National Audit Office

Reducing carbon emissions from cars

Department for Transport, Department for Business, Energy & Industrial Strategy

REPORT

by the Comptroller and Auditor General

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Department for Transport, Department for Business, Energy & Industrial Strategy

Report by the Comptroller and Auditor General

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Comptroller and Auditor General
National Audit Office

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Key facts

2030

date by which sales of new petrol and diesel cars in the UK will end

£1.1bn

amount spent on subsidies for ultra-low emission cars and infrastructure between 2010-11 and 2019-20 to encourage people to use alternatives to petrol and diesel

8%

proportion of new cars sold in the first nine months of 2020 that were ultra-low emission

67.9 million	tonnes of CO_2 equivalent emitted by cars in 2018, accounting for 19% of all of the UK's emissions
32.9 million	number of cars registered in the UK as at September 2020
348,506	number of ultra-low emission cars registered in the UK as at September 2020; 154,691 of these were fully electric
0.5%	proportion of the UK car fleet that is fully electric as at September 2020
142,604	number of electric vehicle charge-points installed with the help of government funding by March 2020 (133,336 are home charge-points)

Summary

Background

1 Transport is the UK's largest source of carbon emissions, with the bulk of these emissions coming from cars. In 2018, building on previous strategies, the Department for Transport (DfT) published an updated strategy, *The Road to Zero*, which set out the government's ambitions for cleaner road transport. The strategy aims to reduce carbon emissions from cars by promoting the use of ultra-low or zero-emission cars and creating the infrastructure that will allow people to charge or fuel their zero-emission cars.[1] The strategy sits within government's wider commitment for the UK achieving "net zero" greenhouse gas emissions by 2050.

2 The Department for Business, Energy & Industrial Strategy (BEIS) has overall responsibility across government for achieving net zero and DfT leads on the strategy to reduce carbon emissions from cars and make roads less congested and polluted by promoting lower-carbon-emitting transport. The Office for Zero Emission Vehicles (OZEV) is a team working across government to support the transition to zero-emission vehicles.[2] OZEV ultimately reports to the Secretary of State for Transport.

3 The government is trying to increase the sale of ultra-low emission vehicles (ULEV) as a way of reducing carbon emissions. These vehicles are partly or fully powered by battery, or less commonly, powered by hydrogen. In November 2020, government announced its ambition to stop the sale of new cars that are powered solely by petrol or diesel by 2030. From 2035, only zero-emission cars can be sold. Government would like almost all cars on the road to emit zero carbon by 2050. As of September 2020, there were 32.9 million cars registered in the UK, of which 1.1% were ultra-low emission (0.5% were fully electric).

4 The aim to reduce carbon emissions from cars is not new and previous governments have been promoting ultra-low emission cars since 2011. To succeed they need consumers to be convinced these cars are a credible alternative to petrol and diesel particularly in terms of price and ease of charging. This requires the motor industry to supply cars people want to buy, at a price people want to pay, with a good range of models that meet different market needs and with adequate delivery timescales. There also needs to be adequate access to charge-points. This transition therefore requires many factors to come together to provide consumers with the confidence and ability to buy ultra-low emission cars.

1 Ultra-low emission vehicle (ULEV) is the term used to describe any vehicle that uses low-carbon technologies and emits less than 75g of CO_2 per kilometre travelled in fumes from the tail-pipe. Zero-emission, a subsection of ULEVs, refers to 100% battery powered or powered by hydrogen.
2 Previously known as Office for Low Emission Vehicles (OLEV).

5 The government has identified factors that might hinder the development of the market, including uncertainty that might hold back investment by manufacturers or charge-point providers and a lack of economies of scale associated with low initial sales volumes leading to higher prices for consumers. Government financial support has come, for example, in the form of grants to help consumers with the higher purchase cost of buying electric cars, and subsidies to fund the installation of charge-points. Its initiatives have focused on battery electric cars rather than hydrogen as this has been the most market-ready zero-emission technology.

6 OZEV manages the grant schemes and subsidies. By March 2020 it had spent £1.1 billion, including:

- £1 billion on the plug-in car grant, the largest amount spent by OZEV, aimed at reducing the upfront purchase costs of qualifying cars – encouraging higher volumes to be sold, which in turn would create economies of scale and lead to lower prices from manufacturers. The grant is currently £3,000 for qualifying cars and is paid to the car manufacturer;
- £97.2 million on grants to help people install charge-points at home. This grant is paid to the installer and covers 75% of the cost (capped at £350);
- £5.8 million to help local authorities install on-street residential charge-points;
- £3.7 million to help install charge-points at workplaces, capped at £350 per socket; and
- £9.5 million on a consumer awareness campaign.

Highways England has distributed £4.8 million to ensure that 95% of the strategic road network was within 20 miles of a charge-point. HM Treasury has also announced a Charging Infrastructure Investment Fund, a £400 million fund, of which government will invest up to £200 million. A portion of the first £70 million, of which £35 million was government-funded, was invested in September 2019. In addition to direct financial support, the government provides reduced Vehicle Excise Duty and Company Car Tax (an element of income tax for individuals who receive a company car) for lower-carbon-emitting cars.

7 The government's recent announcement to stop the sale of new petrol and diesel cars by 2030 will require a rapid growth in the number of zero-emission cars over the next decade. This report examines how well the government has used public money to support the uptake of ultra-low emission cars and draw lessons for the future. It examines:

- progress in increasing the take-up of ultra-low emission cars through the plug-in car grant;
- the development of charging infrastructure using government financial support; and
- the impact of increasing the sale of ultra-low emission cars on carbon emissions from the UK car fleet so far.

8 The report does not examine other factors that will have an important influence over market expansion, including the action taken by the industry to develop a range of cars with the capabilities consumers want to buy, the impact of regulation on incentivising market behaviours and the role of the power supply market. We focus primarily on the impact on carbon emissions given government's focus on reducing carbon emissions from the tail-pipe, rather than the carbon used in production.

Key findings

Progress encouraging the take-up of ultra-low emission cars

9 By the end of September 2020, sales of new ultra-low emission cars were above projections made by OZEV in 2013. In 2013, OZEV projected that between 3% and 7% of all new car sales would be ultra-low emission by 2020. These figures were projections of the potential market and were not intended to be government targets. By the end of September 2020, sales of new ultra-low emission cars in 2020 had accounted for 8% of the market, although this was in a market distorted by the impact of the COVID-19 pandemic with overall new car sales down by 33%. The number of first-time registered ultra-low emission cars rose from over 48,000 between January and September 2019 to over 106,000 between January and September 2020. By the end of September 2020 there were 348,506 ultra-low emission cars licensed in the UK. Approximately half of the ultra-low emission cars are registered to companies and where users have company cars, they benefit from Company Car Tax reductions (paragraphs 1.12, 2.2 to 2.4, and Figure 7b).

10 While OZEV has assessed the likely impact on the market of changes to the plug-in car grant, it cannot clearly demonstrate the cumulative impact spending £1 billion has had on growth of ultra-low emission cars. When it introduced the plug-in car grant in 2011, OZEV was not clear what yearly increase it was expecting on sales, above and beyond what might have happened anyway, due to uncertainties in the market. OZEV and DfT undertake regular analysis on the importance of the plug-in car grant to consumers and the potential impact of making changes to the grant. They have not, however, demonstrated the additional impact the grant has achieved over its lifetime (paragraphs 1.11, 2.6 and 2.8, and Figure 6).

11 Government-commissioned consumer surveys have identified an increased willingness to purchase ultra-low emission cars but continue to highlight the upfront purchase costs as a barrier. By stimulating the volume of sales, OZEV's intention had been to encourage economies of scale, thereby reducing manufacturing costs and purchase prices. Even with the plug-in car grant, zero-emission cars remain an average of £13,000 more expensive to purchase than conventional cars. The initial costs of zero-emission cars did not reduce in relative terms to petrol- and diesel-powered cars between 2011 and 2020. The main reason for this is that manufacturers have focused on extending the battery range – the costliest element of an electric car. OZEV recently estimated that in some cases the lifetime cost of owning a zero-emission car had dropped below the petrol and diesel equivalents (paragraphs 2.5, 2.6 and 2.11).

Supporting the development of the charging infrastructure

12 There has been a considerable growth in public charging infrastructure over the past decade. Working with the private sector and local government, the government has supported the development of the charging infrastructure since 2011. OZEV did not quantify what it intended to achieve with the public money spent on the overall charging infrastructure. This makes it difficult to determine whether the value derived from the investment of public money has been in line with its initial expectations. By the end of March 2020, government funding had contributed towards the installation of 133,336 home charging points; 8,578 workplace charging points; and 690 on-street charging points. By October 2020, including infrastructure funded by the private sector, there was a total of 19,487 publicly accessible charge-points in the UK, an increase from fewer than 1,000 in 2011 (paragraphs 1.10, 2.14 and 2.15, and Figure 11).

13 OZEV has not yet focused sufficiently on charge-point availability to ensure adequate provision where people do not have a driveway. OZEV informed us that its early efforts focused on supporting people with off-street parking or with an ability to charge at work, as it deemed them to be more likely to buy electric cars. By March 2020 OZEV had spent £97.2 million on the home-charging grant to support the installation of more than 133,000 off-street chargers. Electric car owners without home chargers need to charge their cars on the street near their home, at work or in public spaces. This can be a particular issue for the 33% of households without access to off-street parking. Between 2017-18 and 2019-20, OZEV has allocated a total of £8.5 million to help local authorities support installation of on-street residential charge points. The uptake of the latter has been slow with underspending in each of the three years (32% of the budget unused). OZEV undertook targeted consultation with local authorities prior to setting up the scheme. Local authorities however informed us that the scheme had been designed without sufficient consultation, and that as a result it was difficult to bid for. OZEV has told us it will be publishing its plans for improving charging infrastructure in 2021. This will include consideration of different options to allow people without a driveway to charge their cars, for example ultra-rapid chargers in local areas or installing charge-points at the roadside (paragraphs 1.11, 2.15, and 2.17 to 2.22).

14 Government recently set DfT and OZEV targets for developing rapid charge-points across England's main routes. In May 2020, OZEV announced that a driver is never more than 25 miles away from a rapid charge-point on England's strategic road network. However, the government has recently set a new target for there to be at least six ultra-rapid chargers (quicker than the previous rapid charge-points) at each service area, with 10 to 12 in larger sites, by 2023. They expect this will lead to a rise to a total of 2,500 across the network by 2030, compared with just over 800 in January 2020 (an average of two per service area). The development of this network will be supported, in part, through the government's £950 million Rapid Charging Fund (paragraph 2.24).

Progress in reducing carbon emissions

15 Since 2011 there has been a reduction of around 1% in carbon emissions from passenger cars but this is a smaller reduction than DfT expected. In its 2013 strategy, OZEV had expected carbon emissions from cars would fall by 10 million tonnes between 2010 and 2020. DfT has tracked the average carbon emissions from all new car registrations, regardless of emissions category. The average emissions from new cars in Great Britain fell year on year between 2011 and 2016 – a total of 13% over this time. Since 2016, average emissions for new cars began to rise year on year – a total increase of 6% between 2016 and 2019. As ultra-low emission cars only represent a small proportion of the cars on the road (1.1%), the recent increase has been ascribed to several factors, which have cancelled out the reductions from ultra-low emission cars. These include: a rise in the sale of sports utility vehicles (SUVs); increased road traffic and travel by car; and revised methods for estimating carbon emissions given differences between emissions measured in laboratory conditions and those measured on the road (paragraphs 3.2 to 3.6, and Figures 13 and 14).

16 The government has committed to publishing a plan setting out how the UK will meet its target of cars emitting virtually zero carbon by 2050. Previous published plans have not regularly set out interim milestones for growth in the market and carbon impact. In November 2020, the government committed to publishing a delivery plan in 2021 for achieving the phase out of new petrol and diesel cars from 2030 and to consult on a regulatory framework for delivering the associated carbon outcomes. At the end of September 2020, there were 32.9 million cars registered in the UK, of which 1.1% were ultra-low emission. Changing the composition of the UK car fleet will take time, with the average life span of a car currently around 14.5 years. Although sales of ultra-low emission cars have increased since 2011, substantial growth is required to ensure ultra-low emission cars increase from current levels to 100% of the new car market from 2030. This will require significant changes in the automotive manufacturing sector, increases in the availability of public charge-points and consumer confidence (paragraphs 1.6, 2.3 and 3.6 to 3.8, and Figures 7 and 14).

17 Government still needs to manage some risks and challenges to meet the ambition of zero emissions from cars. In December 2020, we published a report on how government is organising itself to deliver net zero by 2050. Many of the issues we identified are relevant to managing the transition to zero-emission cars:

- *Cross-government action*: We found a well-integrated working relationship between OZEV, BEIS and DfT. They had common goals, shared data and had coordinated key policies. However, we identified a less effective relationship between the departments, OZEV and local government, with a lack of shared understanding of national and local strategies.
- *Managing interdependencies and wider stakeholder engagement:* The shift to zero-emission cars requires substantial contributions: from the private sector, in terms of car manufacture, research and investment; and from consumers, in terms of behavioural change. The shift also relates to other policy areas, such as clean air and the impact on the electricity grid.
- *Mitigating uncertainty*: Trade bodies and other stakeholders have said that the government's clearly stated goals to fully decarbonise cars by 2050 have helped to galvanise the automotive industry. However, they have also said that the lack of long-term certainty over the government's underlying plans, including its financial support, have at times hindered investment planning.
- *Resourcing and capacity:* A recent report by the Government Internal Audit Agency (GIAA) found that OZEV's capacity has been under pressure as the programme has grown. They also stated improvements were needed in OZEV's framework of governance, risk management and control to reflect the growth in the size and complexity of the programme (paragraphs 3.7 and 3.9).

Conclusion on value for money

18 Over the past 10 years government has spent more than £1 billion to incentivise the take-up of ultra-low emission cars. While there has been an increase in the number of ultra-low emission cars and the required charging infrastructure, carbon emissions from cars have not reduced in line with government's initial expectations. The lack of an integrated plan with specific milestones for carbon reductions from cars has resulted in a lack of clarity over what value the public money should be delivering. As a result, the departments have not been able to demonstrate value for money from the amounts expended.

19 The government has set an ambitious target to phase out the sale of petrol and diesel cars by 2030. The departments need to develop their detailed plans to achieve this goal and now is an important opportunity to learn from previous efforts. This will be a complex transition as moving away from traditional fuel involves significant changes for consumers, fuel suppliers and car-makers. The departments responsible for this transition will require the appropriate skills and capacity to monitor and support all the necessary changes. To achieve this, and deliver value for money, the departments need a much clearer plan for how they will deliver this societal change, focusing on delivering carbon reductions, not solely increased car sales; and a more targeted approach to addressing potential barriers to take-up across the country.

Recommendations

20 We make the following recommendations:

a **DfT and BEIS, working with OZEV, should set out clearly the carbon milestones they intend to meet on the way to delivering the 2050 target in their plan for the UK car fleet.** The projected carbon reductions should link clearly with their ambition to phase out the sale of new petrol and diesel cars by 2030 and the expected transition in the composition of the UK car fleet beyond that date. They should report progress against these milestones at regular intervals and take action should progress begin to lag against the plans.

b **Before publishing any plans for the coming decade, OZEV should use what it has learned from the interventions to date and examine what has worked well.** It should examine the scope for taking a more targeted approach, using data on car sales and charging points, to use public money effectively to address remaining barriers to take-up.

c **DfT and BEIS, working with OZEV, should set out clearly the added value they expect to deliver from the public money committed to supporting the transition in the car market and how they propose to monitor whether that value is delivered.**

d **DfT and BEIS, working with OZEV, should ensure the plan for transition explicitly recognises the interdependencies that need to be managed.** This includes the investment behaviours of the automotive sector and charging infrastructure companies; the link between take-up and the availability of appropriate supporting infrastructure; the tie-up between the strategies pursued by central and local government; and the potential longer-term impact on our electricity system including generation and network capacity.

e **DfT and BEIS should review whether OZEV has the capacity, skills and remit to enable it to effectively oversee the fast-paced transition implied by the 2030 target.** Any oversight structure that is put in place needs to be able to work effectively across central government departments, local government, industry and the wider public. It will need appropriate commercial skills in place to stay in touch with a rapidly changing market and be able to assess the impact of public support in delivering the government's aims.

Part One

Background

UK carbon emissions and net zero

1.1 The UK is committed to achieving net zero carbon emissions by 2050. In June 2019, Parliament amended the Climate Change Act 2008 to make this commitment legally binding. The act's original target was to reduce carbon emissions by 80% compared with 1990 levels.

1.2 Transport is the largest carbon-emitting source in the UK. In 2019, it accounted for more than one-third of UK carbon emissions – 120 million tonnes out of a total 352 million tonnes, according to provisional figures. Cars produced the bulk of transport's carbon emissions – 55%, or 67.9 million tonnes of CO_2, in 2018. Cars alone contributed 19% of all UK carbon emissions in 2018.

1.3 The government has an ambition for people to move away from cars to other forms of transport, but its forecasts assume that private passenger car journeys will continue to increase to 2050. Government policy is reliant upon people switching from petrol and diesel cars, to cars with ultimately no emissions. Its policies to date have focused on encouraging the uptake of hybrid and battery-powered electric cars as these are the most market-ready technologies (**Figure 1** overleaf). Hydrogen-powered cars are available to buy in the UK but there are at present fewer models and a limited number of hydrogen filling stations (currently 12 locations in the UK).

Figure 1

Ultra-low emission car technologies currently available in the UK

There are numerous types of ultra-low emission cars

Ultra-low emission vehicles (ULEVs)

ULEVs are currently defined as vehicles which emit less than 75g of CO_2 per kilometre travelled. The statistical definition will be made more stringent in 2021 and ULEVs will then need to emit 50g of CO_2 per kilometre travelled or less. Any vehicles which meet the criteria qualify as ULEVs, so the definition could include conventional petrol or diesel cars. However, the most popular ULEVs to date have been hybrid cars:

- **Hybrid electric vehicles**: use a conventional internal combustion engine that charges a small battery while driving, allowing them to travel short distances on the battery alone.
- **Plug-in hybrid electric vehicles**: use a conventional internal combustion engine, but also have a battery that needs to be plugged in to charge. Typically, these have a longer zero-emission range than a standard hybrid.

Zero-emission vehicles (ZEVs) (a subsection of ULEVs)

ZEVs are vehicles that produce no tail-pipe emissions. Government's plans to eliminate carbon emissions from cars rely on ZEVs completely replacing the current UK fleet. Presently there are two types of ZEVs:

- **Battery electric vehicles**: have a plug-in battery as the sole source of power. The trend has been for larger batteries to be fitted, extending the range of battery electric vehicles between charges.
- **Hydrogen fuel cell vehicles**: use hydrogen to power a fuel cell that generates electricity to run an electric motor. These vehicles need to be refuelled with hydrogen at a filling station in much the same way as a conventional car.

Types of electric vehicle chargers

	Power consumption	A full charge typically takes:
Slow	2.3kW–6kW	6–12 hours
Fast	7kW–22kW	7kW 4–6 hours; 22kW 1–2 hours
Rapid	43kW–53kW	Around 20 minutes–1 hour
Ultra-rapid	100kW–350kW	20–40 minutes

Source: National Audit Office analysis of public data

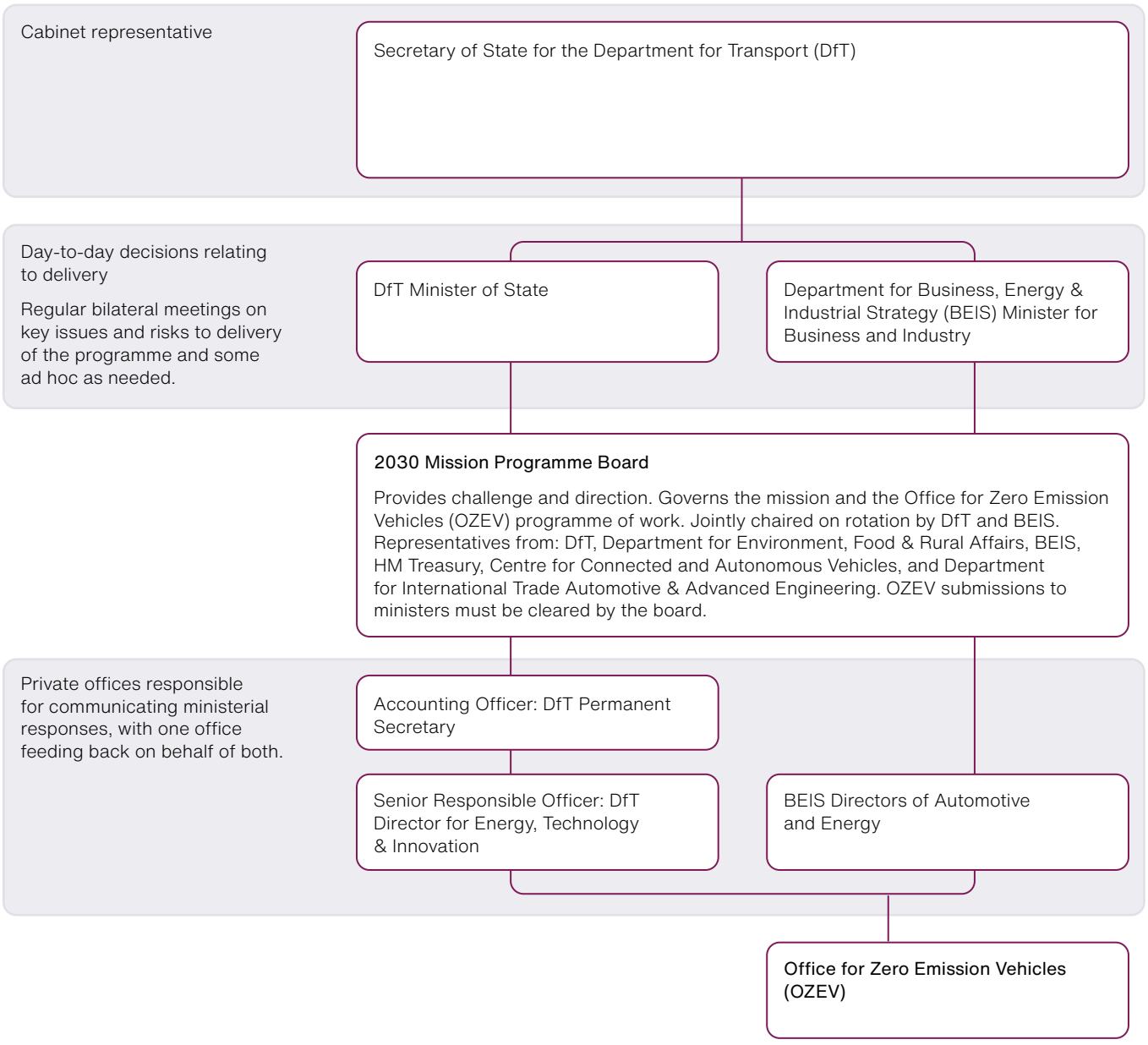
Responsibility for overseeing the transition to zero-emission cars

1.4 The Department for Business, Energy & Industrial Strategy (BEIS) has overall responsibility in government for achieving net zero and the Department for Transport (DfT) leads on the strategy to reduce carbon emissions from cars and make roads less congested and polluted by promoting lower-carbon-emitting transport. In 2009, these departments created a team, called the Office for Low Emission Vehicles (OLEV), recently renamed the Office for Zero Emission Vehicles (OZEV), to coordinate policy delivery for the transition to low and zero-emission vehicles (**Figure 2**). OZEV receives funding from both departments for staff. The majority of funding for vehicle grants and charge-points is from DfT. OZEV ultimately reports to the Secretary of State for Transport.

Figure 2

Departments and boards involved in the oversight of the Office for Zero Emission Vehicles

The Office for Zero Emission Vehicles is a joint team reporting to both the Department for Transport and the Department for Business, Energy & Industrial Strategy



Source: National Audit Office analysis of Office for Zero Emission Vehicles data

1.5 In addition, several other government departments have a role to play: HM Treasury and HM Revenue & Customs set and administer tax policy respectively, which can act as a lever to encourage consumers to make lower-emission choices; the Ministry of Housing, Communities & Local Government (MHCLG) has policy responsibility for building regulations and planning – MHCLG is working with OZEV on its consultation to change building regulations to include requirements for charge-points in new and renovated buildings; and Ofgem and National Grid ensure the electricity suppliers and networks are prepared for the transition to electric cars. Local authorities are responsible for meeting local air quality targets and local environmental strategies, which can include provision of charging infrastructure.

Rationale for government intervention

1.6 Government has had strategies in place for promoting low-emission cars since 2011 (**Figure 3**). In its first strategy, the government committed to help grow the plug-in car market. In an updated strategy in 2013, the government started to set out its expectations for ultra-low emission cars. It stated that all new cars should be ultra-low emission from 2040, and the car fleet effectively decarbonised by 2050. In a further strategy, published in 2018, it set a revised expectation that all new cars would be zero-emission by 2040. In November 2020, it revised the expectation again, announcing that the sale of new petrol and diesel cars will end by 2030, and that all new cars will need to be zero-emission from 2035. Other countries are also trying to increase the number of ultra-low emission and electric cars, with some countries, such as Norway, making good progress over the past 10 years (see Appendix 3).

1.7 A number of government departments have published strategies on issues that complement the expansion of ultra-low emission cars, for example on clean air (**Figure 4** on page 18).

1.8 Whether the market for ultra-low emission cars expands sufficiently quickly depends on a number of factors: changing the purchasing behaviours of consumers; manufacturers bringing cars to the market that meet the needs of different users and at a price that people will want to pay; and having enough charge-points to support the charging requirements. Whether people want to buy these cars depends on the available range of cars to meet different needs, battery performance, availability (with some customers experiencing long waiting times for electric cars) and potential second-hand value.

1.9 The government identified a number of factors that might hold back the market without its intervention. In 2011, an OZEV and DfT business case analysing the case for spending public money identified factors such as uncertainty for car manufacturers leading to under-investment in technology and an inability to achieve economies of scale from low initial production levels. For consumers, it identified the high initial purchase cost compared with conventional petrol and diesel cars and concerns about range and the availability of adequate charging infrastructure.

Figure 3

Government strategies supporting ultra-low emission cars in the UK

The government has had a strategy to incentivise and support the uptake of ultra-low emission cars since 2011

Strategy	Published	Key policy areas	Funding	Car sales and infrastructure targets
Making the Connection: The Plug-In Vehicle Infrastructure Strategy	June 2011	Plug-in car grant. Plugged-in places. Support private investment. Improve consumer information and accessibility to public charging.	More than £300 million for the plug-in car grant. £30 million for the plugged-in places programme.	–
Driving the Future Today: A strategy for ultra low emission vehicles in the UK	September 2013	Plug-in car grant. National consumer communications campaign. Funding package for home, residential street, railway station and public sector car park charging and rapid charge-points. Hydrogen refuelling. Tax incentives.	More than £500 million of capital investment between 2015 and 2020 to support the ultra-low emission vehicle market.	All new cars to be ultra-low emission from 2040. Effectively decarbonised fleet by 2050.
The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy	July 2018	Plug-in car grant. Charging infrastructure fund to accelerate deployment. Street lighting charge-points. Continuation of workplace, on-street and home charging.	£400 million Charging Infrastructure Investment Fund. £4.5 million in the on-street residential charge-point scheme to 2020.	Between 50% and 70% of new cars to be ultra-low emission by 2030. Majority of new cars to be zero-emission by 2040. Almost every car to be zero-emission by 2050.

Notes

1 This table focuses on consumer-facing policy areas. Government strategies also included objectives, commitments and funding for other areas such as research and development and preparing the energy sector.

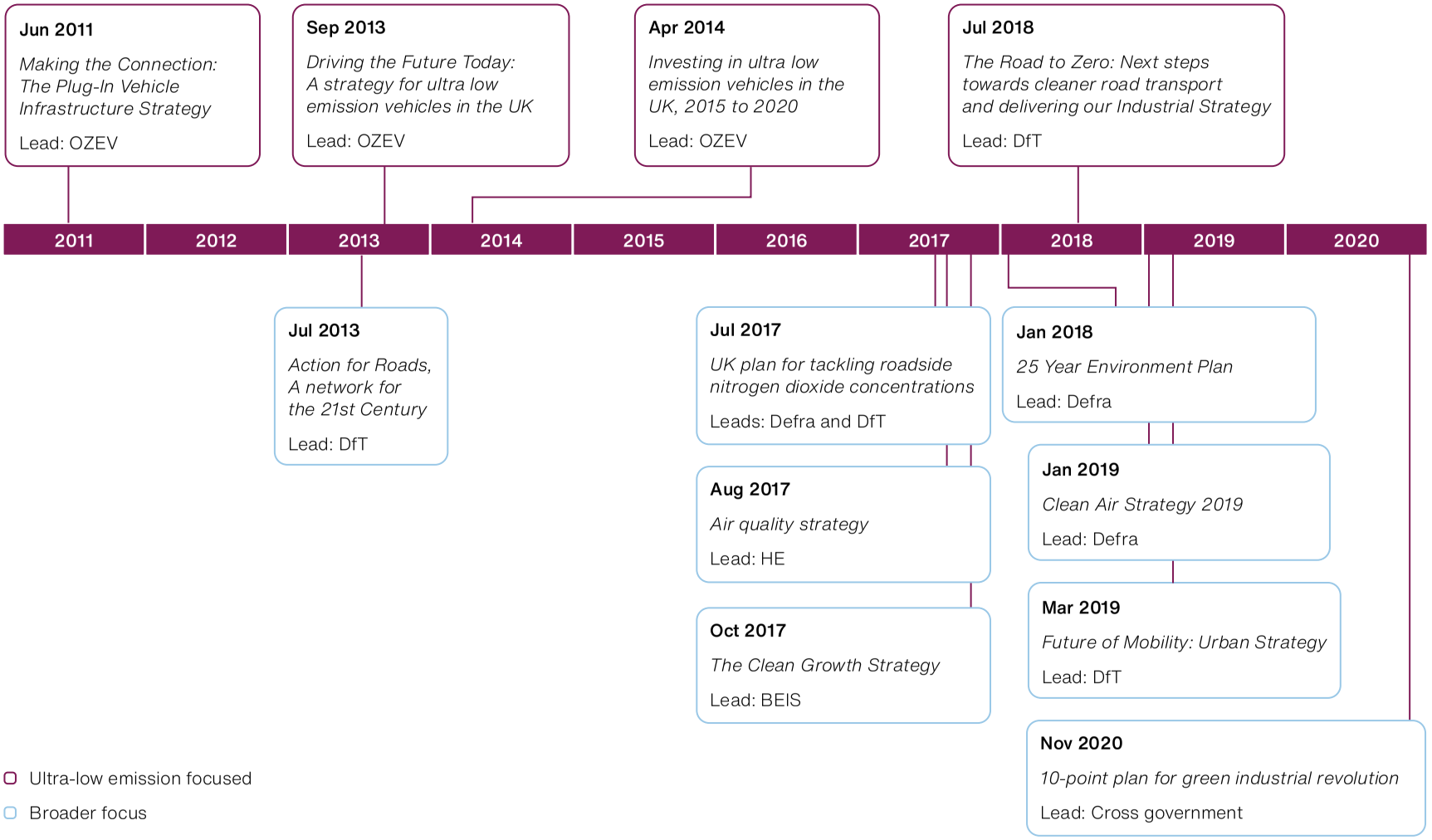
2 £500 million funding was originally announced in the government's *Action for Roads, A network for the 21st century* published in July 2013. More detail was provided in the subsequent *Driving the Future Today* strategy.

Source: National Audit Office analysis of government strategies

Figure 4

Key UK reports impacting the decarbonisation of cars, 2011 to 2020

The decarbonisation of cars is a cross-government issue with other air quality and environmental strategies reliant on progress made in increasing the number of ultra-low emission cars



Note

1 Acronyms are used in the diagram as follows: Office for Zero Emission Vehicles (OZEV), Department for Transport (DfT), Department for Environment, Food & Rural Affairs (Defra), Department for Business, Energy & Industrial Strategy (BEIS) and Highways England (HE).

Source: National Audit Office analysis of government documents

1.10 Based on this analysis, OZEV and DfT identified a need for public investment to:

- bring down the cost of ultra-low emission cars by increasing the rate of uptake, therefore encouraging economies of scale and reducing the purchase price in the short-term (thereby addressing the major barrier in uptake, which was identified as purchase price);
- facilitate the development and installation of a national recharging network, to ensure the necessary infrastructure is in place to enable the public to confidently invest in ultra-low emission cars;
- encourage and invest in the advancement of new technologies to offer consumers a choice of ultra-low emission cars and facilitate private sector investment in this area; and
- connect industry partners to facilitate the ultra-low emission vehicle (ULEV) supply chain.

1.11 Since 2011, government has implemented a range of levers to incentivise consumers and the market across the UK (**Figure 5** on page 21). This has included:

- *the plug-in car grant* – which is paid to the car manufacturer and reduces the purchase cost of qualifying new cars by £3,000. The initial rate was £5,000 per car until 2016. The eligibility rules have been tightened over time, and now only zero-emission cars are eligible. The grant is currently funded until 2022-23. By March 2020, the government had spent £1 billion on plug-in car grants supporting the purchase of more than 230,000 cars;
- *support for home and destination charging* – this has included various funding packages to support the introduction of home, residential street, workplace, railway station and public sector car park charging and rapid charge-points. The grants are paid to local authorities or charge-point installers. By March 2020 the government had spent £97.2 million on supporting the installation of charge-points at home, £3.7 million on charge-points at workplaces and given £5.8 million to local authorities to support the installation of on-street residential charge-points. In November 2020, the government announced £365 million to continue installing new chargers and target places where there are fewer charge-points, such as leasehold properties and smaller businesses;

- *support for charging on route* – OZEV is supporting the development of rapid chargers to help facilitate longer journeys. Between 2015 and 2020, Highways England provided £4.8 million funding to ensure 95% of England's strategic road network was within 20 miles of a charge-point;
- *raising consumer awareness* – since 2014, OZEV has run the Go Ultra Low campaign, a partnership between industry and government, spending £9.5 million by March 2020. This campaign provides consumers with information on grants, car models, charging infrastructure and the cost of ownership, with the aim of increasing uptake of ultra-low emission cars. OZEV also launched the Go Ultra Low City scheme in December 2014, providing £35 million of funding for cities to deliver local initiatives and charge-points; and
- *research and development* – the government has funded research and development for ultra-low technologies through Innovate UK, which is part of UK Research and Innovation. This includes a range of activities to support projects that contribute to the growth of the UK automotive sector, increase low and zero-emission vehicle technologies and reduce carbon emissions. Between July 2014 and December 2017, Innovate UK, BEIS and OZEV have awarded £99.5 million of grant funding.

Figure 5

Current government grant schemes supporting the uptake of ultra-low emission cars in the UK

The Office for Zero Emission Vehicles (OZEV) has gradually reduced the level of grant support for purchasing a new ultra-low emission car or installing charge-points in a home or workplace

Policy	Policy target		Stage	Grant level
	Car	Charging		
Plug-in car grant (PiCG)	✓		January 2011–February 2016	25% of cost of new car up to £5,000
			March 2016–October 2018	Category 1: 35% of cost of new car up to £4,500 Category 2 and 3: 35% of cost of new car up to £2,500 Cars £60,000 and above are ineligible
			October 2018–March 2020	Category 1: 35% of cost of new car up to £3,500 Category 2 and 3: Ineligible
			March 2020–2022-23	Category 1: 35% of cost of new car up to £3,000 Cars £50,000 and above are ineligible
Electric vehicle home charge scheme		✓	September 2014–April 2015	75% of charge-point and installation costs up to £900
			April 2015–February 2016	75% of charge-point and installation costs up to £700
			March 2016–March 2020	75% of charge-point and installation costs up to £500
			April 2020 onwards	75% of charge-point and installation costs up to £350
Workplace charging scheme		✓	November 2016–July 2018	40% of installation cost up to £300 per charging socket Maximum of 20 sockets per applicant
			July 2018–March 2020	75% of purchase and installation cost up to £500 per socket Maximum of 20 sockets per applicant
			April 2020 onwards	75% of purchase and installation costs up to £350 per socket Maximum of 40 sockets per applicant
On-street residential charging scheme		✓	January 2017–March 2020	75% of capital costs for on-street charging up to £7,500 per installation Total project cost is capped at £100,000
			April 2020 onwards	75% of capital costs for on-street charging up to £6,500 per installation (or £7,500 in special cases) Total project cost is capped at £100,000

Notes

1 Categories relate to the emission profile of cars. Category 1 cars emit less than 50g of CO_2 per kilometre travelled and have a zero-emission range of at least 70 miles. Category 2 cars emit less than 50g of CO_2 per kilometre travelled and have a zero-emission range of between 10 and 69 miles. Category 3 cars emit between 50g of CO_2 and 75g of CO_2 per kilometre travelled and have a zero-emission range of at least 20 miles.

2 Grant schemes that are no longer active have not been included in this table. This includes the domestic recharging scheme.

Source: National Audit Office analysis of Office for Zero Emission Vehicles grant information

1.12 The government has also provided road tax exemptions which help to reduce the total cost of owning a lower-emission car:

- Vehicle Excise Duty – battery electric and hydrogen fuel cell cars are exempt from all road tax (Vehicle Excise Duty) with a reduced rate available for plug-in hybrid cars.
- Company Car Tax – through Company Car Tax, an element of income tax for individuals who receive a company car, the government offers incentives for lower-emission cars with a reduced tax rate. To encourage fleet managers and businesses to convert to low emission cars, the government has announced reduced Company Car Tax rates on fully electric cars for 2020-21 through to 2022-23 and reductions for plug-in hybrid cars.

1.13 In some parts of the UK, local authorities and the devolved administrations have provided additional incentives to promote the use of ULEVs. Transport for London, for example, has a cleaner vehicle discount for the London congestion charge zone and some local authorities offer local parking benefits, the use of bus lanes and free entry to low emission zones. In Scotland, consumers can receive additional financial support for electric cars and charging infrastructure on top of the UK-wide incentives.

Total spending

1.14 OZEV spent a total of £1.1 billion between April 2010 and March 2020 funding the plug-in car grant, charging infrastructure schemes and the Go Ultra Low campaign (**Figure 6** overleaf). The majority of this spend (90%) has been on incentivising the purchase of ultra-low emission cars through the plug-in car grant. OZEV grants are demand-led, which means spend is forecast using anticipated demand from the market and an estimate of what it would cost to meet this demand. This leads to annual variation in spend.

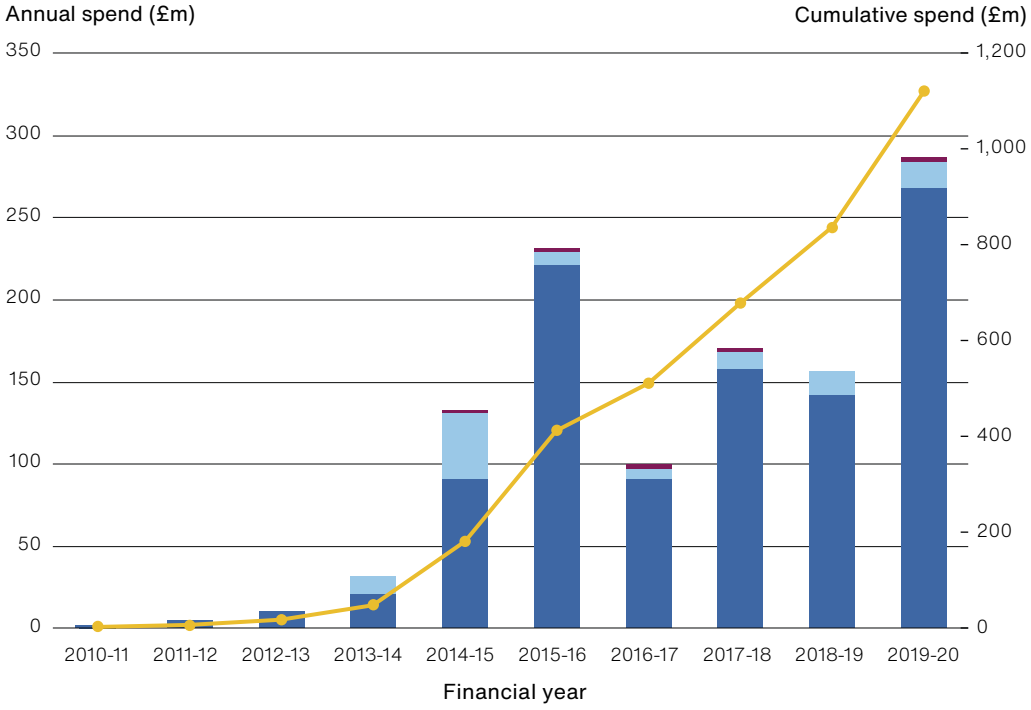
1.15 This report examines the effectiveness of government intervention to reduce carbon emissions by encouraging the use of ultra-low or zero-emission cars. In the following parts we consider:

- Part Two – the efforts made by government to encourage the uptake of ultra-low emission cars and government's role in the development of the associated infrastructure; and
- Part Three – progress reducing carbon emissions and future challenges.

Figure 6

Breakdown of spend on ultra-low emission car grants, charging infrastructure and communications campaign by the Office for Zero Emission Vehicles, by year 2010-11 to 2019-20

Between 2010-11 and 2019-20, the Office for Zero Emission Vehicles (OZEV) spent more than £1,000 million supporting the uptake of ultra-low emission cars and charging infrastructure. Of the total cumulative spend, 90% was on grants to reduce the cost of new ultra-low emission cars



											Total
Go Ultra Low campaign	–	–	–	–	1.3	1.8	2.0	2.0	–	2.5	**9.5**
Charging infrastructure schemes	–	–	–	10.9	39.9	8.5	6.7	10.4	14.1	16.3	**106.8**
Plug-in car grant	1.0	4.4	10.2	20.4	90.7	220.5	90.4	157.5	141.7	267.5	**1,004.3**
Cumulative spending	1.0	5.5	15.7	47.0	178.8	409.5	508.6	678.5	834.3	1,120.6	**–**

Notes

1 Spending figures have been rounded and may not add up to the total.

2 The Go Ultra Low campaign was match-funded by industry between 2014-15 and 2017-18. In 2019-20 the industry contributed £2.5 million, but this was not match-funded, and instead contributed to via the plug-in car grant. No industry funding is included in the graph.

3 Charging infrastructure schemes include the electric vehicle home-charging, domestic recharging, workplace charging and on-street residential schemes.

Source: National Audit Office analysis of Office for Zero Emission Vehicles spending data

Part Two

Progress in encouraging the uptake of ultra-low and zero-emission cars

Introduction

2.1 This part examines:

- the impact of government support on the purchase of ultra-low and zero-emission cars; and
- the progress made by government in supporting the installation of charging infrastructure.

The impact of government support on the purchase of ultra-low and zero-emission cars

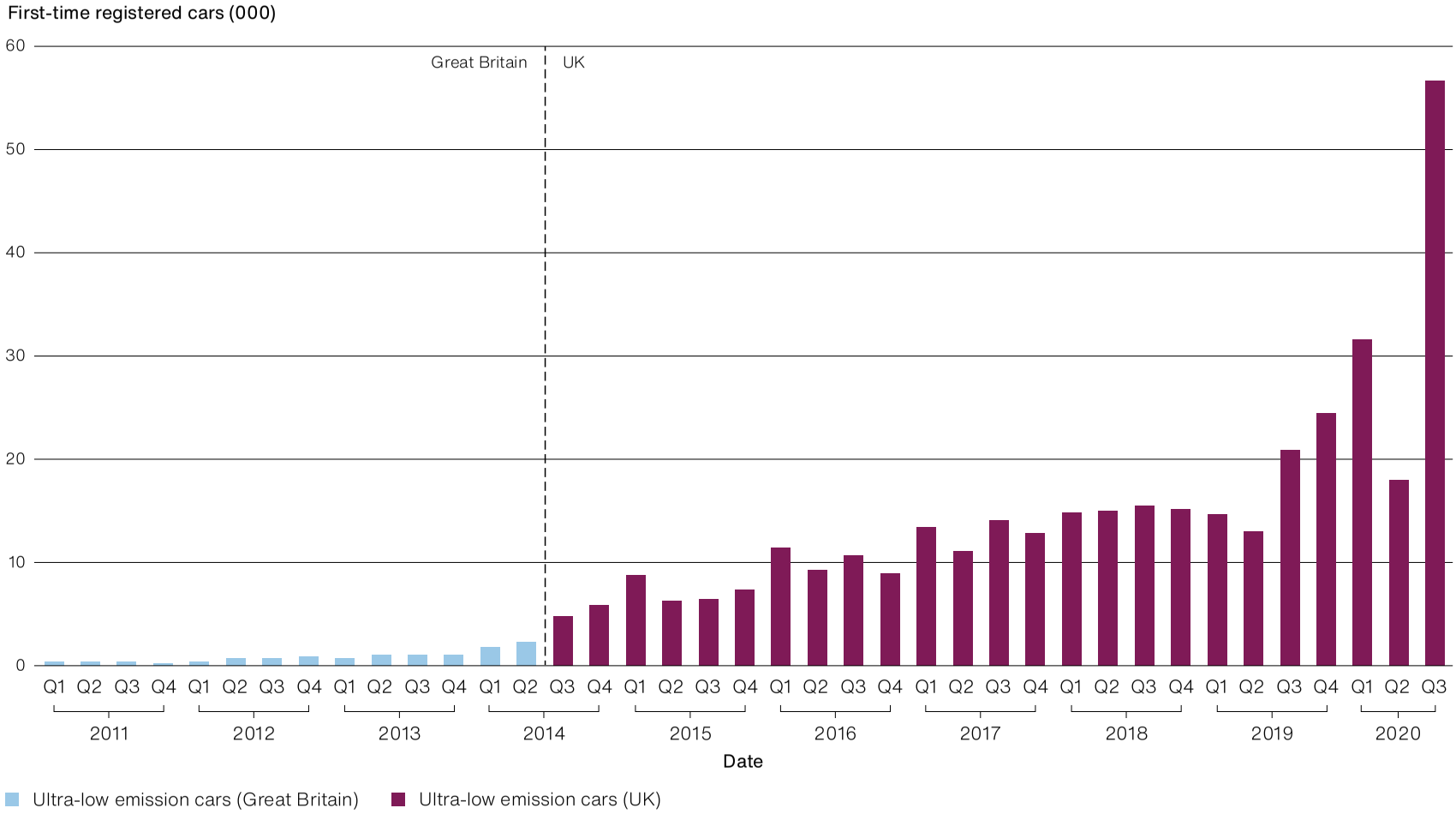
2.2 The use of ultra-low emission cars ultimately depends on car manufacturers producing cars that people want to buy at a price that people want to pay. In 2011, the Department for Transport (DfT) forecast that ultra-low emission vehicles (ULEVs) could reach anywhere between approximately 2% and 12% of new car sales by 2020. Its 2013 revision refined the range to between 3% and 7% by 2020. These figures were projections of the potential market and were not intended to be government targets.

2.3 The sales of new ultra-low emission cars have risen broadly in line with DfT's 2013 projection, accounting for more than 6% of the market between January and March 2020. Since April 2020, sales have exceeded the projection (**Figures 7a** overleaf and **7b** on page 27). Between January and September 2020, sales of new ultra-low emission cars reached 8% of the market, although this was in a market distorted by the impact of the COVID-19 pandemic – overall UK new car registrations were down 33% during this period. The number of first-time registered ultra-low emission cars rose from over 48,000 between January and September 2019 to over 106,000 between January and September 2020. By 2030 sales of new petrol and diesel cars will cease, and from 2035 all new car sales need to be zero-emission.

Figure 7a

Ultra-low emission car first-time registrations in Great Britain and the UK, between 2011 and Q3 2020

The number of ultra-low emission cars being registered for the first time has increased substantially since 2011, with the highest number of registrations in Q3 2020 (July to September)



Notes

1 Statistics are only available for Great Britain between Q1 2011 and Q2 2013. From Q3 2014 onwards, statistics are available for the whole of the UK.

2 New car registrations data are likely to be affected by the COVID-19 pandemic throughout 2020.

3 First-time car registrations are used as a proxy for new car sales.

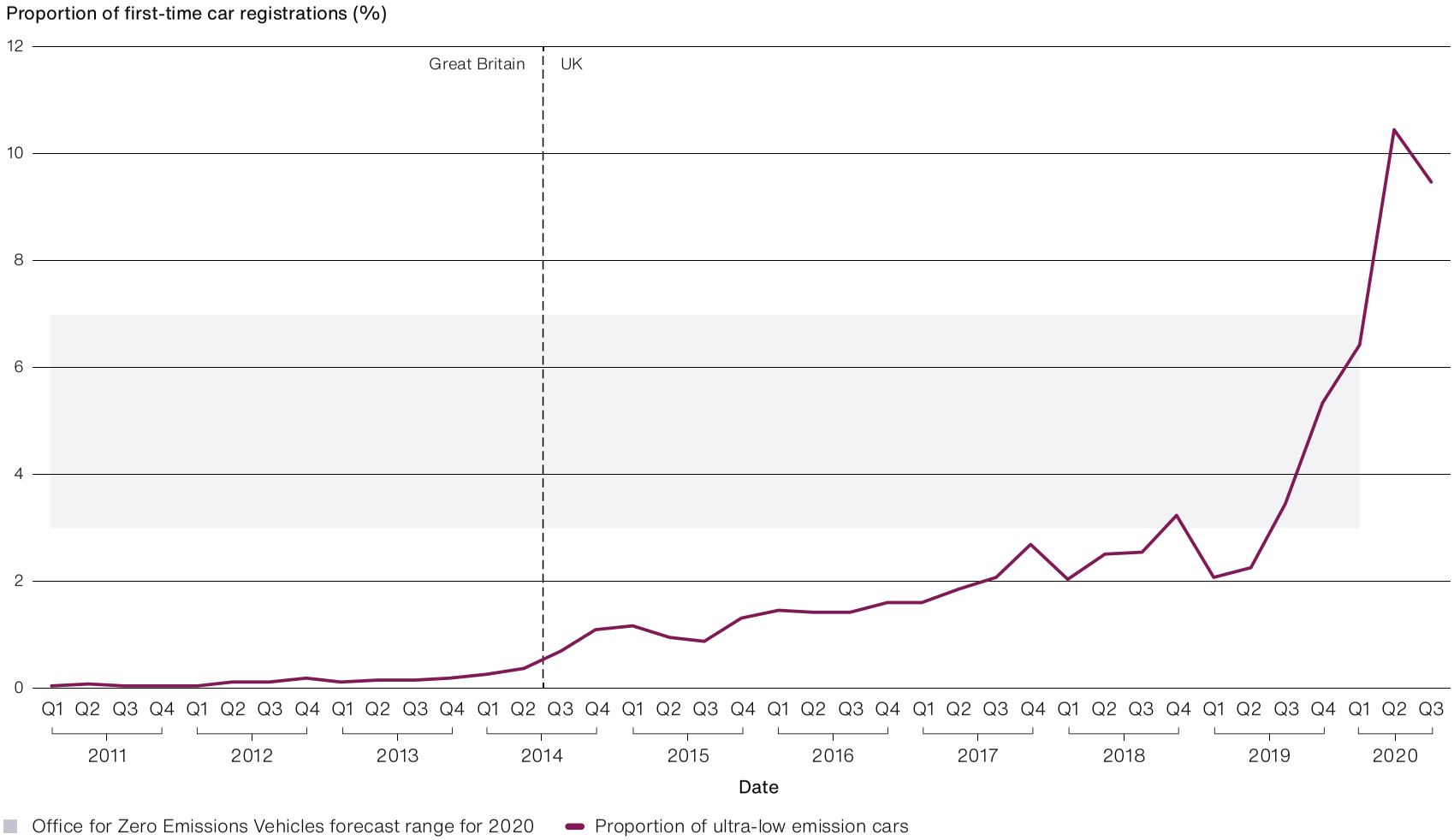
4 'Q' represents quarters per calendar year.

Source: National Audit Office analysis of Department for Transport data

Figure 7b

Ultra-low emission cars as a proportion of first-time car registrations in Great Britain and the UK, between 2011 and Q3 2020

In Q3 2020 (July to September), 9% of first-time registered cars were ultra-low emission



Notes

1 Statistics are only available for Great Britain between Q1 2011 and Q2 2013. From Q3 2014 onwards, statistics are available for the whole of the UK.

2 New car registrations data are likely to be affected by the COVID-19 pandemic throughout 2020.

3 First-time car registrations are used as a proxy for new car sales.

4 'Q' represents quarters per calendar year.

Source: National Audit Office analysis of Department for Transport data

2.4 There have been substantial regional variations in the take-up of ultra-low emission cars (**Figure 8** on pages 30 and 31). By the end of September 2020, there were 348,506 ultra-low emission cars licensed in the UK, 71% of which had been eligible for the plug-in car grant. Approximately half of these cars are registered to companies, and these create hotspots of ultra-low emission car registrations. Data from private registrations highlight the north of England, West Midlands, Northern Ireland and Wales as areas with the lowest number of ultra-low emission cars per capita. The Office for Zero Emission Vehicles (OZEV) has not targeted its funding towards specific regions or to address any factors that might be inhibiting faster expansion in the different parts of the UK.

2.5 Government support, for example the plug-in car grant, was intended to bring down the cost of ultra-low emission cars by increasing the rate of uptake. The intention was to incentivise potential purchasers to make the switch to ultra-low emission cars. By stimulating the volume of sales, the government intended to encourage economies of scale in the manufacture of these vehicles, thereby reducing the purchase price in the short term (paragraph 1.10). We examined the extent to which the DfT, the Department for Business, Energy & Industrial Strategy (BEIS) and OZEV had tracked the impact of government support on the market since 2011.

Impact of government support on purchases

2.6 OZEV and DfT undertake regular analysis on the importance of the plug-in car grant to consumers. DfT has commissioned regular surveys of consumer attitudes towards the purchase of ultra-low and zero-emission cars. Recent surveys have focused on consumer views towards electric cars. These surveys have identified a small increase in the willingness from consumers to purchase cars with lower emissions. However, the surveys continue to identify the upfront cost of these cars as a key barrier to purchase.

2.7 The impact of the government support on consumers' actual purchasing decisions has been less clear. Analysis undertaken by DfT in 2016, using customer survey data from December 2010 to March 2016, found that 93% of people who had purchased an electric car identified the plug-in grant as important to their decision to purchase. Another survey in 2016 of driving licence holders found 33% of its survey population were not aware of the grant and only 31% thought the grant was important in influencing attitudes towards buying electric cars. Surveys commissioned since 2016 have not repeated these questions.

2.8 When it introduced the plug-in car grant in 2011, OZEV was not clear what yearly increase it was expecting on sales, above and beyond what might have happened anyway, due to uncertainties in the market. As part of its budget planning OZEV has sought to forecast the potential impact of changes in the plug-in car grant on the take-up of ultra-low emission cars. However, OZEV has not evaluated the overall cumulative impact of the plug-in car grant in delivering the desired change within the market. It therefore does not know what additional impact the grant has made on the take-up of ultra-low emission cars, over and above what the market would have delivered on its own.

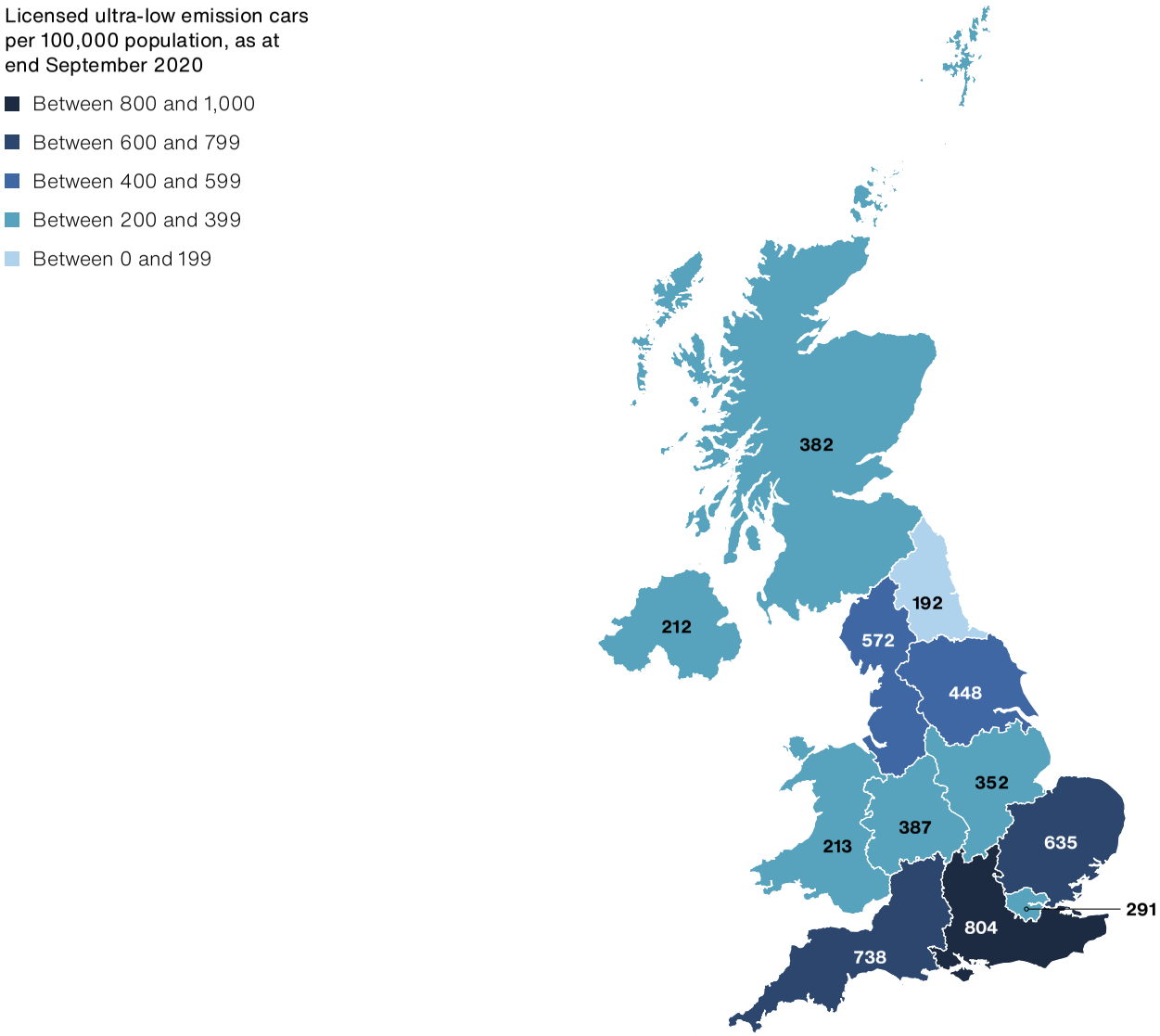
2.9 The removal of the plug-in car grant for some classes of cars does not appear to have had a substantial impact on sales. The government has gradually reduced the size of the plug-in car grant and tightened the eligibility criteria to now only include zero-emission cars (paragraph 1.11). In October 2018, the government disqualified cars that emitted more than 50g of CO_2 per kilometre travelled or those that did not have a zero-emission range of at least 70 miles – essentially plug-in hybrids – from receiving the grant. After a short-term fall in the demand for plug-in hybrids in the preceding months, demand rose above the level when a grant was available (**Figure 9** on page 32).

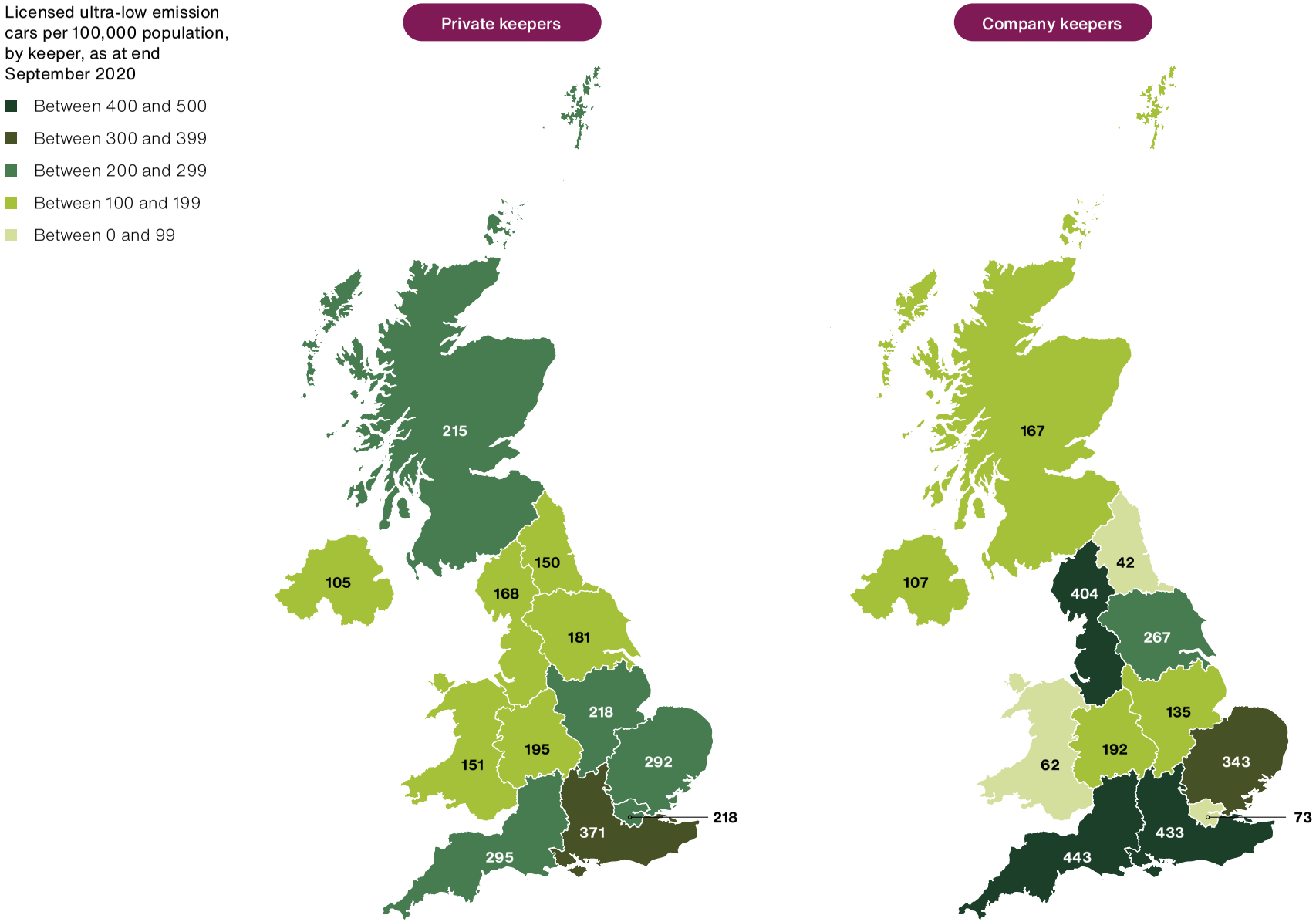
2.10 In 2019 and the first nine months of 2020, close to half of the ultra-low emission cars bought were not eligible for the plug-in car grant because they were above the cost threshold or emitted too much carbon (**Figure 10** on page 33). This market performance suggests that the plug-in car grant was not key to purchasers deciding to opt for this type of car.

Figure 8

Number of licensed ultra-low emission cars per capita, in the UK, by region with split by private or company keepership, as at end September 2020

The north-east of England, Northern Ireland and Wales have the lowest number of privately registered ultra-low emission cars per capita while the south-east has the highest





Note

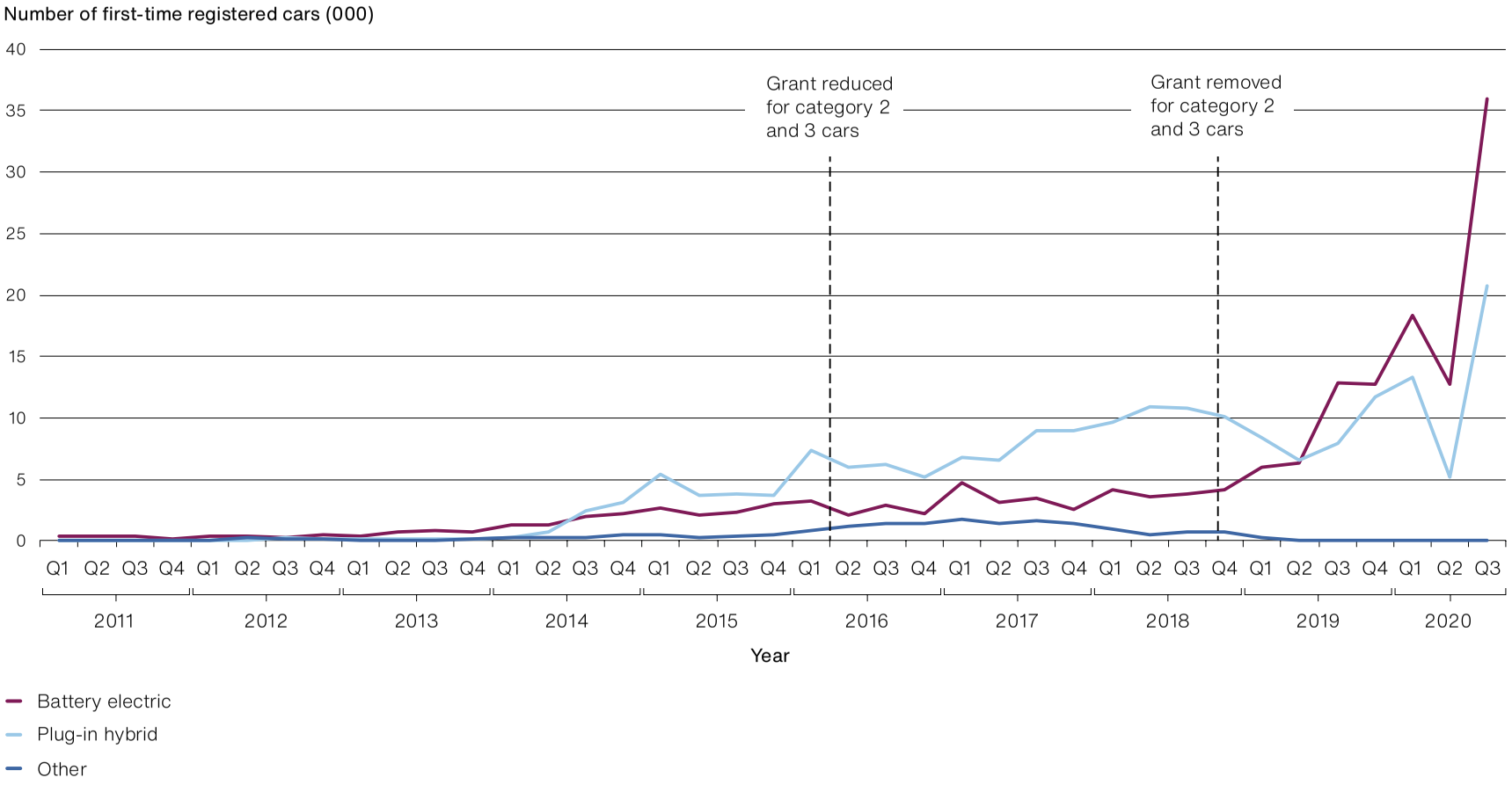
1 Ultra-low emission cars registered to a company address can distort the geographic distribution and significant changes in the number of vehicles can occur when companies change their registered address.

Source: National Audit Office analysis of Department for Transport vehicle licensing statistics

Figure 9

First-time registered ultra-low emission cars in the UK, by category, Q1 2011 to Q3 2020

First-time registrations of cars not eligible for the plug-in car grant continued to grow when the grant was removed



Notes

1 In October 2018, category 2 and 3 cars were no longer eligible for the plug-in car grant. Categories relate to emission profile. Category 1 cars emit less than 50g of CO_2 per kilometre travelled and have a zero-emission range of at least 70 miles. Category 2 cars emit less than 50g of CO_2 per kilometre travelled and have a zero-emission range of between 10 and 69 miles. Category 3 cars emit between 50g of CO_2 and 75g of CO_2 per kilometre travelled and have a zero-emission range of at least 20 miles.

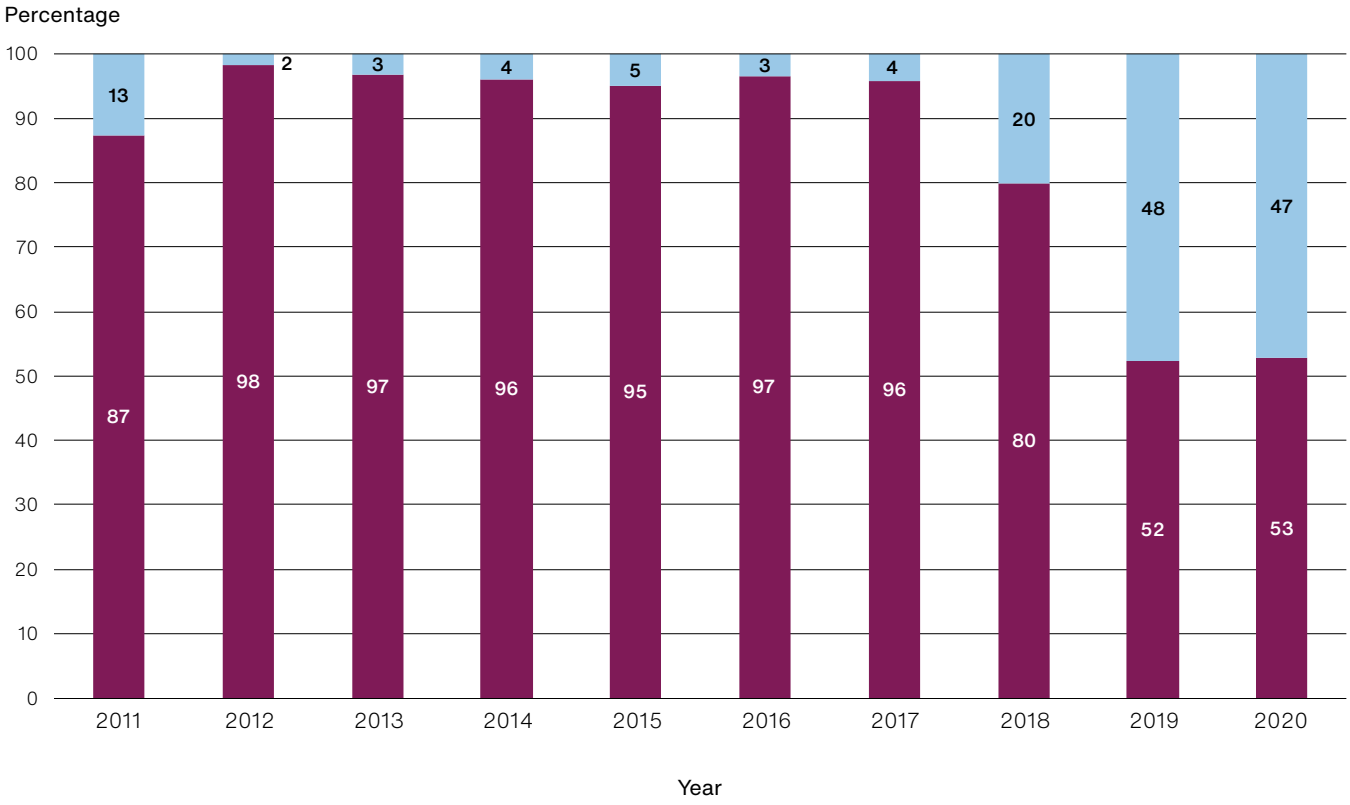
2 'Q' is quarters per calendar year.

Source: National Audit Office analysis of Department for Transport vehicle statistics

Figure 10

Ultra-low emission plug-in cars registered for the first-time in the UK, by grant eligibility, 2011 to September 2020

Almost half of the ultra-low emission cars registered for the first-time in the UK in 2019 were not eligible for a grant



Notes

1 2020 represents registrations between January and September. All other years are January to December.

2 Does not include non plug-in cars.

Source: National Audit Office analysis of Department for Transport vehicle statistics

Impact of government intervention on initial car purchase costs

2.11 In 2011, DfT estimated that buying an electric vehicle typically incurred a premium of around £16,000, or 206% of the purchase price of the equivalent petrol or diesel car. OZEV has not regularly tracked the trend in the price premium to test whether economies of scale are indeed impacting on the initial purchase price of zero-emission cars. OZEV analysed prices in 2019 and found without the plug-in car grant, on average, there was still a £13,000 gap between the purchase price of zero-emission and conventional cars. While the initial costs of zero-emission cars have not reduced in relative terms to petrol- and diesel-powered cars between 2011 and 2020, manufacturers have made progress in increasing battery range. Batteries that have extended range are larger and more costly. OZEV recently estimated that in some cases the lifetime cost of owning a zero-emission car had dropped below the petrol and diesel equivalents.

2.12 The government expects that as sales of electric cars grow, the need for financial support will decrease. The government's 2018 *Road to Zero strategy* set out its intention for a managed exit from the plug-in car grant and stated that the growth of ultra-low emission cars would be supported through other measures. Support through the plug-in car grant has been incrementally scaled back since 2018, with OZEV committing to providing the grant to 2022-23.

Installing charging infrastructure

2.13 The government's rationale for supporting the development and installation of a national charging network is to ensure the necessary infrastructure is in place to enable the public to confidently invest in ultra-low emission cars. We examined how OZEV was tracking progress and the extent to which the overall objective was being achieved.

2.14 Working with the private sector and local government, the government has supported the development of the charging infrastructure since 2011. OZEV did not quantify what it intended to achieve with the public money spent on the charging infrastructure. This makes it difficult to determine whether the value derived from the investment of public money has been in line with its initial expectations.

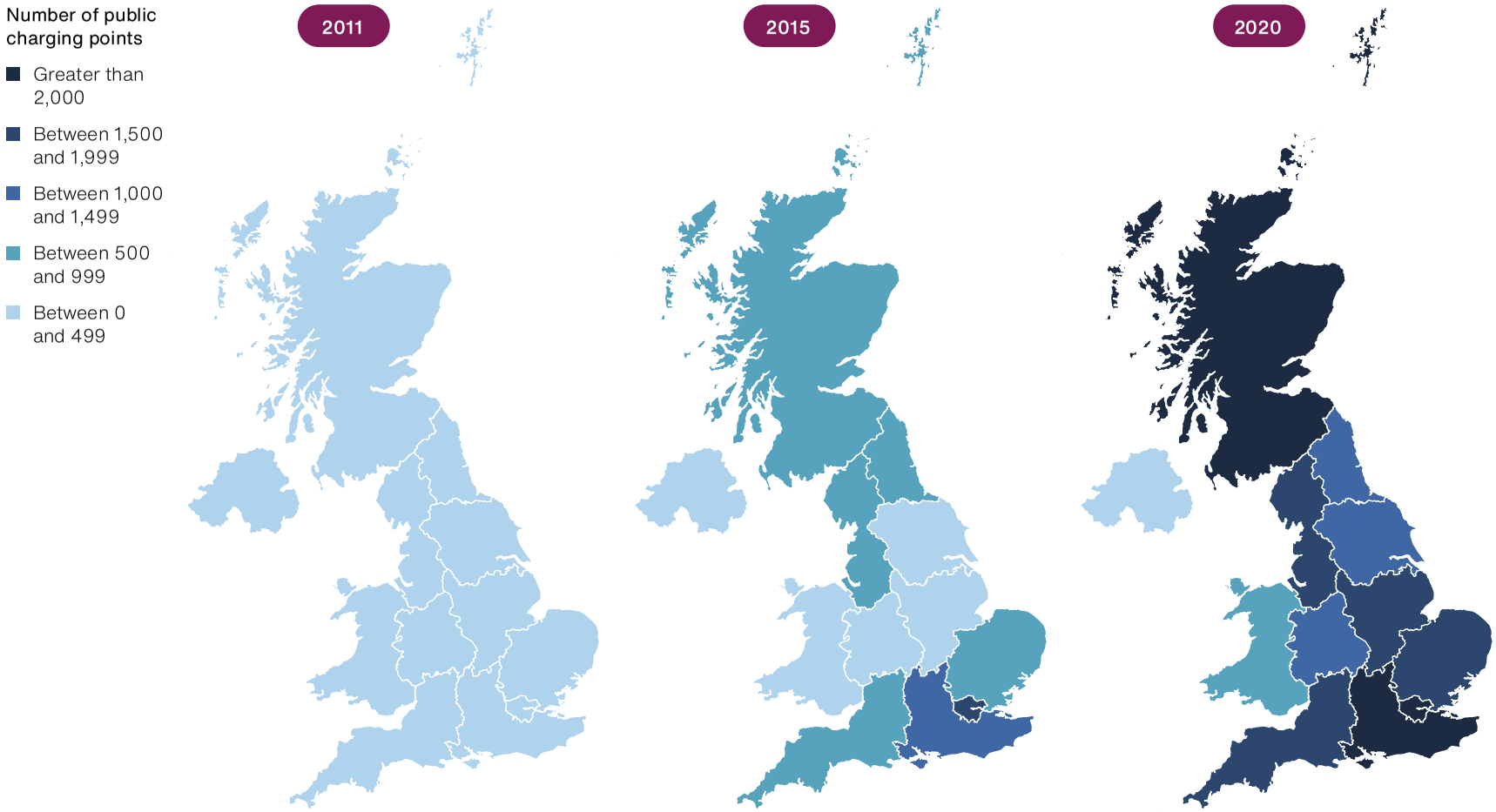
2.15 OZEV's National Chargepoint Registry currently lacks complete and up-to-date data on the publicly available charge-points in the UK, therefore OZEV uses a third-party. Nonetheless, there has been a significant growth in the charging infrastructure over the past decade, from fewer than 1,000 in 2011 (although these data are uncertain because of data quality issues) (**Figure 11**). By the end of March 2020 government funding had contributed towards the installation of 133,336 home charging points; 8,578 workplace charging points; and 690 on-street charging points (142,604 in total). By the start of October 2020, there was also a total of 19,487 publicly accessible charge-points in the UK, the majority of which were funded by the private sector.[3] Of these publicly accessible charge-points, 3,530 were rapid.

3 The majority of these charge-points are privately funded, but some will have benefited from subsidies, such as the on-street residential charging scheme.

Figure 11

Public charging infrastructure in the UK, 2011, 2015 and 2020

There has been considerable growth in public charging infrastructure over the past decade



Notes

1 The range for number of public charging points in different regions in 2020 is between 470 (Northern Ireland) and 6,153 (London).

2 The map for 2020 shows the number of points as of the end of September.

3 We have not verified the accuracy of the Open Charge Map data.

Source: National Audit Office analysis of Open Charge Map data

2.16 The provision of charging infrastructure varies considerably across the country, with the charging infrastructure broadly reflecting the level of sales of electric cars across the regions. The south-east of England, for example, has the highest number of ultra-low emission cars registered per head of population and has a high level of public charge-points. In addition to the electric car charging points, there are also now 12 public hydrogen refuelling stations in the UK.

Schemes aimed at developing the charging infrastructure

2.17 Charging infrastructure and consumer concerns about the range electric cars can travel without recharging remain major barriers for consumers. Government support for developing the charging network has considered:

- charging at home and work; and
- charging on route.

Charging at home and at work

2.18 The installation of chargers at home is straightforward where the car purchaser has access to off-street parking. To date, 9% of government spending on supporting ultra-low emission cars has been on the electric vehicle home-charging scheme, and its predecessor the domestic recharging scheme. This has resulted in the installation of 133,336 home chargers, which was equivalent to 48% of all ultra-low or zero-emission cars that had been registered as of March 2020.

2.19 Electric car owners without home chargers need to charge their cars on the street near home, at work or in public spaces. People reliant on on-street parking need the private sector or local authority to install a charger in a convenient location and may need to share access with others. In October 2016 OZEV announced funding for local authorities to support on-street residential charge-points. It earmarked a pot of £1.5 million for this purpose for 2017-18, and a further £4.5 million for the next two financial years, which was subsequently increased to £7 million. Uptake of this funding has been slow, with underspends against budget in each of the three years – 32% of the total budget was not used. To date, funding has been allocated on a first-come-first-served basis, rather than an assessment of strategic need. OZEV had undertaken targeted consultation with local authorities prior to setting up the scheme. Local authorities, however, told us that the scheme had been designed without sufficient consultation, making it difficult to bid for and contributing to slow take-up.

2.20 The provision of on-street home charging is lagging behind off-street provision, with 690 chargers having been installed by March 2020 under the on-street residential charge-point scheme. There are many more on-street charge-points that have been installed by the private sector and local government, but there are no precise figures available.

2.21 The ability of drivers without off-street parking to charge their cars conveniently is likely to be vital to the expansion in the use of electric vehicles in some areas. Data from the English Housing Survey show that while two-thirds of households in England have off-street parking, the remainder (33%) do not – 16% of households are listed as having access only to inadequate on-street parking or no access to parking. Lack of off-street parking is a particular issue in city and urban areas (where 62% of households do not have off-street parking), and for those in social housing (where 68% of households do not have off-street parking).

2.22 OZEV informed us early efforts focused on supporting those with off-street parking or with an ability to charge at work, as it deemed them to be more likely to buy electric cars. OZEV has yet to clearly articulate what level of on-street charging provision it thinks will be necessary to support delivery of the 2030 target. There is currently no single data set to show which residential areas will pose the most serious challenges to installing charge-points or where the additional network infrastructure will be needed. There are likely to be various technological solutions that will allow people without driveways to charge their car conveniently and quickly including ultra-rapid chargers in local areas or installing charge-points at the roadside. To date, OZEV has not sufficiently focused on which technologies will ensure adequate provision. OZEV informed us that it will be publishing plans for improving charging infrastructure in 2021. This will include consideration of different options to allow people without a driveway to charge their cars.

2.23 OZEV has been providing financial support to companies through the workplace charging scheme since 2016-17. This scheme provides up to 75%, or £350, of the purchase and installation cost of each socket, up to 40 charging sockets at each place of work. By the end of March 2020, the scheme had provided funding for 8,578 charge-points at a cost of £3.7 million.

Charging on route

2.24 In May 2020, OZEV announced that a driver is never more than 25 miles away from a rapid charge-point on England's strategic road network. By January 2020, there were 809 open-access rapid charge-points on England's motorways and A-roads, with an average of two per motorway service station. By 2023, government wants there to be at least six ultra-rapid chargers (quicker than the previous rapid charge-points) at each service area (with 10 to 12 in larger sites), rising to a total of 2,500 chargers across the network by 2030 and 6,000 by 2035. This target is supported by the government's Rapid Charging Fund of £950 million, announced in November 2020.

2.25 Some of the charging infrastructure has been funded through joint investment between the public and private sector. In 2017, HM Treasury announced the Charging Infrastructure Investment Fund, a £400 million fund, of which government will invest up to £200 million, with the remaining £200 million matched by private investors. Zouk Capital, a fund management company, has been appointed following competition to make all the investment decisions based on an agreed investment mandate. It invests in companies whose business substantially involves charging points that are accessible to the public. It aims to generate capital growth and realise capital gains as well as contribute to the expansion of public charging networks in the UK. A portion of the first £70 million, of which £35 million was government-funded, was invested in September 2019 into a private company, which is aiming to grow to 5,000 rapid charge-points. The investment period ends in March 2024, with the fund ending in March 2030.

Charging in public compared to at home

2.26 Drivers with access to chargers at home tend to pay less than those reliant on on-street charging (**Figure 12**). Public charging often requires the user to pay a connection or membership fee, which increases the cost. It is not possible to state the precise difference in cost owing to the wide range of domestic electricity and on-street charging tariffs. However, our analysis of public data suggests that charging at home can be between 59% and 78% cheaper than charging on the public network. Moreover, electricity providers are beginning to launch tariffs specifically aimed at electric car owners, which could increase the price discrepancy further. The Energy Saving Trust estimates that an owner of a Nissan Leaf, driving 10,000 miles a year and charging on the public network, would pay £420 more each year than an owner of the same car charging at home.[4]

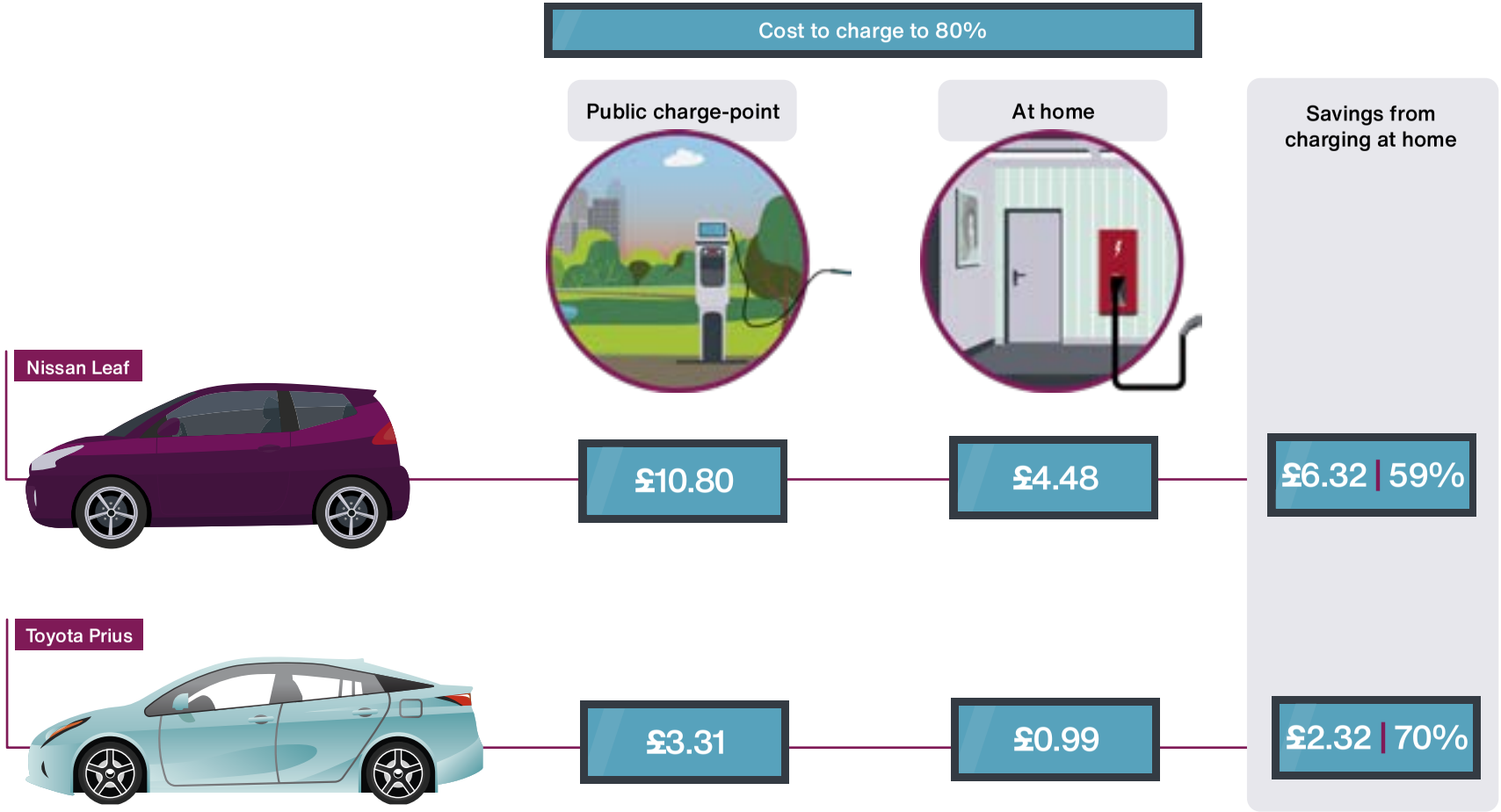
2.27 Alongside the cost of charging, making sure public charge-points are accessible to all electric car drivers is important. OZEV has stated that it wants all public charge-points to be interoperable and accessible to all electric car drivers. Ultimately, government wants charge-points to be accessible, affordable and secure and will be consulting on mandating minimum standards, such as payment method.

4 The Energy Saving Trust estimates if you charge 100% of the time at home, your annual fuel cost will be £300. If you charge 100% of the time on the public network, getting above 80% charge each time, your annual fuel cost will be £720. In comparison, it estimates the average diesel fuel cost of a Nissan Micra driving 10,000 miles a year to be £858 per year.

Figure 12

Example costs to charge ultra-low emission cars at public and private charge-points

It is substantially cheaper to charge at home than on the public network



Notes

1 Calculations assume that the car was new, a connection fee of £1.20 to use public charge-points, and a public charge cost of 30p/kWh. The average home electricity cost has been taken to be 14p/kWh, not including the one-off cost of charge-point installation.

2 Calculations assume the Nissan Leaf is charged to 80% using a 7kW charging speed, and the Toyota Prius is charged to 80% using a 3kW charging speed.

Source: Adapted from Energy Saving Trust, Department for Transport, Office for Zero Emission Vehicles, Charging electric vehicles

Impact on future electricity demand

2.28 Mass uptake of electric cars has implications for electricity demand and distribution. Replacing the UK fleet of petrol and diesel cars with electric cars will increase demand for electricity, which is expected to happen alongside the electrification of other significant sectors such as domestic heating. BEIS has assessed a number of scenarios for meeting net zero by 2050 using a number of different assumptions for different sectors. In these models, electric cars will increase electricity demand by around 20% by 2050, generating between 100TWh and 130TWh of additional electricity demand per year by 2050.

2.29 Although BEIS expects uptake of electric cars to increase the overall demand for electricity, it is examining options to mitigate this impact through smart charging. BEIS expects that most drivers will plug in their cars when they arrive home from work in the evening and then charge their cars overnight. Smart charging would mean that charging occurs in off-peak hours in the middle of the night, rather than at peak times when they are initially plugged in. If smart charging is widely adopted, BEIS expects that less additional generating and network capacity would be needed. As yet, there are no agreed technical standards for smart charging. After consultation in 2019, these are expected to be agreed in 2021.

Part Three

Progress in reducing carbon emissions from cars

3.1 This part examines:

- the impact on carbon emissions from the government's effort to promote the uptake of ultra-low emission cars; and
- the contribution that reducing carbon emissions from cars can make in helping the UK become net zero for carbon by 2050.

The impact on UK carbon emissions

3.2 Since 2011 there has been a reduction of around 1% in carbon emissions from passenger cars. Over the same period, the UK's total carbon emissions have fallen by 20% (**Figure 13** overleaf).

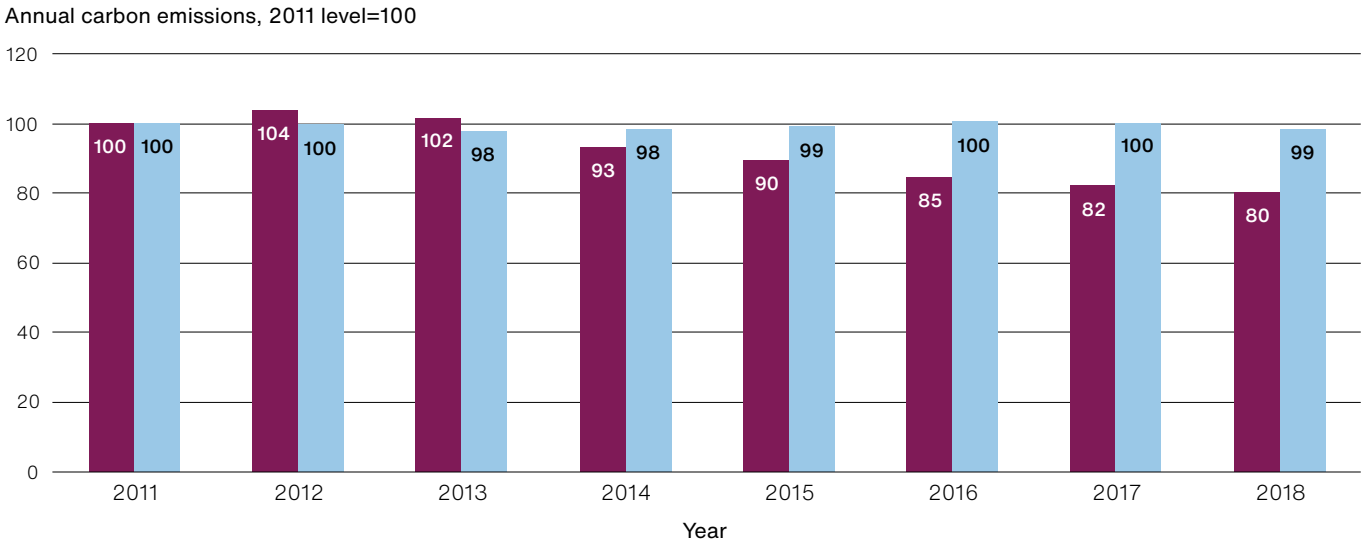
3.3 In its September 2013 strategy *Driving the future today*, the Office for Zero Emission Vehicles (OZEV) estimated that if the uptake of low emission cars met its trajectory of between 3% and 7% of all new cars sales by 2020, carbon emissions from cars would fall by 10 million tonnes – from 66.8 million tonnes of CO_2 in 2010 to 56.6 million tonnes of CO_2 in 2020. As detailed in paragraph 2.3, the projection for new car registrations by 2020 was met. Despite this, however, overall carbon emissions from UK cars have not substantially changed.

3.4 Since 2015, EU legislation has set emission targets for new cars. In January 2020, the EU strengthened these targets; average CO_2 emissions of all new cars can be no more than 95g of CO_2 per kilometre travelled in a calendar year by 2021 – 95% of all new cars registered needed to meet this target in 2020. The government has made a commitment to pursue a future approach that is at least as ambitious as the current arrangements for vehicle emissions regulation now the UK has left the EU. The Department for Transport (DfT) has tracked the average carbon emissions from all new car registrations, regardless of emissions category, which presents a mixed picture on progress. The average emissions from new cars in Great Britain fell year on year between 2011 and 2016 – a total of 13% over this time frame. Since 2016, however, average emissions for new cars began to rise year on year – a total increase of 6% between 2016 and 2019.

Figure 13

Carbon emissions from passenger cars and the UK as a whole, 2011 to 2018

Carbon emissions from passenger cars remained broadly constant between 2011 and 2018, whereas total UK emissions gradually reduced from 2012



Notes

1 Government has published provisional figures for the UK's greenhouse gas emissions for 2019, but the data are not sufficiently granular to identify emissions from passenger cars.

2 Carbon emissions are measured in million tonnes of CO_2 ($MtCO_2$).

Source: National Audit Office analysis of Department for Business, Energy & Industrial Strategy data

3.5 The recent increase in average emissions from new cars and lack of progress in reducing overall emissions from cars, despite growing sales of ultra-low emission cars, have been ascribed to the following factors:

- The Committee on Climate Change (the Committee), an independent expert committee which advises government, pointed to the sharp rise in sales of sports utility vehicles (SUVs) over the past decade (from 6% of new car sales in 2008 to 25% in 2019) as a large contributor to the lack of progress in reducing CO_2 emissions from new cars. SUVs are generally heavier than standard cars and therefore emit more carbon.

- Both the distance cars are travelling and total road traffic have increased over the past decade. This has contributed to a lack of progress in overall emissions from passenger cars according to the Committee.

- There has also been a growing disparity between expected emissions from cars, tested in laboratories, and actual 'real world' emissions. Governments have had to reassess the methodologies used to estimate carbon emissions from cars, with these newer methodologies often reporting higher emissions for cars. For example, in April 2020 a new methodology was introduced which typically increases the emissions for petrol, diesel and hybrid electric cars by 20% compared to the previous method.

3.6 The minimal impact of low-carbon-emitting cars on the overall carbon emissions from UK cars also reflects their as yet small number compared with the overall UK car fleet. At the end of September 2020, there were 32.9 million cars licensed in the UK, of which only 0.5% were fully electric (**Figure 14** overleaf). Changing the composition of the UK car fleet will take time. The average life span of a car is currently around 14.5 years and therefore the second-hand market remains critical to achieving full-fleet decarbonisation by 2050.

Meeting the government's long-term targets for carbon

3.7 The UK government's announcement in November 2020 that the sale of new petrol and diesel cars will end by 2030, and all new cars sold will be zero-emission from 2035 implies a very rapid acceleration in the sale of zero-emission cars over the next decade. This will require significant changes in the automotive manufacturing sector, greatly increasing the supply of zero-emission cars, and in step with that expansion, further significant development of the charging infrastructure. It also implies the sector overcoming the remaining issues that might be holding back consumers from making the changeover and managing the impact of the transition. In this section we identify lessons drawn from how DfT, the Department for Business, Energy & Industrial Strategy (BEIS) and OZEV have organised themselves to date that may be relevant to the pursuit of the new ambitious targets.

Figure 14

Licensed cars in the UK by fuel type, as at September 2020

By the end of September 2020, 1.1% of licensed cars in the UK were ultra-low emission

Notes

1 Total ultra-low emission cars are calculated as electric and other ultra-low emission cars (1.1%). Other ultra-low emission cars include hybrid electric, plug-in hybrid electric, range-extended electric, and other fuels.

2 Petrol and diesel category also includes all non-ultra-low emission cars.

3 At the end of September 2020, there were 154,691 battery electric cars licensed in the UK.

Source: National Audit Office analysis of Department for Transport vehicle statistics

3.8 Since 2011, the government's support for the increased use of ultra-low emission cars has proceeded without a detailed published plan setting out the milestones that needed to be reached to keep the 2050 carbon objective on track. In our 2019 briefing to the House of Commons Environmental Audit Committee on DfT sustainability, we noted that OZEV had set few interim milestones for the roll-out of electric vehicles. As set out in paragraph 2.2, the projections that had been made in 2013, which were not intended as targets, focused on the sale of electric cars as a proportion of new registrations, rather than the impact on carbon emissions. As indicated in the previous section, a focus on increasing the number of ultra-low emission cars on the road does not automatically lead to an overall carbon reduction if other factors are working against it. In November 2020, the government committed to publishing a delivery plan in 2021 for achieving the phase out of new petrol and diesel cars from 2030 and to consult on a regulatory framework for delivering the associated carbon outcomes.

3.9 In December 2020, we published a report on how government is organising itself to deliver net zero by 2050.[5] That report identified a number of challenges and risks the government must manage in taking forward its net zero strategy, many of which extend to managing the transition to zero-emission cars. We briefly examine each of these in turn as they relate to overseeing the transition:

- *Cross-government action*: Our report on achieving net zero highlighted the need for coordinated cross-government action to achieve the government's overall goal, with collaboration, sharing of information and learning taking place.[6] Decarbonising car transport will require effective working across a number of departments and with the private sector. We found a well-integrated working relationship between OZEV, BEIS and DfT. For example, they had common goals, shared data and had coordinated key policies. However, we identified a less effective relationship between the departments, OZEV and local government, with evidence of a lack of shared understanding of national and local strategies and the capacity of local government to participate (paragraph 2.19).

- *Wider stakeholder engagement*: The shift to zero-emission cars requires substantial contributions: from the private sector, in terms of manufacturing and managing the supply-chain, research and investment; and from consumers, in terms of behavioural change. The sale of zero-emission cars ultimately depends on car manufacturers developing models that consumers want to buy (paragraph 2.2), that the barriers remain for consumers in terms of costs and ability to charge are overcome (paragraphs 2.6 and 2.17) and that wider stakeholders, such as electricity suppliers, are also involved in delivering this policy (paragraph 1.5). In our net zero report, we highlight that achieving net zero will cost less if the public understands and accepts the changes that are required.

- *Mitigating uncertainty*: Since at least 2011, DfT and BEIS have recognised that uncertainty could hold back the development of the market for low emission vehicles. Trade bodies and other stakeholders have said that the government's clearly stated goals to fully decarbonise cars by 2050 have helped to galvanise the automotive industry. However, they have also said that the lack of long-term certainty over government grants, especially the plug-in car grant, has been a barrier to investment in zero-emission technology.

5 Comptroller and Auditor General, *Achieving net zero*, Session 2019–2021, HC 1035, National Audit Office, December 2020.
6 See footnote 5.

- *Managing interdependencies*: The shift to zero-emission cars is interlinked with several other policy areas, such as clean air and the impact on the electricity grid. Many of these interdependencies are quite long-term. For example, BEIS analysis suggests that the extra demand from electric cars will not require additional electricity generation until the 2030s, at which point many other sectors of the economy will be decarbonising and therefore demanding less power. A more immediate issue is the government's lack of a clear vision of how much charging infrastructure will need to be installed through the 2020s to support the rapid increase in electric cars over this period.

- *Effective monitoring*: OZEV has focused on monitoring new car sales versus its targets but does not currently have responsibility for monitoring carbon emissions. We noted similar issues in our 2016 report on the Green Deal, which identified that targets did not correspond to the ultimate goal of cutting carbon emissions.[7] OZEV has also relied on long-term trajectories for car sales, with a lack of interim goals and an unclear project plan. There has also been a lack of good data and analysis on charge-points. Despite collecting data in this area, OZEV has been unable to conduct analysis due to capacity constraints. It has also been reliant on a third-party for charge-point data.

- *Resourcing and capacity*: Our net zero report highlighted the need for government to have sufficient resourcing, prioritisation and capacity to meet its objectives.[8] As above, we found that OZEV has been unable to effectively monitor and evaluate its impact, in part due to capacity issues. A recent report by the Government Internal Audit Agency (GIAA) found that OZEV's capacity has been under pressure as the programme has grown and that it needed to ensure resourcing and skillsets meet current priorities and delivery targets. GIAA stated improvements were also needed in OZEV's framework of governance, risk management and control to reflect the growth in the size and complexity of the programme. OZEV has now responded to the recommendations and is in the process of implementing them to strengthen its governance.

7 Comptroller and Auditor General, *Green Deal and Energy Company Obligation*, Session 2015-16, HC 607, National Audit Office, April 2016.
8 See footnote 5.

Appendix One

Our audit approach

1 This report evaluates how well the government has used public money to support the uptake of ultra-low emission cars and draw lessons for the future. It examines this in three parts:

- Part One sets out where decarbonising cars fits in with the broader goals of reaching net zero and describes ultra-low emission car and charging technologies. It also sets out departmental responsibilities, rationale for government intervention, the incentives it has offered and the amount spent on them.
- Part Two examines the progress that has been made in encouraging the uptake of ultra-low emission cars and installing charging infrastructure in the UK. It assesses what impact government has had in this area and identifies what barriers remain to further uptake of zero-emission cars.
- Part Three assesses the progress that has been made in reducing carbon emissions from cars and identifies future challenges for decarbonising car transport in the broader context of the transition to net zero.

2 We focused on consumer-facing grant incentives and did not examine other government interventions to promote research and development or support manufacturers. Our study looks at passenger cars and does not consider other transport modes. The report does not examine other factors that will have an important influence over market expansion including the action taken by the industry to develop a range of cars with the capabilities consumers want to buy, the impact of regulation on incentivising market behaviours and the role of the power supply market. We focus primarily on the impact on carbon emissions given government's focus on reducing carbon emissions from the tail-pipe, rather than the carbon used in production.

3 Our audit approach is summarised in **Figure 15** overleaf. Our evidence base is described in Appendix Two.

Figure 15
Our audit approach

The objective of government

Government has set an ambitious target to bring all greenhouse gas emissions to net zero by 2050. Achieving net zero will require almost all passenger cars to be zero-emission. The government has committed to end the sale of new petrol and diesel cars by 2030. All new cars will need to be zero-emission from 2035.

How this will be achieved

In 2018, the Department for Transport (DfT) published its strategy *The Road to Zero,* which set out government's ambitions for cleaner road transport. The strategy aims to reduce carbon emissions from cars by promoting the use of ultra-low and zero-emission cars and creating the infrastructure that will allow people to charge or fuel their zero-emission cars. Government is encouraging people to switch to ultra-low emission cars through a range of policy instruments, primarily demand-led policies targeting ultra-low emission car purchases and charge-point installation. The main policies in the UK are:

- plug-in car grant;
- electric vehicle home charge scheme;
- workplace charging scheme; and
- on-street residential scheme.

Our study

This study examines whether government is achieving value for money in its approach to increasing the uptake of ultra-low emission cars.

Our evaluative criteria

Government's plans are sufficient to achieve its ambitions to ensure all cars on the road are zero-emission by 2050.

Government is on target to deliver its ambition for increasing the take-up of zero-emission cars and reducing carbon emissions.

Government has a robust understanding of the barriers and opportunities to achieving its ambitions for increasing the take-up of zero-emission cars.

Our evidence
(see Appendix Two for details)

We interviewed staff from DfT, the Department for Business, Energy & Industrial Strategy (BEIS), and the Office for Zero Emission Vehicles (OZEV) and reviewed internal and public documents from these bodies. We engaged with a range of other stakeholders, notably representatives from local authorities, academia, the motor industry and environmental bodies.

Our conclusions

Over the past 10 years government has spent more than £1 billion to incentivise the take-up of ultra-low emission cars. While there has been an increase in the number of ultra-low emission cars and the required charging infrastructure, carbon emissions from cars have not reduced in line with government's initial expectations. The lack of an integrated plan with specific milestones for carbon reductions from cars has resulted in a lack of clarity over what value the public money should be delivering. As a result, the departments have not been able to demonstrate value for money from the amounts expended.

The government has set an ambitious target to phase out the sale of petrol and diesel cars by 2030. The departments need to develop their detailed plans to achieve this goal and now is an important opportunity to learn from previous efforts. This will be a complex transition as moving away from traditional fuel involves significant changes for consumers, fuel suppliers and car-makers. The departments responsible for this transition will require the appropriate skills and capacity to monitor and support all the necessary changes. To achieve this, and deliver value for money, the departments need a much clearer plan for how they will deliver this societal change, focusing on delivering carbon reductions, not solely increased car sales; and a more targeted approach to addressing potential barriers to take-up across the country.

Appendix Two

Our evidence base

1 We reached our independent conclusions about whether government is achieving value for money in its approach to increasing uptake of zero-emission cars after analysing evidence collected between March and November 2020. Our audit approach is outlined in Appendix One. Detail on the data used is shown in **Figure 16** on pages 52 and 53 and **Figure 17** on page 54.

2 We reviewed: the carbon emissions of passenger cars and what contribution they make to the UK's total emissions; government's strategies and targets for decarbonising car transport; and the roles various government departments play in implementing them. We mapped the main barriers preventing further consumer uptake of electric cars, government's demand-side policy interventions to address these barriers and how they have changed over time, and the money that has been spent to date (Part One).

- We reviewed the data sets published by the Department for Business, Energy & Industrial Strategy (BEIS), which set out the UK's greenhouse gas emissions.
- We reviewed published documentation setting out the legally binding targets covering decarbonisation in the UK and the various strategies that government has published relating to decarbonising passenger car transport dating back to 2011.
- We gathered and analysed financial data from the Office for Zero Emission Vehicles (OZEV) to understand levels of expenditure on the various policy interventions over the past decade. We also reviewed the original business cases setting out the original justification for this expenditure.
- To understand the barriers preventing further uptake of electric vehicles, we reviewed the results of the regular public attitudes surveys carried out by the Department for Transport (DfT), BEIS and other stakeholders. We also spoke to a range of stakeholders from the sector, including the British Vehicle Rental and Leasing Association, Low CVP, Zero Carbon Futures and the Committee on Climate Change. We also reviewed a wide range of publicly available data addressing these issues.

3 We examined: the progress made in encouraging the uptake of ultra-low emission cars and the provision of charging infrastructure in the UK; how government has evaluated the effectiveness of its strategies and how these evaluations have been used to inform policy; the challenges to wider take-up of ultra-low emission cars in terms of sales; the technological issues in providing sufficient provision of charge-points and the steps government is taking to address them (Part Two):

- We reviewed published DfT vehicle licensing data to understand the growth in sales of different types of ultra-low emission cars over the past decade and the proportion of the UK car fleet these account for. We also used these data to chart ultra-low emission car sales by region across the UK.
- We collated public information on the retail prices of popular electric and conventional petrol/diesel cars to get an idea of the price differential between the different types of vehicle. We also spoke to industry stakeholders such as the Society of Motor Manufacturers and Traders (SMMT) to understand the main causes of the higher cost of electric cars and what industry's expectations are for future prices.
- To understand the future challenges of increasing electric car sales in the future, we spoke to a wide range of government officials (primarily in OZEV) and also industry bodies such as SMMT and academics from the University of Birmingham and the University of Cardiff.
- We reviewed the results of DfT's regular public attitudes survey to understand how impactful government incentives have been in shaping consumer attitudes and also looked at the impact monitoring performed by OZEV to track the effectiveness of their Go Ultra Low information campaign.
- We reviewed Open Charge Map and ZapMap data to understand the scale of public charging infrastructure provision in the UK and chart its growth over time. We reviewed data from OZEV to understand the number of private home-based, workplace and on-street chargers partially funded by central government.
- We spoke to the Local Government Association and held a small focus group with a number of members of the Association of Directors of Environment, Economy, Planning and Transport (ADEPT) to get the perspective of local government on the challenges of ensuring sufficient public charge-points. We spoke to representatives from Roadchef and the RAC Foundation to understand the challenges facing the private sector in installing high-powered charge-points at motorway and A-road service areas.
- To understand the scale and challenge of off-street parking, we reviewed published data from the English Housing Survey to understand the number and type of households without access to off-street parking.

- We used public data from the Energy Saving Trust, OZEV and DfT to assess how much more expensive public charging of electric cars is compared with charging at home. We also spoke to Ofgem, the Competition and Markets Authority and the National Infrastructure Commission to understand the issues surrounding the installation of public charge-points.

- We interviewed a team at BEIS and reviewed documentation they provided to understand how the increasing number of electric cars is expected to impact upon the electricity grid. We also reviewed the government's consultation on smart charging to understand how this could help reduce the impact of electric cars on electricity generation, transmission and distribution.

4 We examined: the progress government has made in reducing carbon emissions from cars and the factors that have influenced this; and the future challenges for increasing uptake of electric cars in the context of the broader transition to net zero (Part Three):

- We used UK greenhouse gas emission figures published by BEIS to track progress in reducing carbon emissions from cars and from the wider economy. To support this examination, we reviewed annual updates that the Committee on Climate Change prepares for Parliament. We also reviewed data on carbon emissions for new car registrations published by DfT to track average emissions.

- We spoke to OZEV about how it monitored progress in the transition to electric cars and compared the results against good practice from previous National Audit Office (NAO) reports and the 2019 briefing we prepared on sustainability in DfT for the Environmental Audit Committee. We used a wide range of sources to develop our assessment of future risks. In particular, we drew on the recent NAO report on achieving net zero in government.[9]

9 Comptroller and Auditor General, *Achieving net zero*, Session 2019–2021, HC 1035, National Audit Office, December 2020.

Figure 16

Publicly-available government data used in our report

We did not carry out additional validation on government's published data sets but have highlighted the sources and limitations where known

Type of statistic	Department	Description	Limitations	Data set	Figure
Vehicle licensing	Department for Transport (DfT)	DfT publishes data on licensed and first-time registered cars in the UK annually and quarterly. It also provides additional detail on ultra-low emission cars.	Not all data are available quarterly. Licensing records only available for Great Britain prior to July 2014. Records available for all of the UK from July 2014. Ultra-low emission car registration and licensing data are affected by hotspots created from company car headquarters. Full notes and definitions available at: www.gov.uk/government /publications/vehicles-statistics-guidance.	VEH0150 VEH0171a VEH0133a VEH0203 VEH0170 VEH0101	7a, 7b, 9, 10, 14
UK greenhouse gas emissions	Department for Business, Energy & Industrial Strategy (BEIS)	BEIS produces final and provisional greenhouse gas emission statistics each year. Final estimates are used for formal reporting and provisional data are used to help provide a steer on trends.	As emissions are estimated, BEIS identifies an overall uncertainty of around 3% for its 2018 estimate. Provisional figures are subject to a greater range of uncertainty than final figures.	Final UK greenhouse gas emissions national statistics: 1990–2018. Provisional UK greenhouse gas emissions national statistics 2019.	13
English Housing Survey	Ministry of Housing, Communities & Local Government	A continuous national survey looking at housing stock and housing circumstances in England. Created in 2008 through the merging of the English House Condition Survey and the Survey of English Housing. Involves a household interview and a physical inspection of a sample of properties.	Geographically limited to England. Face-to-face interviews reach around 13,300 households and the physical survey reaches approximately 6,000 households.	English Housing Survey 2018 to 2019.	–
Population	Office for National Statistics (ONS)	National and sub-national mid-year population estimates for the UK and its constituent countries by administrative area.	–	Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland.	8

Figure 16 *continued*
Publicly-available government data used in our report

Type of statistic	Department	Description	Limitations	Data set	Figure
Public attitudes	DfT	Government departments run their own surveys to gather data on public attitudes towards transport and their opinions, including: • The National Travel Attitudes Study (NTAS) is a repeated survey with a sample of individuals in England. Survey populations vary. • Transport and technology public attitudes tracker is a repeated survey of individuals living in England using face-to-face interviews. • ONS runs an omnibus survey on opinions and lifestyle. DfT commissioned a series of questions in 2014, 2015 and 2016 on attitudes towards electric vehicles.	Variable geographies. Survey population samples, and some variation particularly with surveys using multi-year waves. Survey questions do not always remain consistent over time. There are variations in the survey populations. Some survey questions are directed at all of the survey population, whereas others, such as the omnibus survey, direct questions at driving licence holders.	NTAS – including willingness to buy a lower CO_2 emission car. Transport and technology public attitudes tracker: electric vehicles ONS opinions and lifestyle survey: public attitudes towards electric vehicles.	–
	BEIS	Data for BEIS's public attitudes tracker are collected through face-to-face interviews with approximately 4,000 households in the UK.	BEIS stopped asking questions about electric vehicles following a review in 2018.	BEIS Public Attitudes Tracker.	–

Source: National Audit Office

Figure 17
Other data used in our report

We did not carry out additional validation on the following published data sets but have highlighted the sources and limitations where known

Type of statistic	Source	Description	Limitation	Data set	Figure
Public charging infrastructure	Open Charge Map	Open Charge Map is a non-commercial, non-profit, electric vehicle data service. Data are provided from a range of sources, including the UK National Charge Point Registry.	Based on public information. Uses data from the National Charge Point Registry, which covers fewer charge-points than ZapMap (see below). Accuracy of information has not been quality assured and some points may have erroneous location information.	–	11
	Department for Transport (DfT)/ZapMap	DfT has published charging device statistics since October 2019, using data from ZapMap.	ZapMap data cover approximately 95% of publicly accessible devices, but true counts are likely to be higher. DfT cannot assess whether data coverage is better in some geographical areas than others. These data include charge-points installed before Q3 2019, but as it is a snapshot, it does not include charge-points already decommissioned or unavailable. DfT notes a small likely impact from the COVID-19 pandemic where data coincide with restrictions. DfT flags these as experimental statistics – new, subject to testing in terms of volatility and ability to meet customer needs.	Electric vehicle charging device statistics	

Source: National Audit Office

Appendix Three

International comparators

1 Other countries have also been focusing on increasing their share of ultra-low emission cars. **Figure 18** provides estimates on the number of electric cars in other countries, as well as the type of support that is provided by government.

Figure 18
Comparison of international electric car numbers and types of government support

Other countries are also trying to increase the number of electric cars

Country	Estimated number of electric cars in 2020[1]	Proportion of total car fleet	Proportion of newly registered cars	Types of support by government			
		(%)	(%)	Direct consumer incentive	Regulatory target	Charging infrastructure support	Other
China	2,580,000[2]	–	~4.9[2]	Yes	Yes	Yes	Yes
United States	880,000[2]	–	–	Yes	Yes	Yes	Yes
Norway	290,436	10.1	49.1	Yes	Yes	Yes	Yes
France	246,701	0.8	6.0	Yes	Yes	Yes	Yes
Germany	211,309	0.4	5.1	Yes	Yes	Yes	Yes
Netherlands	144,876	1.7	12.7	Yes	Yes	Yes	Yes

Notes

1 Data on the number of electric cars, proportion of total car fleet and proportion of new car registrations (excluding China and the United States) have been sourced from the European Alternative Fuels Observatory. Data on China and the United States are sourced from the International Energy Agency (IEA) *Global EV Outlook 2020*. We have not audited these values and include them to help provide context to progress being made in other countries.

2 Data on the number of electric cars and proportion of new car registrations for China and the United States are from 2019. Data from other countries are from the most-up-to date data in 2020 provided by the European Alternative Fuels Observatory.

3 'Other' includes indirect consumer incentives, such as parking spaces for select types of cars, and other areas of spend such as research and development, and marketing campaigns.

Source: National Audit Office analysis of public data

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