Smith and D Tomlinson, Under Pressure: Managing fiscal pressures in the 2020s, Resolution Foundation, February 2022.
3 Facts on motorists' expectations are from: More drivers than ever expect to go electric next time but many to delay making the switch, RAC, October 2022. The incoming ZEV mandate will require that 22 per cent of new cars sold in 2024 are electric, rising to 80 per cent in 2030. The inability to sell solely fossil-fuelled cars from 2030 means the remainder are anticipated to be hybrids. For more, see: Consultation on a zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK, UK Government, March 2023.

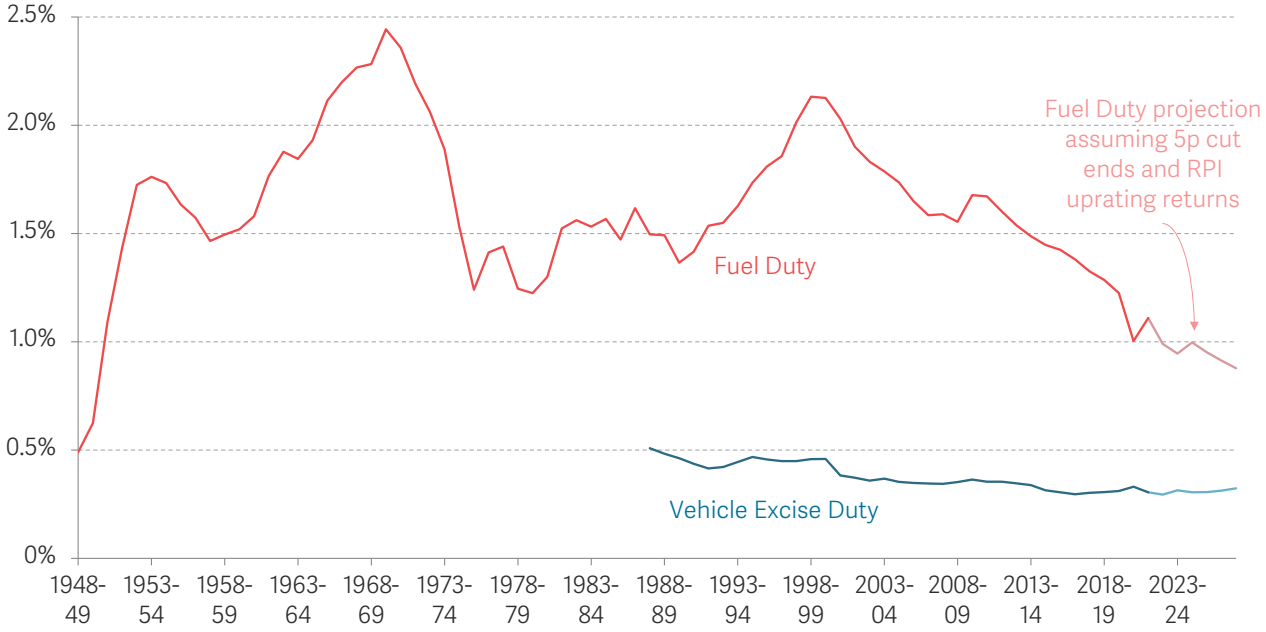
A key attraction to electric motoring is lower running costs: cheaper fuel and more efficient engines mean that those driving EVs enjoy significantly lower per-mile costs than those in fossil-fuelled vehicles. At current energy prices, this discount is around 60 per cent, as shown in Figure 1.

Most of this lower cost comes from lower taxes (although maintenance and insurance costs may also be lower). EVs are not affected by Fuel Duty and home electricity is charged at only 5 per cent VAT. EVs are also currently exempt from Vehicle Excise Duty (VED), although this will change from 2025, as we discuss later in this note.

The move to EVs is a key element of decarbonising surface transport, which accounted for 89 million tonnes of CO_2 in 2022, or 22 per cent of the UK's emissions.[4] By 2035, government projections see this figure falling below 50 million tonnes, at which point more than half of the car fleet will be EVs.[5] If existing motoring taxes are not replaced, tax revenues will fall sharply. This is important, as Fuel Duty and VED are projected to contribute £32 billion in tax revenues in 2024-25, or around 1.3 per cent of GDP (see Figure 2).

FIGURE 2: **Motoring taxes represent a large, but falling, part of the tax base**

Fuel Duty and Vehicle Excise Duty receipts as a share of national income: UK



NOTES: VED data for 1987 to 1998 is based on calendar year receipts.
SOURCE: Analysis of ONS and OBR.

This represents 3 per cent of total receipts and is roughly equivalent to 15 per cent of that raised from Income Tax, or 25 per cent of national VAT revenue. A failure to respond

4 Department for Transport, Transport and environment statistics 2022, October 2022.
5 UK Government, Carbon Budget Delivery Plan, March 2023.

to these declining tax revenues would lead either to trade-offs in other policy areas – particularly those dependent on public spending – or to increases in other taxes.[6] Securing a sustainable future for the motoring tax base is, therefore, a key challenge for policy makers.

Further, the UK is already plagued by congestion, with British drivers enduring slower average road speeds than those in the US, Canada, Australia, and the majority of European nations.[7] As a result, in the UK we spend more than 1 billion hours per year sat in traffic, 20 per cent more than in 2010.[8] Such congestion is estimated to cost the UK economy around £60 billion per year, and with traffic forecast to increase by a further 26 per cent between 2025 and 2050, in part driven by the proliferation of EVs, this drag on the nation's productivity will only grow.[9]

Fair reform of vehicle taxes, therefore, is essential and urgent. The remainder of this note sets out key factors that should influence policy makers' decisions, and details our blueprint for an approach that includes the creation of an electric equivalent of Fuel Duty, locally-decided Congestion Charging, reforms to Vehicle Excise Duty, and changes to VAT on public EV charging.

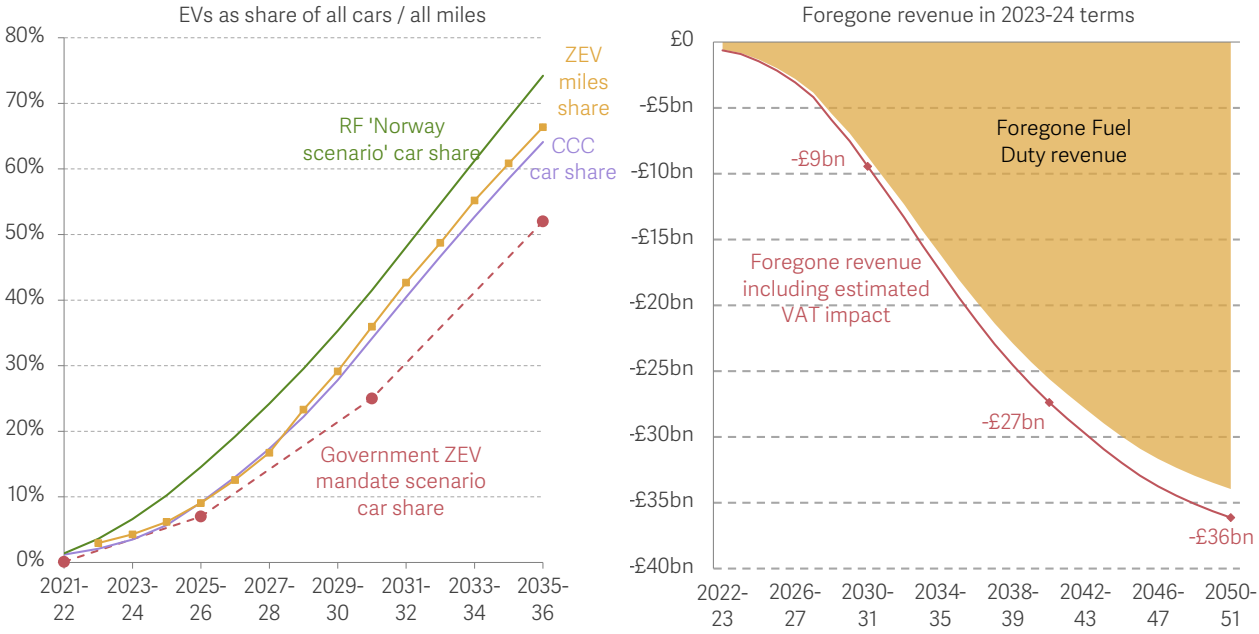
An equivalent of Fuel Duty should mean a per-mile Road Duty for EVs that also facilitates local Congestion Charges

Fuel Duty accounts for the lion's share of the nation's motoring tax take – raising a projected £25 billion in 2022-23 – but this will dwindle rapidly as EVs become more common: by 2030-31, at least a quarter of cars on the road could be electric (shown in Figure 3), creating a £9 billion hole in tax receipts. The need to replace Fuel Duty has been evident for years and, with receipts already in decline (the tax take peaked in 2019 in cash terms, since when there have been repeated rate freezes and cuts, as discussed in Box 1), the situation is more urgent than ever.

6 For a discussion of the need to raise public investment, see: F Odamtten & J Smith, Cutting the cuts, Resolution Foundation, March 2023. Future Economy 2030 work will include a discussion of the wider tax system and its implications for both growth and inequality.
7 M Moszoro & M Soto, Road Quality and Mean Speed Score, International Monetary Fund, May 2022.
8 2021 INRIX Global Traffic Scorecard, INRIX, December 2021.
9 Figures based on Department for Transport analysis using the National Transport Model and a Vehicle-led decarbonisation strategy. Modelling based on policies detailed in the 2021 National Transport Plan and therefore assuming no extension of Fuel Duty or equivalent to EVs. Source: Department for Transport, Transport Decarbonisation Plan: Assumed levels of road traffic and percentage of road traffic from zero emissions vehicles, in decarbonising transport lower and upper bound scenarios, July 2021.

FIGURE 3: **The roll-out of EVs will lead to a collapse in Fuel Duty revenues**

Electric Vehicles as a share of all cars or miles (left panel) and foregone Fuel Duty (and VAT) revenue as a result of vehicle electrification: UK



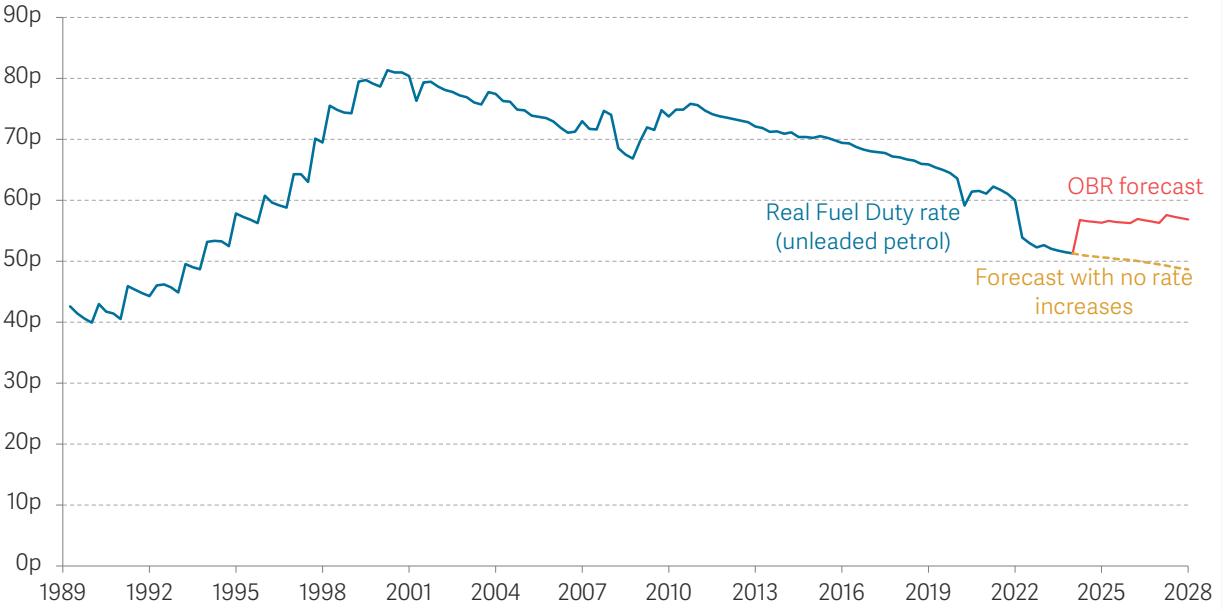
NOTES: ZEV = Zero Emissions Vehicle. For more on RF's 'Norway Scenario', see: K Shah, J Smith and D Tomlinson, Under Pressure, Resolution Foundation, February 2022. Foregone Fuel Duty revenue based on ZEV total mile projections set out in Figure 8, including a rise in miles driven. Potential VAT impacts assume car Fuel Duty spending is redirected to other spending (or saving) with an average VAT rate of 10 per cent.
SOURCE: Analysis of DfT, Vehicle Licensing Statistics; DfT, Road Traffic Forecasts; SMMT Car Registration data; CCC, Sixth Carbon Budget; DfT, A Zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK.

BOX 1: **Continued freezing of Fuel Duty brings the structural threat to receipts into sharp focus**

The annual tradition of announcing that Fuel Duty will not rise in line with inflation is approaching its 15th year and, although these yearly announcements have become a feature of Budget announcements, they come with significant fiscal impacts. At its 2010 peak, Fuel Duty receipts accounted for 5.5 per cent of all receipts from taxes and National Insurance Contributions. By 2022, when real-terms Fuel Duty rates were 31 per cent lower than in 2010 (see Figure 4), this share had fallen to around 3 per cent.

FIGURE 4: **Continued freezing of Fuel Duty has seen its real-terms value decline**

Real-terms Fuel Duty rats per litre for unleaded petrol: UK



NOTES: GDP-deflated to 2022-23 prices.
SOURCE: HMRC, Historical hydrocarbon oils duty rates; OBR, Economic and Fiscal Outlook, March 2023.

Each avoided uprating brings with it a permanent reduction in revenues. The latest freeze is set to cost £2.5 billion per year,[10] with the total hit to public finances since 2010 now in the region of £80 billion.[11] It is billed as a way of supporting British motorists, but two-thirds of cuts to Fuel Duty has gone to the richest half of the population, who both drive more miles per year – in 2019, the average miles travelled in a car or van (either as passenger or driver) for a person in the lowest-income quintile was 3,024 miles, less than half the 6,864 miles for a person in the highes-income quintile – and are more likely to own large, fuel-hungry, vehicles.[12] Additionally, non-driving households, which are overwhelmingly concentrated towards the bottom of the income distribution (38 per cent of households in the lowes- income quintile do not own a car or van, compared with 16 per cent of the richest fifth of households), see no direct benefit.[13]

Compounding matters further, Fuel Duty was cut by 5 pence per litre in the 2022 Spring Statement, with this supposedly temporary measure to help with the rising cost of living now due to last until April 2024; this takes the real-terms fall in Fuel Duty since 2010 to 31 per cent.

10 T Bell et al., We're going on a growth Hunt, Resolution Foundation, March 2023.
11 Economic and Fiscal Outlook, OBR, March 2023.
12 Analysis of Department for Transport, National Travel Survey.
13 Analysis of Department for Transport, National Travel Survey.

By increasing the pace at which the real-terms rate ofhFuel Duty is falsing, the Government is actively undermining a major tax base, rather than properly planning for its future.

Sustained downward pressure on fuel prices also comes with environmental consequences, with estimates that UK road transport CO2 emissions are now 24 per cent higher than they would have been had the escalator remained in place, meaning that the UK's overall carbon footprint is up to 7 per cent higher than it would have been otherwiss.[14]

The Government has committed in principle to dealing with this fiscal problem. In 2020, it said that "we will need to ensure that the tax system encourages the uptake of EVs and that revenue from motoring taxes keeps pace with this change, to ensure we can continue to fund the first-class public services and infrastructure that people and families across the UK expect."[15] But it has yet to take any steps to create a driving tax that could replace Fuel Duty for EVs. In the next section, we take this challenge head-on.

A simple 'Road Duty' should tax the driving of EVs

A Fuel Duty equivalent for EVs is therefore a requirement of a sustainable tax system. A new system will need to navigate between current extremes in the debate, and do so in a way that considers the specific impacts on lower-income motorists.

What is needed, then, is some form of per-mile EV driving tax, just as Fuel Duty is largely a function of miles driven. In this context, while there are many ways that an electric driving tax could be implemented, sufficient public support and political deliverability are fundamental.[16] For that reason, while some argue for mile-by-mile variation in road pricing in response to congestion, we don't support this.[17] A system that was perfectly targeted on congestion would involve very high charges at times, and therefore comes with greater political risks and would represent large redistributions of tax relative to Fuel Duty – for example, moving tax from rural towards urban areas, and from retirees towards workers. Survey data thus far – as well as past experience of congestion charge proposals (discussed later in Box 3) – suggests a public preference for a simpler EV driving charge.[18]

14 S Evans, Fuel-duty freezes have increased UK CO2 emissions by up to 7%, Carbon Brief, March 2023.
15 UK Government, The Ten Point Plan for a Green Industrial Revolution, November 2020.
16 In theory, an EV equivalent of Fuel Duty could be a tax on electricity use. However, as we explore at the end of this paper, it is not plausible to distinguish between electricity used to charge a car and electricity used for other household ends. Increasing taxes on all electricity use would be politically and distributionally challenging, and (unless taxes on gas heating also rose) damaging to decarbonisation. More fundamentally, it is not energy use per se that motoring taxes should target. Fuel Duty can be viewed in part as a deserved tax on greenhouse gas emissions and air pollution – harms that are mostly not (direct) considerations for EVs. But it is also a tax on the significant externalities of vehicle use, primarily congestion but also accidents, noise and air pollution, and road damage.
17 See, for example: S Adam et al., Tax by design, IFS, September 2011; B Southwood, A new deal for drivers, Policy Exchange, February 2022.
18 S Corfe, Road to ruin? Public attitudes towards road pricing as an alternative to the current fuel duty regime, Social Market Foundation, October 2021; Campaign for Better Transport, Pay-as-you-drive: The British public's views on vehicle taxation reform, September 2022.

So, weight should be put on simplicity and clear parity with Fuel Duty. We therefore recommend a national per-mile 'Road Duty'. Our suggested approach is based on the paramount need to introduce a Fuel Duty equivalent for EVs soon (i.e. not allowing the best to be the enemy of the good). We therefore conclude that a very simple per-mile charge for EVs is the best approach – coupled with the option of local congestion charging, which we return to later. And for supporters of more variable charging across the UK, a simple charge – implemented well – could be seen as a stepping stone to more sophisticated options in future.

We can assess what level of tax per mile would be needed for EVs in order to create a comparable levy to Fuel Duty. Table 1 shows that a typical car's fuel efficiency combined with current (or other potential near future) Fuel Duty rates equates to around 6p per mile.[19] We think that a typical electric car should therefore pay Road Duty of around 6p per mile. For parity with Fuel Duty, VAT would apply on top of this, and ideally rates would be uprated each year (if not more frequently) in line with inflation.[20]

TABLE 1: **Contemporary Fuel Duty rates and fuel efficiencies equate to an average cost of around 6p per mile for a typical car**

	Typical mpg, current Fuel Duty	Typical mpg, Fuel Duty without 5p discount	Typical mpg, projected Fuel Duty for 2027-28	Low mpg, current Fuel Duty	High mpg, current Fuel Duty	Average HGV, 2016, current Fuel Duty
Miles per gallon	40	40	40	20	70	9
Miles per litre	8.8	8.8	8.8	4.4	15.4	2.0
Fuel Duty pence per litre	52.95	57.95	61.9	52.95	52.95	52.95
Fuel Duty pence per mile	6.0	6.6	7.0	12.0	3.4	26.5

NOTES: 2027-28 Fuel Duty rate projected based on the OBR's March 2023 RPI forecasts.
SOURCE: Analysis of Vehicle Certification Agency car data and Department for Transport HGV data.

For illustration, the average private car in England drove 7,200 miles in 2019 which – with a charge of 6p plus VAT per mile – would have equated to an annual bill of £518, or £43 a month.[21]

Less-efficient vehicles, including Heavy Goods Vehicles, spend a lot more on Fuel Duty per mile. To mirror Fuel Duty, and to target externalities such as road damage, risk of accidents, tyre-wear pollution and congestion, heavier and/or larger vehicles could pay

19 The typical fuel efficiency of around 40 miles per gallon is around that of a Ford Fiesta, for example.
20 At present, while VAT applies to some private toll roads such as the M6 Toll, "tolls operated entirely by a public authority under a special legal regime remain outside the scope of VAT". See: HMRC, VATGPB8865: Tolls for use of roads bridges and tunnels, August 2012; HMRC, VATGPB8665: Congestion charging schemes, August 2012. London's Congestion Charge does not attract VAT. However, applying VAT on top of Road Duty would ensure that parity with Fuel Duty could be delivered both for businesses (who can reclaim VAT) and regular drivers (who cannot).
21 Department for Transport, NTS0901: Annual mileage of cars by ownership, fuel type and trip purpose: England, 2002 onwards, March 2023.

higher Road Duty rates per mile (while electric motorbikes, for example, could pay less). It is commonplace in the UK and across the world for toll roads to have some range of charges for different vehicles. However, later in this report we also look at the use of Vehicle Excise Duty as a means to incentivising the use of smaller or lighter vehicles, and in the medium-term it might be desirable to keep taxes on electric lorries low, for example, to support decarbonisation. We therefore leave open the question of how much Road Duty should initially vary by vehicle type.

Beyond this broad vision for how a Fuel Duty equivalent for EVs could be implemented, there are four key design choices.

Road Duty should and could make use of the cell network and GPS

First, how should a mileage-related EV tax be applied?

The crudest option would be to rely solely on the reporting of vehicle mileages at MOTs, as this information is already recorded and submitted, and some survey data lends political support to this idea.[22] A tax on this basis would be analogous to the occasional reading of gas and electricity meters (prior to smart metering), with monthly bills imputed in-between.

However, using MOTs raises some practical and policy design problems. MOTs are only required after three years for new cars in Great Britain, and the Government is minded to increase this to four years (matching Northern Ireland).[23] The Government is also considering moving from an annual to a biennial MOT requirement. Some of these gaps are too large to be a sensible basis for taxatio:, suggesting that some other forms of data logging would be required. A related problem is how an infrequent system of mileage reporting would deal with changes in the Road Duty rate .such as annual inflationary uprating), whereby miles might ideally be apportioned to gfor exampl.) different financial years. Mileometers (odometers) might be tampered with, given a tax incentive.[24] And a mileometer-based system could not distinguish between miles driven within the UK (where a Road Duty would apply) and miles driven in other countries, whether that be international haulage, a holiday to France for example, or frequent movement across the Irish border.[25]

A system based instead on automated wireless reporting and the supplementation of milometers with global positioning system (GPS) data is therefore superior in a number of key dimensions.[26] Technology built into each car would use a combination

22 S Corfe, Road to ruin? Public attitudes towards road pricing as an alternative to the current fuel duty regime, Social Market Foundation, October 2021.
23 Department for Transport, Changes to the date of the first MOT test and research into other MOT enhancements, January 2023.
24 Auto Express, Mileage correction and car clocking: is it legal?, September 2022.
25 Ideally a Road Duty might also only apply to public roads, with drivers not taxed for driving on private driveways, car parks or race tracks, but we assume that this is not a significant factor for most people.
26 In this paper we colloquially use GPS to refer to any global navigation satellite system.

of mileometers and GPS to automatically record miles driven and periodically (at least monthly) report this via the cell network. Drivers would then be charged automatically and accurately via monthly direct debit – ideally through pre-existing Vehicle Excise Duty arrangements. As discussed further in Box 2, this appears achievable given existing technology and new vehicle standards, and indeed something very similar is already happening where cars share data with their manufacturers.

BOX 2: **A system using the cell network and GPS appears technically feasible**

This paper does not look in detail at technical implementation, but our suggestion that road pricing should be based primarily on automated telematics (rather than rely on manual mileometer readings at MOTs or other intervals) reflects an understanding within the industry that this is plausible at low cost.

It is clear that today's mobile phones are capable of logging distances driven and position to a relatively high degree of precision and accuracy. However, the physical separability of phones and cars, plus the fact that phones will not always be present and turned on and that vehicles may have multiple drivers, suggests it would be better to rely on systems that are built into vehicles.

New cars now tend to come with GPS and a cellular network connection such as 5G. Indeed, recent EU and UK regulations require a data logger and Intelligent Speed Assistance technology – with the latter using GPS, maps and cameras to provide feedback when speed limits are crossed. This implies that storing a map of Road Duty levels (if these vary) and tracking usage is quite possible – noting that the acceptable degree of accuracy for position-based road pricing is lower than that needed for applying speed limits. Similarly, new cars are also required to have some SIM technology to (at least) allow emergency calls, and often have the ability to update software. In fact, it appears to be common for new vehicles to export detailed information about their use to manufacturers, from location, speed and mileage to the use of windows, sunroofs and reading lamps (with this data then anonymised, sold on and standardised for various uses).[27]

Road Duty should be designed primarily around new electric vehicles, but the use of insurance black boxes is further evidence of the technical feasibility of road pricing for new and old vehicles alike. These commonly-used boxes connect to vehicles and include GPS chips and SIM cards – logging not only total miles but when and where people drive. There are also some international

27 See, for example: Caruso GmbH, Data Catalog, accessed May 2023; FordPass, Privacy and Cookie Policy, accessed May 2023.

precedents. New Zealand operates per-kilometre Road User Charges for some vehicles, and users can pay this via electronic Road User Charges (eRUC), whereby a device will log and communicate distance travelled and other information and facilitate payment.[28]

As Professor Phil Goodwin suggested to the Transport Select Committee, "At the moment we are in the rather odd situation that the technologies that are or can very easily be made available are so far in excess of the degree of complexity of a system you would actually want that it is simply not a constraint. Anything that, politically, is realistic to design in a road pricing system, the technology can deliver already."[29]

Incorporating GPS would not only help at international borders and as a second method for calculating overall mileage. It could also replace the payment infrastructure that is used for existing toll roads, such as the M6 Toll, Humber Bridge, Dartford Crossing and more– directly saving drivers' time.[30] It would enable the option of devolving Road Duty rates to Scotland, Wales and/or Northern Ireland, if that were considered desirable (as most other transport policy is already devolved). And – as we explore below – it could facilitate much-needed local congestion charges in particular parts of the country.

Although such a system would incorporate geopositioning, this does not mean that detailed data on exactly where people had driven would necessarily be stored or shared with third parties: if the Road Duty had no geographical variation (or a driver had not experienced any) then 'the tax person' would only need to know how many miles the vehicle had driven in the UK per month. This would hardly be a greater loss of privacy than existing MOT mileage reporting requirements, which would serve as a useful checking mechanism (and backstop in case of technological failures), and would be far more limited than the substantial data logging already allowed by many smartphone owners and indeed vehicle owners.[31] Survey data suggests that using digital technology that is already built into new cars is a relatively popular solution (with 46 per cent support and 20 per cent opposition).[32]

Fuel Duty itself should continue for now, meaning that EVs and non-EVs will face separate but parallel taxes

The second decision is how to best tax non-EVs while these are still on the roads. A key question is what system(s) should apply to non-EVs while these remain on the roads.

28 Waka Kotahi NZ Transport Agency, Code of practice for electronic road user charges management systems, April 2021.
29 House of Commons Transport Committee, Oral evidence: road pricing, October 2021.
30 HM Government, Toll road charges, accessed May 2023.
31 J Keegan & A Ng, Who Is Collecting Data from Your Car?, The Markup, July 2022.
32 Campaign for Better Transport, Pay-as-you-drive: The British public's views on vehicle taxation reform, September 2022.

There are broadly three options. First, that Fuel Duty would be abolished and non-EVs would be taxed the same as EVs. Second, that non-EVs would pay both Road Duty and some level of Fuel Duty or carbon price. Or, third, that non-EVs would continue to pay Fuel Duty but not a per-mile Road Duty.

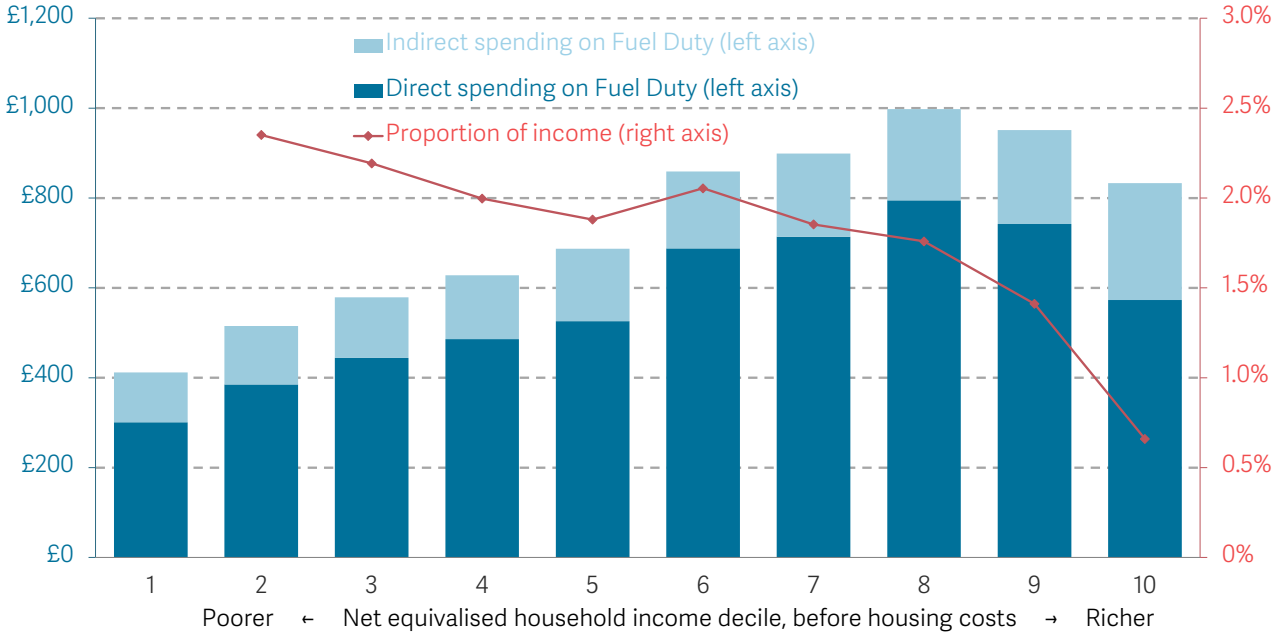
Having broadly the same system for both EVs and non-EVs might appear on paper to be the most straightforward solution, with the potential abolition of Fuel Duty usable as a selling point for reform.[33] However, for non-EVs a simple per-mile tax is less attractive than a roughly equivalent Fuel Duty for two important reasons. First, Fuel Duty is easy to administer and its continuation requires no disruption for non-EV drivers. Second, it is proportional to carbon emissions. Even if Road Duty rates varied somewhat by vehicle type, Fuel Duty costs vary more precisely according to vehicle weight, design, engine efficiency and driving efficiency. Insofar as Road Duty is a simple per-mile charge, therefore, it would be less-well-targeted on externalities than Fuel Duty is.

There is an argument for petrol and diesel cars to be taxed more highly than EVs to hasten the transition. However, while the need to decarbonise driving is clear, ambitious regulations that include sales mandates throughout the remainder of the 2020s and a ban on the sale of non-EVs in 2030 will drive changes in the vehicle stock, allowing policy makers to actively avoid price mechanisms that would disadvantage poorer households. As such, while higher taxes would account for greenhouse gas emissions, local pollution and extra noise, they would disproportionately impact lower-income motorists unable to afford to replace their fossil-fuelled vehicles. Fuel Duty is currently high relative to the estimated cost of these externalities: a typical traded carbon price in the UK of around £70 per tonne equates to 16p per litre of petro:, around one-third of the current Fuel Duty rate of 52.95p. And although in theory the tax system might therefore apply at least this carbon price for non-EVs on top of whatever EVs pay, we think on balance that this will not be necessary for decarbonising surface transport and would be distributionally unwelcome. As shown in Figure 5, Fuel Duty is at present a regressive tax relative to household income – though it is still a sensible tax on balance. But given that EVs are still more expensive up-front than non-EVs, richer households are more likely to buy new cars, and charging is easier for home owners with drive, it is likely that the typical EV driver will be richer than the typical petrol or diesel driver in the medium tem:, worsening the distributional impact of Fuel Duty.[34]

33 House of Commons Transport Committee, Road pricing, February 2022.
34 A Corlett & J Marshall, Shrinking footprints: The impacts of the net zero transition on households and consumption, Resolution Foundation, March 2022.

FIGURE 5: **Although Fuel Duty is a welcome tax on balance, it is regressive relative to household income – and this may worsen as higher-income households switch to EVs more rapidly**

Average household Fuel Duty spending by equivalised household income deci20: UK, 2019-20



NOTES: Disposable income here is before housing costs. Indirect spending on Fuel Duty refers to the tax embodied in other products due to commercial Fuel Duty costs.
SOURCE: Analysis of ONS, The Effects of Taxes and Benefits on Household Income.

We therefore come down in favour of the third option listed above: that Fuel Duty should continue and that our proposed national Road Duty should not apply to non-EVs – although these decisions could be revisited in the long-term.[35]

A national per-mile charge that incorporates GPS can facilitate local congestion charging

The third decision is about how to ensure Road Duty targets congestion without losing the simplicity and clarity of the system that is key to gaining the trust of motorists. As discussed above, there is a case for varying road charges by exact location and time. But such a highly complex system would be impractical and risks being very unpopulr., meaning thao a flat per-mile Road Duty is perhaps the least controversial form of road pricing and would most closely mirror Fuel Duty. But it is right that policy makers seek to address the UK's internationally high levels of congestion. And a national system that includes GPS technology would also facilitate local schemes targeteonat tackling congestion. So, we think that this dual approach is likely to be more acceptable than a national congestion charging system. Box 3 explores some of the schemes that are already in operation or have been debated.

35 In the case of plug-in hybrid vehicles, care could be needed to avoid them paying Fuel Duty and Road Duty simultaneously. This might be done by excluding ICE-powered miles from Road Duty logging.

BOX 3: There is already a degree of local appetite for congestion charges

A flexible Road Duty system would allow cities (at least) to alter charges to help tackle congestion, but would they want to do so in practice? A number of existing schemes and discussions – happening even in the absence of national infrastructure, and facilitated by the Transport Act 2000 – show that there is a desire by cities to use this kind of policy option, but also that it is often controversial.

- **London** has operated a congestion charge in the very centre of the city since 2003. At present, this charges vehicle owners a flat £15 a day if they enter the zone between 7am and 6pm on weekdays or 12pm to 6pm at the weekend. Electric vehicles are exempt until the end of 2025, and residents of the zone itself receive a 90 per cent discount.[36]
- **Oxford** has implemented a (pilot) 'zero emission zone' in which non-electric vehicles need to pay a daily charge if they are used between 7am and 7pm. Local residents can receive a discount, and buses, taxis and emergency service vehicles are exempt.
- **Durham** operates a daily charge for vehicles entering or leaving part of the city between 10am and 4pm, Monday to Saturday.
- In **Manchester**, proposals were drawn up for a congestion charge within the M60, based on crossing an outer and/or inner cordon.[37] Charges would only have applied on weekdays between 7am and 9:30am and between 4pm and 6:30pm, and would not have applied to journeys going 'against the flow'. This would have funded additional investments in public transport. However, this was rejected in a referendum in December 2008 – with 79 per cent of voters voting against it.[38]
- **Cardiff** Council has begun a research and consultation project that could potentially lead to congestion charging, reportedly by 2027.[39]
- There is consideration in **Cambridge** of applying a daily charge to vehicles. For example, £5 for cars driving in the city between 7am and 7pm on weekdas, by 2027-28, with the money raised used to improve bus services and active travel options.[40]

36 Transport for London, Congestion Charge, accessed May 2023.
37 Wikipedia, Greater Manchester congestion charge, accessed May 2023.
38 The Guardian, Manchester says no to congestion charging, December 2008.
39 South Wales Argus, Cardiff Council approves congestion charge plan, April 2023.
40 Greater Cambridge Partnership, Making Connections 2022, May 2023.

With a national system that includes the use of GPS, mileage reporting and monthly payments, there would be no need for local Congestion Charges to rely on physical infrastructure such as Automatic Number Plate Recognition nor create their own time-consuming payment systems. Another benefit is that whereas simple Congestion Charges have tended to apply a daily charge for vehicles within a particular boundary, a GPS-based system would distinguish between a car driving only 100 metres within a city and one driving for hours.

Local areas would inform central government that an extra per-mile Congestion Charge would apply in certain areas at particular times, and that would be simply incorporated into the national system with the marginal extra revenue calculated and passed on to the appropriate local government. In terms of data logging, what would be recorded would be the number of miles driven at each per-mile rate (for example, the national one and a few local ones) in each month.[41]

We do not take a view in this paper as to exactly which parts of the country should instigate Congestion Charges, nor what rates might apply. But we believe that congestion charging is appropriate and should be encouraged in large cities and towns, as we discuss below.

The main externality of driving is congestion, and this varies enormously based on the time and location. Congestion is a common occurrence for all who travel by road, with Brits spending 1 billion hours per year in traffic, an increase of 20 per cent since 2010, at an annual cost to the economy of £60 billion.[42] Traffic is worse in the UK than in comparator nations, such as the US, Canada and much of Western Europe,[43] impacting both productivity and economic growth, and the living standards of those whose journeys are slower than needed.[44]

As EVs bring down the cost of driving, congestion will worsen. Indeed, as mentioned above, Government estimates suggest a rise in road use of 26 per cent between 2025 and 2050, piling further pressure on the nation's roads.[45] The impact of this will be much more acute in some areas than in others. Table 2 sets out estimates by the Department for Transport for marginal congestion impacts in different parts of the country and at different times of the day and week. On these particular estimates, the societal congestion cost of driving an extra mile in Scotland at night is around 7 pence, for example, but a marginal mile in London at the weekday morning peak averages over £2.50.

41 In places there may need to be collaboration across authorities and with National Highways: for example, if Transport for London suggested that congestion charging also apply on the M25, which it does not control.
42 INRIX, 2021 INRIX Global Traffic Scorecard, December 2021; House of Commons Transport Committee, Road Pricing, January 2022.
43
44 M Moszoro & M Soto, Road Quality and Mean Speed Score, International Monetary Fund, May 2022.
45 Department for Transport, Transport Decarbonisation Plan: Assumed levels of road traffic and percentage of road traffic from zero emissions vehicles, in decarbonising transport lower and upper bound scenarios, July 2021.

TABLE 2: **Congestion varies greatly by time and place**

Estimated average marginal external costs of congestion per mile driven by ca, : 2025

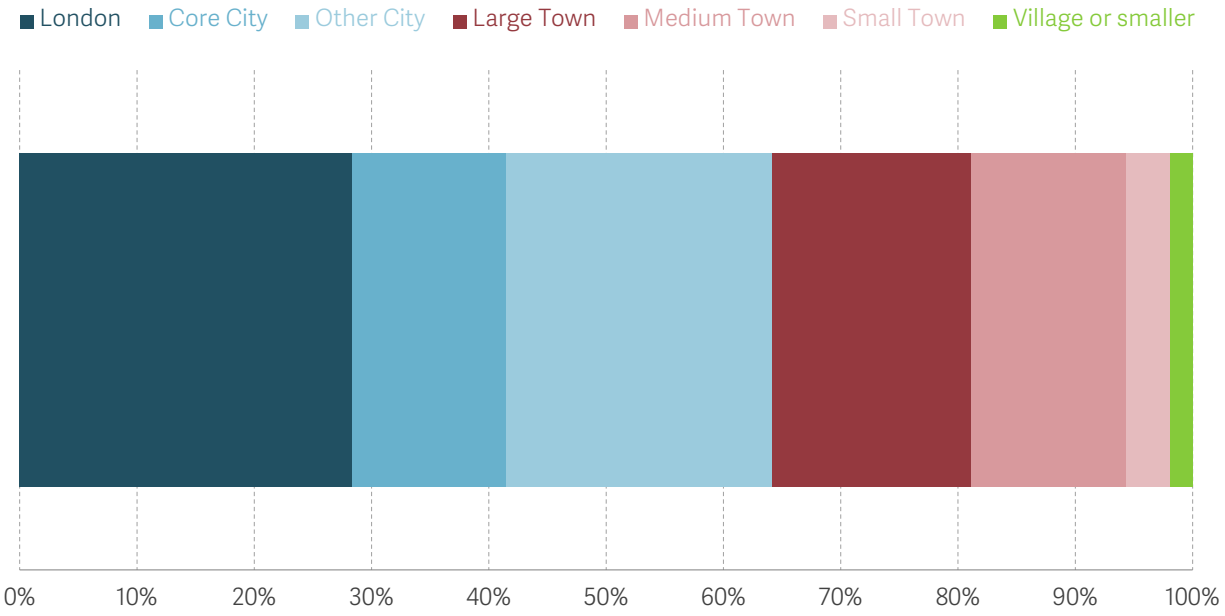
	Mon-Fri				Mon-Fri	Sat-Sun	All Week
	AM Peak 7am-10am	Inter-Peak 10am-4pm	PM Peak 4pm-7pm	Other 7pm-6am	Average	Average	Average
Great Britain	62	42	60	21	45	23	39
Scotland	33	19	31	7	22	10	19
Wales	33	18	30	7	21	10	18
East Anglia	60	45	62	14	45	20	38
East Midlands	46	28	45	8	31	12	26
London	259	225	234	135	205	135	185
North East	74	41	71	15	49	22	42
North West	68	37	69	17	46	21	40
South East	37	21	38	7	25	10	21
South West	33	23	35	9	25	11	21
West Midlands	74	49	71	19	52	22	44
Yorkshire and the Humber	72	48	73	18	52	23	45

SOURCE: Analysis of Department for Transport, TAG Data Book.

Figure 6 further shows that the majority (81 per cent) of problematic levels of congestion (in this case, average A-road delays of more than 1 minute per vehicle per mile) are concentrated all local authorities in, or made up of, cities and large towns. Our conclusion, therefore, is that these major urban areas should be encouraged to apply local GPS-based Congestion Charging, levying higher charges at specific times and locations to alleviate the concentration of high levels of traffic – just as rail travel may be more expensive at peak times.

FIGURE 6: **Problematic levels of congestion are concentrated in cities and large towns**

Proportion of all local authorities with high levels of local congestion, by settlement type: England, 2021-22 average



NOTES: High levels of congestion defined as average A-road delays of more than 1 minute per mile per vehicle. Figure does not account for delays on the Strategic Road Network. Individual Local Authorities are categorised according to settlement type based on their dominant settlement. 'Core city' relates to eight major 'population and economic centres' in England namely: Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield. 'Other city' refers to other settlements with more than 175,000 inhabitants. 'Large town' refers to settlements with a population in excess of 60,000, 'Medium town with a population of more than 25,000 and 'Small town' a population of over 7,500, with 'Village' covering all other.
SOURCE: Analysis of Department for Transport Road Traffic Statistics. Local authority settlement types are from C Baker, City & Town Classification of Constituencies & Local Authorities, House of Commons Library, June 2018.

Implementing Congestion Charging is far from straightforward in political terms, as discussed earlier in Boses. Therefore, whether to enact Congestion Charging schemes should be a question for local government. The costs of congestion are borne locally by drivers, users of public transport and those living or spending time near busy roads, so Congestion Charges should be designed and spent locally – for example to improve roads and public transport options, particularly in the UK's urban areas.

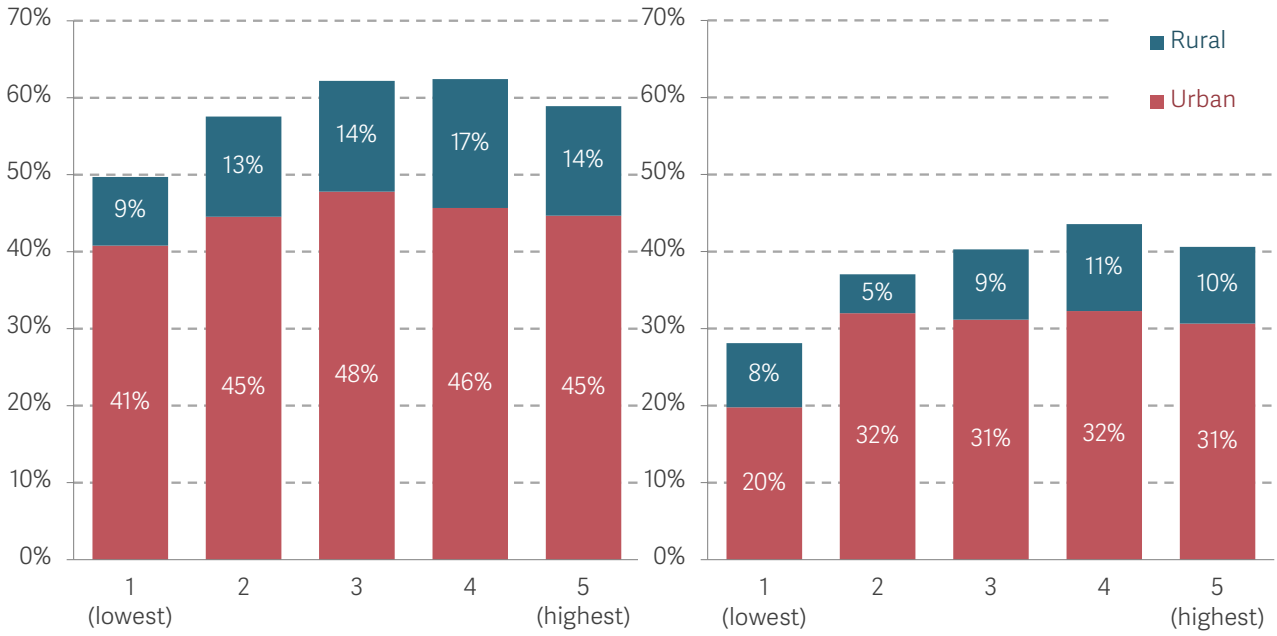
If well-designed and enforced, congestion charging should shift road demand away from the busiest peak time hours, however there are two types of 'inflexible' journeys likely to be most impacted: the six-in-ten (59 per cent) of all commuters (in England) who drive to work, and the four-in-ten (37 per cent) of journeys to school that are made by car.

As Figure 7 shows, there is a marginal preference among middle-income commuters for driving to work, while poorer children are less likely to be driven to school than their wealthier classmates. Reflecting the share of the population, those making these

'inflexible' journeys overwhelmingly live in urban areas, and are therefore more likely to face Congestion Charging.

FIGURE 7: **Drivers across the income distribution will be liable for Congestion Charging when commuting or doing the school run**

Share of individuals that usually drive a car or van to wrion(left panel) and share of school commutes by car or aon (right panel), by household income quintile and household urban-rural settlement classification: England, 2018-19



NOTES: 2019 data used to avoid including pandemic-induced changes in transport habits and sampling issues that occurred during Covid-19. Rural-Urban split is based on classification in the 2011 Census.
SOURCE: Analysis of Department for Transport, National Travel Survey.

The prevalence of car commuting across the income distribution means that households of all means would be impacted by a congestion charge. In fact, any system in which they were not, and so carry on driving at peak hours would fail in its plan to divert demand away from the busiest sections of road at the busiest times. As such, mitigants could and should be utilised to avoid harming the living standards of low- and middle-income households.[46]

While such decisions would ultimately be for the Local Authority or Council, there are more grounds for helping those with commuting costs (especially if employers do not provide the flexibility to travel at off peak times), than for parents driving children to school. Three quarters (73 per cent) of parents live within 2 miles of their children's

46 For example, there have been calls to allocate 'free miles' or even off reduced rates for different drivers. However, such methods would merely serve to boost demand for peak-time travel, thereby actively undermining the notion of congestion charging. That is not to undermine their efficacy: such means may help in the short term, negating shocks as new schemes are brought into effect, but they are not a permanent solution. Instead, and over the longer term, Local Authorities should invest in public and active transport – recycling money raised through congestion charging into local infrastructure and services – such that urban residents, particularly those on lower incomes, are able to get around more efficiently without using a car.

school[47] – rendering walking or cycling a very real option, especially if investment was made to make such active travel modes easier and safer – and the Government's free school travel scheme (already distributed by Local Authorities) could be expanded for those living further away and who cannot affordably attend their place of education using public transport or school buses.[48]

The locally-determined nature of Congestion Charging would allow these trade-offs to be democratically decided, with policy makers taking into account area-specific conditions, such as working patterns and levels of congestion, when deciding how best to respond. This approach would also give voters a say on how revenues could be best invested – be that into bus or train services, improved roads, safe cycling and walking infrastructure, or lower off-peak driving charges.

As fossil-fuelled vehicles still cause congestion, and it would not be desirable or socially acceptable to exempt them from local Congestion Charges, all new non-EVs should therefore also be made ready for GPS-based charging, despite their exemption from a basic Road Duty. At least some older non-EVs should also be made compatible with GPS-based charges (e.g. through the addition of insurance-style black boxes)[49] to facilitate local schemes, but given the burden of doing this, plus the natural rollover of stock, the optimal solution may involve some compromises such as focusing on the compatibility of those vehicles that would actually be affected by local Congestion Charges and/or using high daily charges or exclusions for vehicles that are not tech-ready.[50]

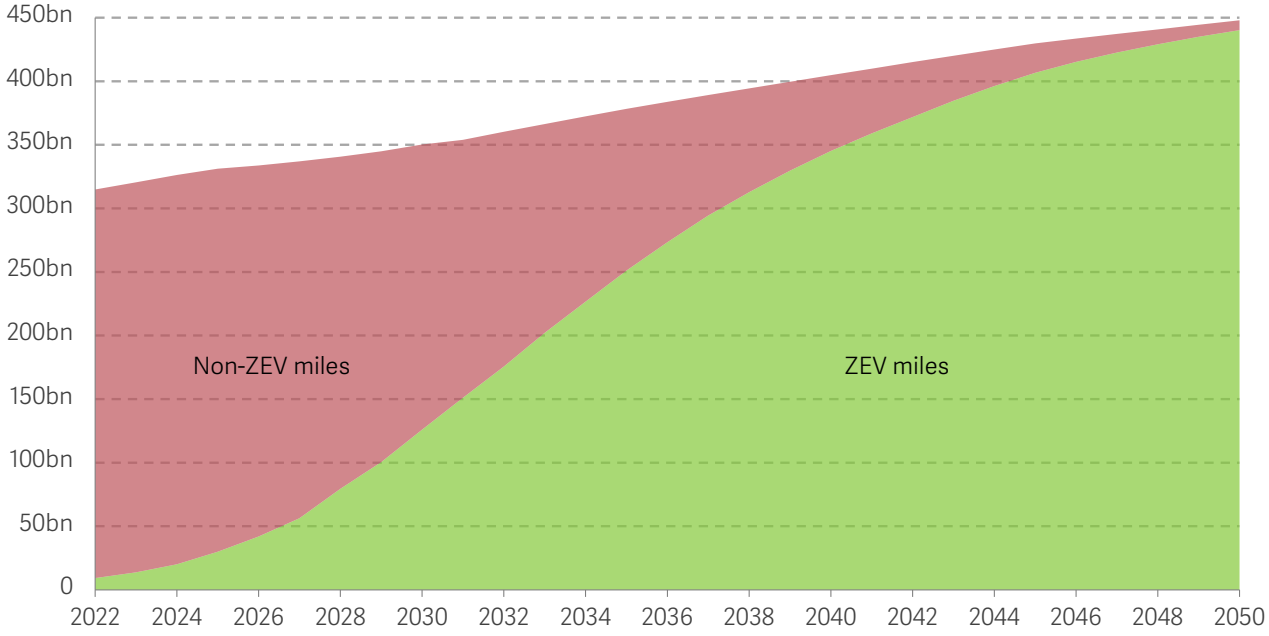
Decisions are urgently needed to make national Road Duty and decent local Congestion Charging a reality within the next decade

And fourth, there is a decision about how quickly to proceed. In this context, it is important to recognise the urgency of the situation. This comes both from the need to support the public finances in the short-term, but also to limit the extent to which EV drivers 'get used' to paying minimal driving taxes. As Figure 8 shows, the proportion of UK driving that is electric – and therefore not affected by Fuel Duty – will rise rapidly over the next decade and beyond, to account for a majority (55 per cent) by 2033. Every year of implementation delay will make the introduction of Road Duty more painful, as well as concentrating motoring taxes among a shrinking – and likely lower-income – proportion of drivers.

47 Parent School Travel Survey, Sustrans, September 2020.
48 Travelling to school by car is also highly undesirable for environmental and safety reasons. Developing lungs are particularly sensitive to air pollution created by idling engines, while the presence of vehicles on the roads around schools increases the likelihood of accidents involving children who have undertaken the journey on foot or by bicycle. For more on available Government support, see: Free school transport, UK Government.
49 Black box insurance, RAC.
50 The Transport Act 2000 already includes the ability for local congestion charges to require "equipment to be carried in or fitted to a motor vehicle while it is on such a road".

FIGURE 8: **By 2033, EVs are expected to account for the majority of miles driven**

Projected total miles driven per year: UK



NOTES: ZEV = zero emission vehicle. Based on the average of upper and lower bounds of DfT Decarbonising Transport scenarios.
SOURCE: Analysis of Department for Transport modelling in Decarbonising Transport: A Better, Greener Britain, 2021.

With an election expected in 2024, a basic suggestion would be that new EVs – and at least some other recently-built EVs – should be paying Road Duty within the next parliament, such as by 2027, when one-in-six miles driven is expected to be electric and the resulting foregone tax revenue will be around £3 billion. The Government should therefore act quickly to begin piloting Road Duty and determine the necessary standards for manufacturers, given that they will need to deliver some new software functionality at least.

Some will argue that introducing a new tax is too difficult and controversial. But as we have set out, such a system appears technically very feasible and – for now at least – there is public openness to the idea that the tax gap between EVs and other vehicles should be narrowed; while inaction would require further tax rises elsewhere or spending cuts.

Reforms to Vehicle Excise Duty should go further to ensure fairness and to influence vehicle purchases

EVs are also currently exempt from Vehicle Excise Duty (VED), the UK's other main transport tax. VED raises £8 billion per year, of which the vast majority (90 per cent) is from annual 'road tax' levies, with the remainder from taxes applied when cars are purchased. VED is levied on new car purchases according to CO2 emissions, with rates

ranging from £0 for zero emission vehicles (such as EVs) to £2,600 for those producing more than 255 grams of CO2 for each kilometre driven.[51] However, VED levied at purchase only accounts for around 10 per cent of total revenue, or approximately £800 million in 2019, with the rest raised through annual taxes. These annual 'road tax' charges used to be also banded by emissions but 2017 reforms designed to simplify the system and avoid penalising lower income households, who are more likely to own older and less efficient vehicles, mean cars registered since then now pay a flat annual tax.[52]

It has been argued that VED should be abolished, with lost revenue recouped through higher road use charges.[53] However, introducing a new Road Duty scheme to replace £32 billion of tax receipts will be a bigger change than one that aims to recoup £24 billion. In addition, Road Duty only taxes cars when they are on the move instead of the 96 per cent of time in which it is occupying public space when parked, and does not apply at-purchase signals (lower tax salience) that can influence consumer choices.[54] VED, therefore, should be retained, however there are two key decisions to be made on its future.

In contrast to ignoring the issue of fading Fuel Duty receipts, the Government has acted to shore up annual receipts by levying annual VED on EVs from 2025. This move will bring in £1.6 billion by 2028, when more than a fifth of the cars on our roads could be electric (as shown earlier in Figure 3), and even more beyond that.[55] While the Government may wish to see this major change as 'job done', there is a question about whether this should go further.

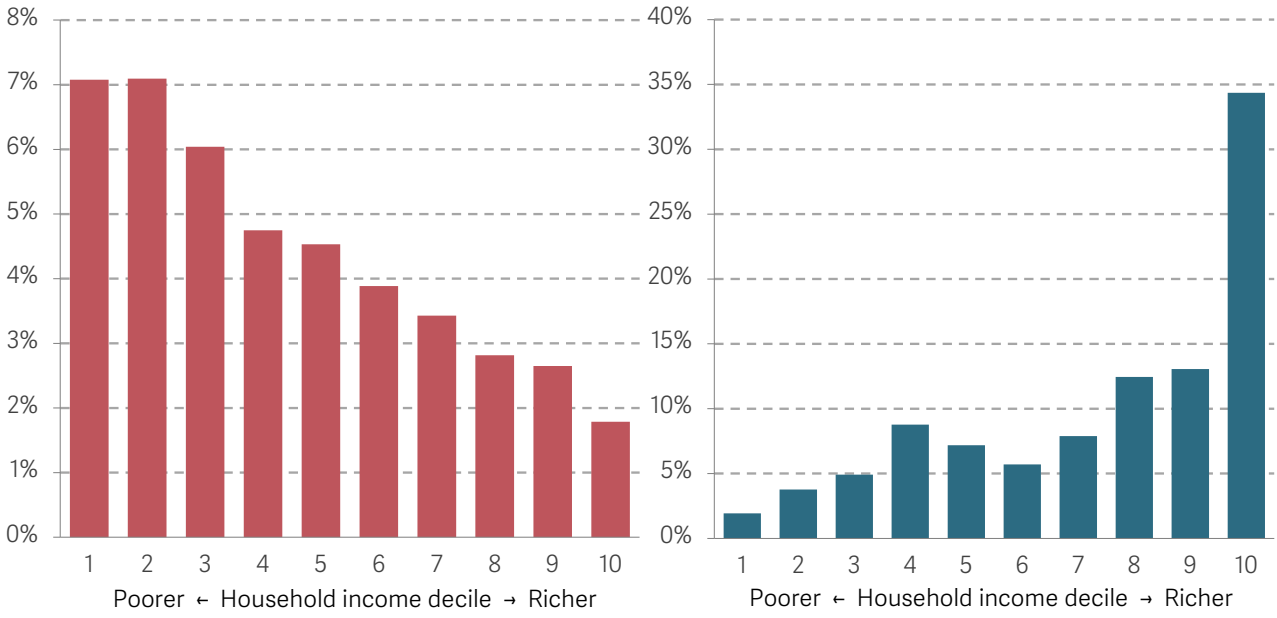
In this context, an important reason for bolder policy in this area is that, without changes, the number of cars taxable at purchase will fall to zero during this decade, thereby pushing more of the burden of VED onto those with older vehicles via annual charges. Absent further policy changes, upfront VED receipts fall away as EVs make up an ever-growing share of new car sales. This would make the system much more regressive: at-purchase VED is overwhelmingly paid by wealthier motorists, who unsurprisingly account for the majority of spending on new cars. In fact, two-thirds (67 per cent) of all spending on new cars and vans comes from households in the top two income quintiles, compared with just one fifth (20 per cent) from the poorest two quintiles – as shown in Figure 9. No further changes to VED would therefore penalise households who cannot afford a new car. Additionally, annual VED payments account for a greater share of overall motoring spending for poorer households: 7 per cent of the cost of keeping a car on the road for

51 Vehicle tax rate tables, Accessed May 2023.
52 Department for Transport data shows that, in 2016, 43 per cent of the poorest fifth of driving households had a vehicle aged 10 years or more, compared with 24 per cent of the richest fifth of driving households.
53 Road Pricing, House of Commons Transport Committee, January 2022.
54 RAC Foundation, Cars parked 23 hours a day, July 2021.
55 For more, see: Consultation on a zero emission vehicle (ZEV) mandate and CO2 emissions regulation for new cars and vans in the UK, UK Government, March 2023.

the bottom two income deciles, compared with just 2 per cent for the richest decile (also shown in Figure 9).

FIGURE 9: **VED accounts for a greater share of motoring spending for poorer households, while richer households spend the most on new cars**

Annual VED as a share of total motoring spending (left hand panel) and decile share of total spending on new cars (right hand panel), by equivalised after housing costs income deciles: UK, 2018



NOTES: Both charts are for car owning households only.
SOURCE: ONS, Living Costs and Food Survey.

The other key argument for going further on VED is that it can be used to incentivise motorists to buy (or not to buy) certain types of vehicles.

Up front taxes are more visible and immediate than those levied over time, with the latter often underestimated by consumers. Up front VED is a 'salient' tax at the point of purchase, especially as it is paid on top of increasingly common hire purchase or leasing schemes, which allow motorists to spread vehicle purchase costs over a number of years.[56] Up-front taxes also create market signals that can encourage manufacturers to develop cleaner options such that their consumers do not face such a levy.

In fact, the current approach of banding at-purchase VED by CO2 has overlapped with improvements in efficiency: as car models are replaced by newer versions they are becoming more efficient.[57] This improvement in efficiency, however, has been undone,

56 For more on VED salience, see: D Cerruti & J Linn, Charging Drivers the Pound: How Does the UK Vehicle Tax System Affect CO2 Emissions?, Environmental and Resource Economics, January 2019.
57 For example, a Vauxhall Corsa sold in 2000 produced around 140 grams of CO2 per kilometre, for a comparable car sold today this value is around 120 grams/km. Source: Vauxhall.

at least tom some extent, by the trend towards larger vehicles, with average emissions from new cars actually increasing in 2017, 2018 and 2019.[58] In 2022, the average weight of new cars sold in the UK was 1,520 kg, up 13 per cent (or 175 kg) from the 2015 average.[59] Not only is the average weight increasing, very large vehicles are becoming increasingly common: cars with a kerb weight of more than 2 tonnes accounted for 14 per cent of all UK sales last year, up from just 3 per cent in 2015.[60] [61]

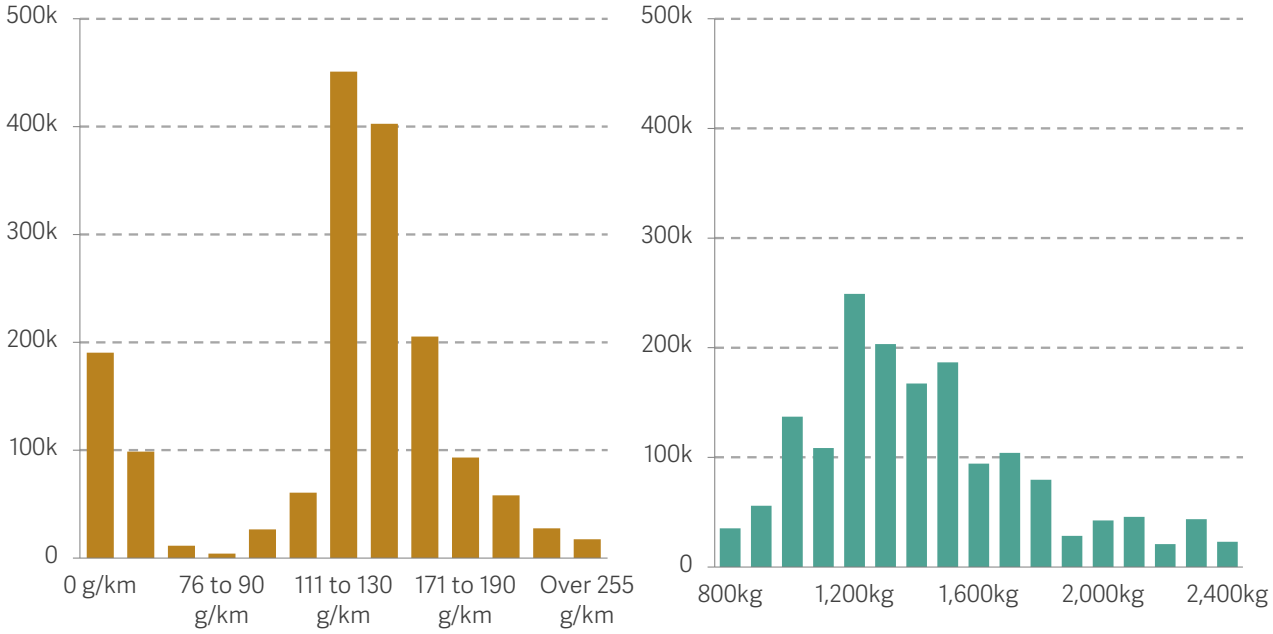
While larger vehicles provide more safety for those behind the wheel, they come with significant externalities: they consume more energy, with EV energy demand increasing by around 40 per cent as vehicle weight doubles,[62] require more space when driving and parked, cause more damage to road infrastructure and car parks,[63] produce more particulate pollutkg)[64], and are much more dangerous to others.[65]

With sales regulations soon to take over as the key mechanism for driving EV uptake, VED should therefore be reformed in a way that encourages drivers to buy smaller cars. There is also further rationale behind increasing the differential between low and high duty vehicles, as the current £0-£2,600 spread is clearly failing to discourage the purchase of larger (higher emission) vehicles, with Figure 10 showing how the 1.6 million cars sold in 2021 are more heavily concentrated around middling levels of emissions, while the distribution by weight is notably broader.

58 Letter – Vehicle Excise Duty consultation, Climate Change Committee, August 2020.
59 Analysis of SMMT car vehicle registration data.
60 Analysis of SMMT car vehicle registration data.
61 In the UK, there is also a clear trend of larger vehicles being registered in more affluent parts of the country. Between 2018 and 2020 the three districts in which large SUVs accounted for the greatest share of new car registrations were Kensington and Chelsea (36 per cent of all new cars), Hammersmith and Fulham (30 per cent), and Westminster (29 per cent): all areas with household incomes well above the national average. D Boyle et al., Mindgames on wheels, Badvertising, April 2021.
62 Which is of particular importance as the UK looks to build a decarbonised electricity system capable of underpinning existing demand as well as that from transport and home heating
63 C Hope & J Simpson, Sheer weight of electric vehicles could sink our bridges, Daily Telegraph, May 2023 and M Pope, Ageing multi-storey car parks 'could collapse' under the weight of heavier electric vehicles, experts warn, This is Money, April 2023.
64 Emissions of particulate matter from tyres, the road, and braking in a 2,000kg EV can be double that of a car that weighs 1,200kg. V Timmers & P Achten, Non-exhaust PM emissions from electric vehicles, Atmospheric Environment, March 2016.
65 A US study found that being hit by a vehicle 1,000lbs (454 kg) heavier generated a 40-50 per cent increase in fatality risk, and that 1,000 annual pedestrian deaths could have been avoided had the trend towards higher vehicles over the past 20 years not occurred. For more, see: M Anderson and M Auffhammer: Pounds That Kill: The External Cost of Vehicle Weight, Review of Economic Studies, April 2014.

FIGURE 10: **New car registrations are more dispersed by weight than they are by emissions band**

Cars registered for the first time by VED CO_2 emissions band (left panel) and by weight (right panel): UK, 2021



SOURCE: Analysis of DfT and SMMT car vehicle registration data.

Table 3 shows two options for how such a charge could apply in a way that raises £1 billion in receipts, a figure comparable to at purchase VED receipts before the pandemic impacted new car sales. These involve a per-kg charge levied on cars above a certain weight: to either cars just above the average weight of new cars sold in 2022, or solely to heavier vehicles, thereby mirroring a policy mooted in France.[66]

TABLE 3: **Impacts of two possible weight-based VED systems**

	Lower weight limit for non-EVs	Lower weight limit for EVs	Number of non-EVs impacted	Number of EVs impacted	£/kg
Average weight	1,600 kg	1,900 kg	320,000	150,000	£7.38
High weight only	1,800 kg	2,000 kg	177,000	125,000	£13.80

NOTES: Data relates to 2022 sales figures. In both instances, taxes for EVs begin at a higher weight, to account for the mass of battery packs, but there is no reason that these higher EV weights should not be reduced over time as technology develops.
SOURCE: Analysis of SMMT car vehicle registration data.

66 A comparable car weight tax has been suggested in France, whereby vehicles weighting more than 1,800 kg would be taxes at a rate of €10 for each additional kilogram. T Shale-Hester, SUVs targeted by new weight tax in France, Auto Express, October 2020.

Both of the above options would both futureproof annual VED receipts and ensure that the tax burden was not shifted away from households who purchase new cars, and especially heavier cars, since those below the weight limit would incur no levy.[67] The key design consideration, therefore, would be how many new cars policymakers want to expose to VED: including more cars through a lower weight limit means a wider tax base but lower incentives (therefore risking not impacting consumer choices), however a higher weight limit brings with it a risk that the tax base is eroded should incentives work too well, but delivers higher charges for the heaviest cars.

Finally, the 2022 Autumn Statement also saw the VED Expensive Car Supplement (an additional £390 charge for cars with a list price of over £40,000, levied for five years after purchase) extended to EVs.[68] The higher list prices of EVs mean they are likely to be more targeted by this tax than non-EVs, with estimates that 30-40 per cent of EV sales will be liable compared with around 20 per cent of non-EV sales.[69] This potential hindrance to EV take up, as well as the Expensive Car Supplement being ignorant of vehicle emissions, efficiency, and size, mean that policy makers may look to disband it, recouping receipts through slightly higher per-kg VED charges instead.

VAT on public EV charging should be cut so that lower-income drivers do not face a 'pavement tax'

While most of the per-mile savings enjoyed by EV drivers result from the savings on Fuel Duty, cheaper fuel costs also make driving cheaper. Unlike for petrol and diesel, where historically all motorists had access to fuel at largely the same price, electricity is not equally cheaper for EV drivers who can charge at home and for those who have no choice but to use the public charging network.[70] Current prices see the cost of a kilowatt of energy from public chargers 59 per cent higher than that from an at home charger, the majority of which the Government has little influence on.[71] However, a third of this difference stems from policy that imparts a higher rate of VAT (20 per cent on public chargers compared to 5 per cent at home), resulting in a typical driver paying an extra £66 per year today.

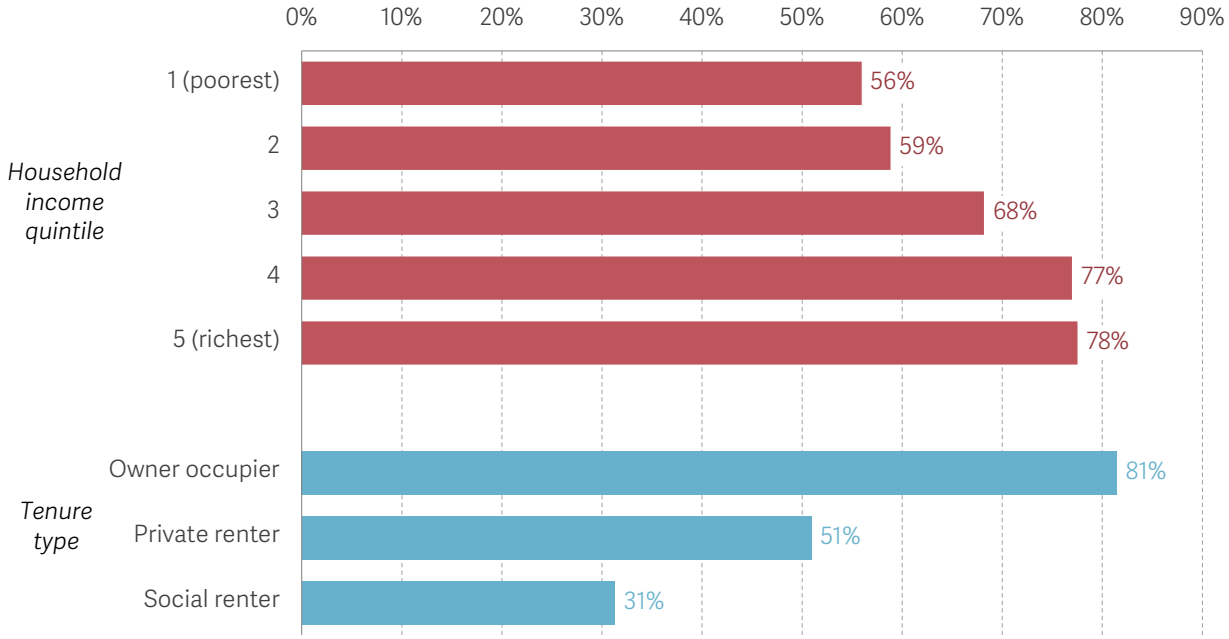
This immediately hits drivers who have no ability to charge their cars at home: predominantly poorer households (44 per cent of the lowest income quintile do not have off street parking, compared with 22 per cent of the richest), and those who live in rented

67 Were the lower limit set at 1,600kg (1,900 for EVs), 29 per cent of new cars would be liable for upfront VED, compared with 19 per cent were the limit set at 1,800kg (2,000kg for EVs). Analysis of SMMT car vehicle registration data.
68 F Masala and A Seely, Autumn Statement 2022: Vehicle Excise Duty, House of Commons Library, November 2022.
69 EVs and Road Tax: Analysis of the Autumn Statement 2022 for EV figure. Share of overall car stock provided by HM Treasury.
70 Albeit with notable exceptions for motorway service stations, although all drivers are able to use these should they wish.
71 In principal, prices across the public charging network could be regulated, however in light of the need to rapidly expand charging provision (and the reliance on the private sector to do so), such an intervention would likely be counterintuitive.

accommodation (49 per cent of private renters would have no choice but to charge on-street, compared with 19 per cent of owner occupiers), as Figure 11 shows.[72]

FIGURE 11: **Higher-income households and those who own their own homes are much more likely to be able to charge EVs at home**

Access to off-street parking at home, by household income quintile and tenure: England, 2019



NOTES: Off-street parking refers to properties with a garage or 'other off-street parking'.
SOURCE: Analysis of English Housing Survey.

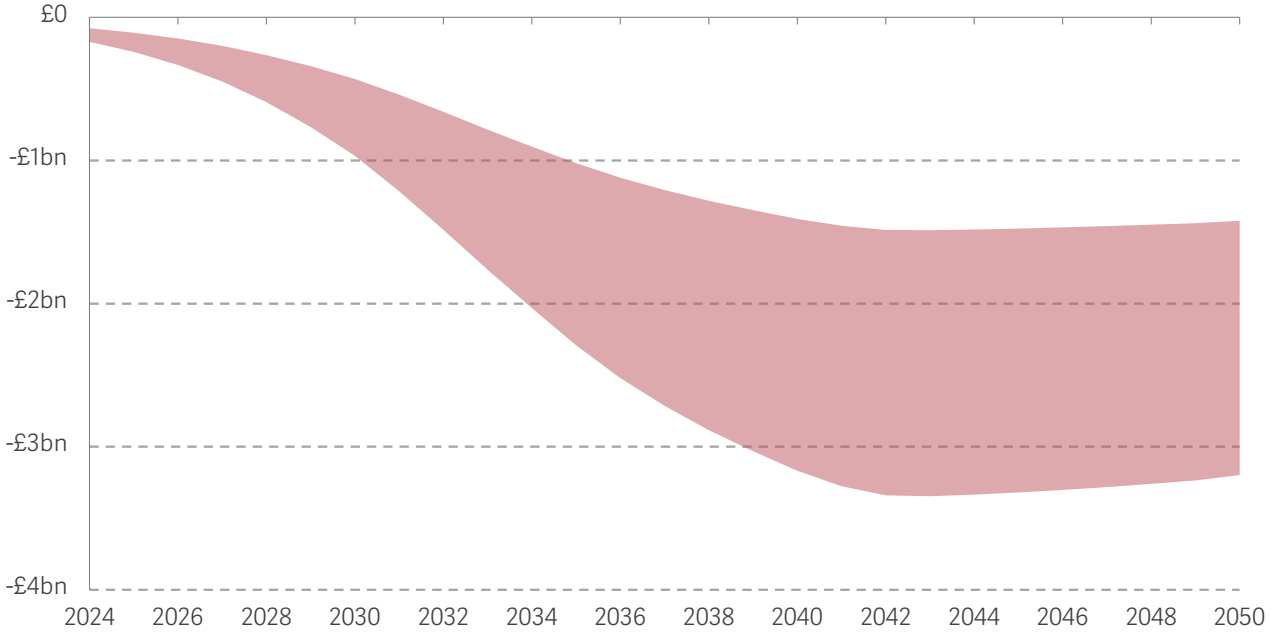
Current technologies mean it is impossible to charge different unit rates on residential electricity depending on how it is used (and even if these were to be enacted, EV drivers could easily bypass higher cost energy by 'trickle charging' from a household plug socket), and increasing the rate of VAT on residential electricity to 20 per cent would represent another unwelcome increase in household energy bills, as well as running contrary to tax and levy reforms that are needed to encourage families to replace their gas boilers with cleaner heat sources, such as electric heat pumps.[73] Therefore, VAT equality should be reached by cutting the rate on public chargers to 5 per cent. The relatively small number of electric vehicles on the road today mean that the cost of this policy would start small, before rapidly increasing to top £1 billion per year in the early to mid-2030s and levelling out between £1.5 and £3 billion by 2040 (see Figure 12).

72 For more, see: A Corlett and J Marshall, Shrinking Footprints, Resolution Foundation, March 2022 and J Marshall and A Valero, The Carbon Crunch, Resolution Foundation, September 2021.

73 The UK Government is actively looking to reduce the burden of taxes and levies on household electricity costs, reaffirming plans to 'rebalance the costs of electricity and gas' in its 2023 Powering Up Britain plan. Increasing the price of electricity through a higher VAT rate, therefore, would run contrary to this aim, reducing consumer appetite for electrification of home heating, as well as levying an even higher tax rate on electricity than gas, despite electricity being a less carbon intensive fuel.

FIGURE 12: **The cost of cutting VAT on public chargers will start small before rapidly accelerating as EVs become more common**

Forecast range of annual loss in tax receipts from reducing VAT on non-residential EV charging to 5 per cent



NOTES: Calculations based on an illustrative range of average future pre-tax public charger electricity costs of 20p-45p/kWh. Based on National Grid's 'Consumer Transformation' scenario.
SOURCE: Analysis of National Grid Future Energy Scenarios, Department for Energy, ZapMap charging price index and Net Zero Domestic energy price indices.

While this would effectively represent a tax cut for EV drivers (all of whom will likely charge outside the home at some point), policy makers have a number of options to recoup forfeited revenue, with the most progressive means likely via higher rates on upfront VED.

Conclusion

With the transition away from fossil fuelled cars well underway, reforming the way motoring has taxed has never been more urgent. Allowing a significant source of government revenues to dwindle would have severe consequences in terms of restricting spending in other areas, or lead to politically-challenging increases in other taxes. A failure to replace it would leave driving undertaxed and hindering economic growth by reducing the ability of the state to invest, as well as further clogging up the nation's roads. Therefore, a replacement package to manage this transition fairly – while ensuring the transition to EVs does not slow – is an immediate priority.

Policy makers face a number of key decisions when facing up to this not-insignificant task. The suite of policies outlined in this note – mirroring Fuel Duty with an electric per-mile charge; curbing congestion through locally applied schemes in areas where traffic

delays are highest; furthering already-underway reforms to VED such that at-purchase taxes are instead levied according to weight instead of CO_2 emissions; and equalising VAT on public and private charging – would, in our view, future-proofing the UK's motoring tax regime while ensuring that low-to-middle income households do not see a reduction in living standards by picking up a disproportionate share of the bill.

Reports published as part of The Economy 2030 Inquiry to date

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The Inquiry is a collaboration between the Resolution Foundation and the Centre for Economic Performance at the London School of Economics. It is funded by the Nuffield Foundation.

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